

6th Grade Science Unit 1: Setting Things in Motion

Pop-Out 1: Engineering for Equity

Explore

Engineers have been working for years to design solutions that make it easier for people with disabilities to do everyday activities, including those that involve moving objects. As a group,

1. Research examples of solutions that engineers have designed to improve the lives of people with disabilities. As you research, record notes in the table below:

Solution	How does it help people with disabilities?	Would it help a person with a disability do your activity? If yes, how?

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2. Use your research as inspiration to brainstorm a potential solution to make your Culminating Project Activity more accessible to someone with a disability. Describe your solution below:

Explain

1. As a group, prepare a 1-2 minute presentation to share your solution with the class. In your presentation, include:
 - What your activity is
 - What might make this activity difficult for someone with a disability
 - What your solution is and how it helps to solve a problem
 - What research inspired your solution
2. Present to the class, making sure everyone in the group shares.
3. As a class, discuss how some of these solutions might be used for many different activities.

Elaborate

Many of the solutions you researched and presented were engineered to make an existing activity more accessible to people with disabilities. However, what if we instead decided to always try to engineer products and environments to be usable by **all** people from the very beginning?

1. As a class, watch the following video about a new approach to engineering called “Universal Design”:
<https://www.youtube.com/watch?v=bVdPNWMyZY> (5:05 – 10:10).
2. With a partner, discuss:
 - a. Describe the example of Universal Design he used in the video.
 - b. Can you think of another example you have seen in the world that not only works for people with disabilities, but also for everyone?




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c. Why do you think Universal Design might be a good idea?

Evaluate and Reflection

Individually, take a few minutes to think about what you learned in this Pop-Out. Then reflect on the questions below:

1. Look at the pictures and the captions below.

Equality	Equity	Justice
		
<p>The assumption is that everyone benefits from the same supports. This is equal treatment.</p>	<p>Everyone gets the supports they need (this is the concept of "affirmative action"), thus producing equity.</p>	<p>All 3 can see the game without supports or accommodations because the cause(s) of the inequity was addressed. The systemic barrier has been removed.</p>

<http://agentsofgood.org/wp-content/uploads/2017/04/Equality-vs-Equity-Illustration3.jpg>

a. How do you think the photos show the difference between equality, equity, and justice?

b. Look at the picture on the left: why can only practicing equal treatment sometimes be a problem?

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2. Why do you think it is important for us to practice using equity or justice, instead of just equality?

3. How can engineering be used to promote equity and justice for all human beings?

6th Grade Science Unit 2: Extreme Living

Pop-Out 2: Equity in STEM

Pop-Out Essential Question: *Is there diversity in STEM and why does it matter?*

In this unit's culminating project, your job is to design a product that makes it more comfortable for people to live in extreme climates. What you are doing is engineering!

Engineering is part of a larger category you may have heard of before called STEM – Science, Technology, Engineering, and Math. In the last 30 years, STEM jobs have grown 79% and they often pay a much higher salary than non-STEM jobs (see graph to right). With lots of jobs available and higher pay, you might think all kinds of people decide to work in STEM professions!

In this Pop-Out, you will explore who works in STEM fields and why this matters for the rest of society.

Engage

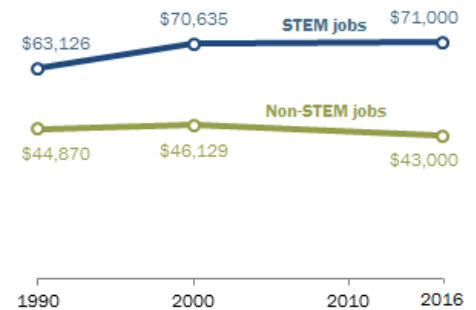
Innovations from STEM fields are all around you, affecting most aspects of your everyday life! How did these innovations come about and who did they come from?

1. Individually, think about when you've acted like an engineer, for example when you designed a solution to a problem:
 - a. Do you think you'd come up with a better solution on your own, or if you had a chance to share ideas with others? Why?
 - b. Let's say you decide to work with a team. Do you think you'd come up with a better solution if your team was made up of people with identical backgrounds, perspectives, and experiences? Or, do you think your solution could be improved by working with people from different backgrounds, perspectives, and experiences? Why?

2. Diversity refers to difference. Do you think diversity is important in STEM fields? Why? Share your opinion, first with a partner and then with the class.

The typical STEM worker now earns two-thirds more than non-STEM workers

Median annual earnings of full-time, year-round workers ages 25 and older, in 2016 dollars



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Pop-Out 2: Equity in STEM

Explore

You've discussed ways in which diversity is good for STEM. Let's explore how diverse STEM fields actually are. You will be given four Research Cards. Each contains a different graph of data that shows the groups of people represented in STEM. As a group, review each Research Card and use the graph analysis questions to help you understand each source of data. Fill in the graphic organizer with your notes below:

Research Card #	What is this graph about?	Discussion Questions
1		<p>Is there a higher female-to-male ratio in non-STEM or STEM fields?</p> <p>Are there more women or men majoring in STEM fields?</p>
2		<p>Are there more females or males in each STEM education level?</p> <p>At what level of STEM education is there the most difference between the percentage of females and males?</p>
3		<p>Which racial group holds the largest percentage of STEM jobs and which racial group holds the lowest percentage?</p> <p>Which STEM field has the most white people?</p> <p>Which STEM field has the fewest underrepresented minorities (Black and Hispanic people)?</p>
4		<p>Which racial group is most represented (largest bar) and which racial group is least represented (smallest bar) at each Professor Rank Level?</p>

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Pop-Out 2: Equity in STEM



		At which Professor Rank is there the most difference between white representation and representation of other races?
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Explain

Now that you have seen the data, how would you explain the amount of diversity in STEM to another person? Individually, fill out the graphic organizer below to help you describe diversity in STEM, citing evidence from the graphs.

Claim About Diversity in STEM	According to data, would you say there is a lack of diversity in STEM, lots of diversity in STEM, or is it too difficult to tell?
Evidence of Gender Diversity (Describe what you saw in Graphs 1 and 2)	
Evidence of Racial Diversity (Describe what you saw in Graphs 3 and 4)	

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Pop-Out 2: Equity in STEM

Elaborate

To address this lack of gender and racial diversity in STEM, we need to better understand why it might be happening!

1. Individually, read and annotate the article, “Why Are We Seeing a Lack of Diversity in STEM?”
2. With a partner, fill out the table below:
 - a. First Row: Describe three possible reasons for the lack of gender and racial diversity in STEM.
 - b. Second Row: Brainstorm at least one strategy to address each issue described in the article.

Reasons For the Lack of Gender and Racial Diversity in STEM			
Strategies to Bring More Women and Underrepresented Minorities into the STEM Field			

3. As a class, share ideas out and make a poster of potential strategies.

6th Grade Science Unit 3: Nature Via Nurture

Pop-Out 3: Genetic Testing – Access Denied

Pop-Out Essential Question: *How is genetic testing important for our health and who has access to it?*

You have examined a lot of scientific evidence around the nature vs. nurture debate and found that both genetics and environment affect the traits of organisms. Studying an organism’s environment is not difficult—we simply observe an organism’s habitat. However, to figure out how an organism’s genetic information affects how it looks or behaves, may not be as simple.

In this Pop-Out, you will learn about the rise of genetic testing, including why it is so important in modern medicine and who has access to it.

Engage

Perfect pitch is one of those traits that we know is hereditary, or determined by a gene variation passed on from a family member. 48% of people with perfect pitch have a close relative with perfect pitch, compared to only 14% of people without perfect pitch. Having perfect pitch means you are able to recognize, or make a tone without another reference, like hearing the tone or note on a piano.

Here’s where it gets interesting! Even if a child has the genetic variation, they need early musical training before age six in order to actually develop perfect pitch. This means, without knowing it, some of you may have the genetic variation for perfect pitch and not even know it!

With a partner, discuss:

1. Does this support the argument for nature, nurture, or nature via nurture? Why?
2. Why do you think this would make someone want to know more about their genetic makeup?
3. Genetic testing is not a simple medical test. It uses complex machines and highly trained professionals to interpret the results. This means genetic testing is very expensive!
 - a. What do you think this means for who gets to find out about their genetic makeup?

6th Grade Science Unit 3: Nature Via Nurture

Pop-Out 3: Genetic Testing – Access Denied

Explore

Knowing whether you have the genetic variation for perfect pitch may not seem like the biggest priority. However, there are lots of other genetic variations that can have a big impact on your health and the health of your children. For example, some genetic variations affect the way your cells or organs function, or whether you may develop certain diseases in your lifetime. So, how can we find out more about our genetic makeup? Genetic testing is a medical test that looks for any differences in your DNA code that can cause you to develop and/or pass on certain diseases. Remember that you inherit part of your genes, or DNA code, from your mother and some from your father.

As a group, pick one of the following patients and watch a video of their story to learn more about what genetic testing can do and why it is important:

- Paige’s Story: <https://www.youtube.com/watch?v=-UHg0oEqdAg>
- Nicole’s Story: <https://www.youtube.com/watch?v=d7u3A1WMT5s>
- Jessica’s Story: <https://www.youtube.com/watch?v=uFjv5vae1J8>
- Conner’s Story: <https://www.youtube.com/watch?v=ZOJ9LpNRg3Q>
- Nicole R.’s Story: <https://www.youtube.com/watch?v=EvUmsi5gZY0>

Take notes in the box below. You will use these notes to prepare a presentation about how genetic testing helped your patient.

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Pop-Out 3: Genetic Testing – Access Denied

Explain

Genetic testing is important for many different purposes. Since other groups in your class chose different patient stories, you can learn about some of these different purposes from each other.

1. As a group, create a presentation to share your patient’s story. In your presentation, make sure to include the following:
 - A background of your patient
 - A description of what medical issues or problems your patient was facing
 - An explanation of how genetic testing helped your patient and/or your patient’s family members
2. After hearing about all the patients’ stories, discuss as a group:
 - What are the different benefits of genetic testing?
 - Why is genetic testing important for health outcomes?Prepare to share out ideas as a class.

Elaborate

You have seen that genetic testing can play an important role in many people’s health. Since it is so important, it seems like genetic testing should be available to everyone. But is it?

1. Individually, read and annotate the article below, “Who Has Access to Genetic Testing?”

Who Has Access to Genetic Testing?

Genetic testing has been on the rise, helping doctors to prevent, diagnose, and treat more diseases. However, research has shown that minority and low-income groups are much less likely to receive genetic testing.

Research shows that a major reason for this is cost. Genetic testing is very expensive, and private insurance companies will only pay for it if the patient meets specific conditions. For example, an insurance company may only allow someone to get testing for a specific disease if they have other family suffering from the same disease. Other data also shows that minority and low-income groups are less likely to even have that private health insurance. These are just some of the reasons why many people often cannot afford this expensive genetic testing.

Another challenge minority and low-income groups face is not knowing that genetic testing is available or not getting enough understandable information from their

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doctor. If they don't know that genetic testing is an option, they can't ask for it. For example, research shows that white women are more likely to request genetic counseling for breast cancer than women in minority groups.

Lastly, studies indicate that there is often less trust in the medical system among minority groups. Many individuals report concern about how their genetic test results will be used. For example, research has shown that African American women perceive that there are more risks and limitations to genetic testing than other groups.

How will this affect the health of people in these groups? Is this fair?

Adapted From The Following Sources:

- <https://www.nature.com/articles/gim200997>
- <https://www.healthcarediver.com/news/genetic-testing-threatens-to-widen-health-disparities/424144/>

2. With a partner, discuss the article and answer the questions below. Be prepared to share ideas with the class.
- Which groups of people usually have less access to genetic testing?
 - What three reasons does the article give to explain their lack of access?
 - Think about the stories you heard and how the patients benefited from genetic testing. Why might it be a problem if certain groups of people do not have access to genetic testing?
 - How can you see this being a problem for our society?

6th Grade Science Unit 4: A Warmer World

Pop-Out 4: A Call For Equity in Climate Action

Pop-Out Essential Question: *Why does Greta Thunberg call for equity in climate action?*

In your Culminating Project, you are focusing on a plant or animal affected by climate change. However, many of you already know that humans are also suffering the impacts of climate change, and it is only getting worse!

In response, people all around the world are talking about climate action. These are the efforts we can take to reduce our contributions to climate change and to adapt to the situation we are in. In this Pop-Out, you will explore who should be the major players in climate action and why.

Engage

You may have heard the name Greta Thunberg in the news or social media. She is a Swedish environmental activist that is not much older than you are! In the last few years, she has made countless speeches calling attention to the international crisis of climate change.

1. As a class, watch the following video of one of Greta Thunberg's speeches:
https://www.ted.com/talks/greta_thunberg_the_disarming_case_to_act_right_now_on_climate_change/up-next
2. Discuss the following questions first with a partner and then as a class:
 - a. How did listening to Greta make you feel? What were your first impressions?
 - b. What does Greta say is so confusing to her about the climate crisis?
 - c. What does Greta say about equity, or climate justice?
 - d. What reason does she give for people not caring enough about the climate crisis right now?

6th Grade Science Unit 4: A Warmer World

Pop-Out 4: A Call For Equity in Climate Action

Explore

In Greta Thunberg’s speech, she talked about a need for equity or climate justice in order for climate action to work on a global scale. Many climate activists say equity is the key to climate action. But why?

You have been introduced to this idea of equity throughout the other Pop-Outs this year. With your group, use what you’ve learned from previous Pop-Outs to first discuss what you think equity means. Record your ideas in the box below:

Now let’s see why climate activists, like Greta, are asking for equity in climate action. As a group, use the online interactive Carbon Map to help you decide for yourself what might be fair in a climate action plan.

1. Type carbonmap.org into your web browser. Press the play button to watch and listen to the introduction that describes how this interactive map works. Write a few sentences to describe what this interactive map will show you:

2. You have seen an “Area” Map before. Let’s start to explore the different maps by first looking at the “Population” Map and the “Wealth” Map (*Note: make sure the “Shade By” tab is set to “Continents”*)
 - a. Click on the “Population” Map. How is it different from the “Area” Map? Write down 1-2 things you notice.

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b. Next click on the “Wealth” Map. How is it different from the “Population” Map? Write down 1-2 things you notice.

i. Compared to their population size, which continents have more wealth than you would expect? How could you explain this?

3. The rest of the Maps will help you determine which continents are most responsible for climate change and which are most vulnerable to the impacts. Click on the tabs at the top to explore the other maps and fill in the table below with your analysis. For each map, make sure to click back on the “Population” tab to make comparisons.
- o Helpful Tip: on the right side, there is a box labeled “This Map” that will give you more helpful information about that map.

Responsibility			
Map Type	Which continents are larger than their “Population” map size?	Which continents are smaller than their “Population” map size?	Questions to Consider
Emissions			Compared to their population size, which continents contribute more to carbon emissions than you would expect?
Consumption			Compared to their population size, which continents contribute more to carbon emissions from consumption than you would expect?
Historical			Which two continents have contributed the most carbon emissions in the past ?

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Vulnerability			
People At Risk			Which continent has the most people at risk of feeling the effects of climate change in the future?
Sea Level			Which continent is most in danger of sea level rise (a result of climate change)?
Poverty			Which continents are most vulnerable to the impacts of climate change because of poverty ?

Explain

Now that you have seen the data for yourself, take a stance: do you think we need equity in climate action? In other words, should everyone have equal responsibility in dealing with climate change or should some countries have more responsibility?

As a group, prepare for a class discussion in which you will:

- ✓ Vote on whether you think equity should be considered in climate action
- ✓ Use map data to justify why you think equity should or shouldn't be an essential piece of climate action
- ✓ Explain what you think it would mean to have equity in climate action

Elaborate

If some countries are going to be responsible for more of the climate change burden than others, this is going to require a lot of cooperation around the globe! This kind of cooperation was attempted by the Paris Climate Agreement, which was signed by 195 countries in 2015 (including the United States). At the time, it was seen as the most promising effort to tackle climate change thus far.

1. As a class, watch the following video that gives you a news update on where the United States stands with the Paris Climate Agreement: https://www.youtube.com/watch?v=MRCRiMNg_kM. Use the following questions to discuss the video:
 - What was the goal of the Paris Climate Agreement?
 - What did President Trump decide to do about the Paris Climate Agreement?
 - How could this affect global climate action?
 - Do you agree with this decision?
 - If you don't agree, what would you do differently and why?

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2. The Paris Climate Agreement calls for equity, but doesn't lay out a specific system to ensure it. As a group, brainstorm: What would you include in a climate agreement like this one to make sure it is fair and equitable?

Evaluate and Reflect

Individually, take a few minutes to think about what you learned in this Pop-Out. Then reflect on the questions below:

1. Why do you think that there should be equity in climate action?
2. What do you think are the best ways to achieve equity in climate action?
3. Think back to Greta Thunberg's speech in the first video. What do you think you could do as a young environmental activist like Greta?