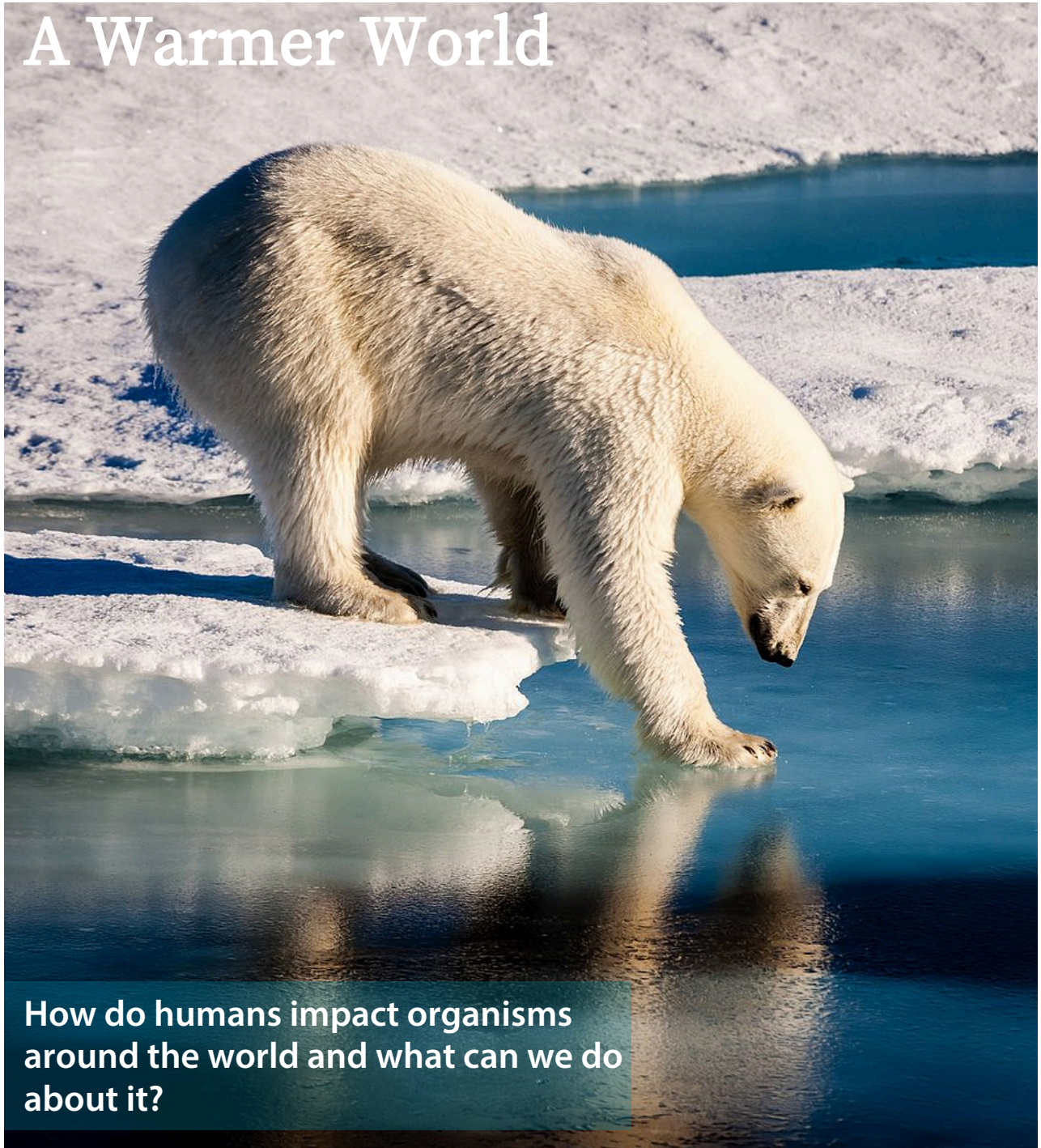


UNIT 4

A Warmer World



How do humans impact organisms around the world and what can we do about it?

SCALE

Stanford Center for Assessment,
Learning & Equity



6th Grade Science Unit 4: A Warmer World

Culminating Project

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Challenge

In the Lift-Off Task, you saw that bee populations are drastically decreasing. We are seeing these kinds of changes in organisms around the world—changes in population size and even in behavior and in traits. Why is this happening and what can we do about it?

Your task is to pick a plant or animal harmed by global warming and design a method to monitor and minimize this impact. You have likely seen images or videos depicting very sad stories of animals affected by climate change. While it is certainly sad, there is still hope! As a group, create an advocacy video that describes the human impact on your organism and gives a potential solution, thus replacing the sad and hopeless type of video we usually see.

Individually, you will then compare and evaluate all the different solutions amongst your classmates. You may present your evaluation in the format of your choice (report, poster, powerpoint, video, podcast, etc.)



List of Organisms to Choose From

- Magpie Lark
- Shorebird
- Finnish Farm Bird
- Salmon
- Whooping Crane
- Hummingbird
- Caribou
- Lilac
- Spider Orchid
- Glacier Lily

6th Grade Science Unit 4: A Warmer World

Culminating Project

Group Project Criteria for Success

Your advocacy video should include:

- ✓ A description of the problem
 - How is your chosen plant/animal affected by global warming, and why is it a problem?
 - What are the criteria for solving this problem?
 - What are some constraints in solving this problem?

- ✓ An explanation of your method to monitor or minimize the impact on your plant/animal

- ✓ The pros and cons of your solution
 - How does it meet the criteria and constraints of the problem?
 - What are some challenges in meeting the criteria and constraints?

- ✓ Quality Video Structure
 - Grabs the audience's attention
 - Is organized logically
 - Includes relevant visuals
 - Persuades your audience

6th Grade Science Unit 4: A Warmer World

Culminating Project

Individual Project Criteria for Success

Your solutions evaluation should include:

- ✓ A description of the problem facing all of the organisms, including:
 - The criteria and constraints for solving this problem for all of the organisms

- ✓ Scientific background to help your audience understand the problem, including:
 - The cause of the problem and the evidence that supports this cause-and-effect relationship
 - Whether you think this problem was caused by a sudden change or gradual changes that have accumulated over time and why

- ✓ An argument for why global warming poses a threat to organisms, including:
 - How all the organisms' behaviors or structures affect their probability for successful reproduction, and
 - How these behaviors or structures are being affected by rising temperatures
 - For both bullets above, remember to include descriptions of examples from other groups' projects as evidence

- ✓ An explanation of your method to monitor or minimize the impact on your plant/animal

- ✓ An evaluation of solutions:
 - Which solution do you think will have the most impact (best meets the criteria)? Why?
 - Which solution seems to be the most feasible (best meets the constraints)? Why?
 - Based on your evaluation, which solution would you recommend and why?

**6th Grade Science Unit 4: A Warmer World
Culminating Project**

Solutions Evaluation Peer Review Feedback

Complete after you have a full first draft of your Solutions Evaluation.

Evaluation Owner's Name	
Evaluation Reviewer's Name	

Review the following sections of the Solutions Evaluation:

- ✓ A description of the problem facing all of the organisms, including:
 - The criteria and constraints for solving this problem for all of the organisms
 - Positive Comment:

 - Constructive Comment:

- ✓ Scientific background to help your audience understand the problem, including:
 - The cause of the problem and the evidence that supports this cause-and-effect relationship
 - Whether you think this problem was caused by a sudden change or gradual changes that have accumulated over time and why
 - Positive Comment:

 - Constructive Comment:

**6th Grade Science Unit 4: A Warmer World
3-Dimensional Individual Project Rubric**

Overview: The following rubrics can be used to assess the individual project: an evaluation of different solutions to minimize human impact on organisms. Each rubric is aligned to one section of the *Individual Project Criteria for Success*, located on your Culminating Project Student Instructions. Use these rubrics to see if you are doing your best work on your individual project.

Rubric 1: Student defines the problem of human impact on organisms, including criteria of success and constraints that might limit possible solutions.

Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
Student does not define the problem of human impact on organisms and/or includes inaccurate or irrelevant criteria of success and constraints that might limit possible solutions.	Student accurately defines the problem of human impact on organisms, including accurate criteria of success OR constraints that might limit possible solutions.	Student accurately defines the problem of human impact on organisms, including accurate but partial criteria of success and constraints that might limit possible solutions.	Student accurately defines the problem of human impact on organisms, including accurate and complete criteria of success and constraints that might limit possible solutions.

Rubric 2: Student explains the cause of the problem, including whether it is due to a sudden change or gradual changes that accumulate over time.

Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
Student inaccurately explains the cause of the problem.	Student accurately but partially explains the cause of the problem, and may include whether it is due to a sudden change or gradual changes that accumulate over time.	Student accurately and completely explains the cause of the problem, but does not include whether it is due to a sudden change or gradual changes that accumulate over time.	Student accurately and completely explains the cause of the problem, including whether it is due to a sudden change or gradual changes that accumulate over time.

Rubric 3: Student argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, supporting with evidence from their own and other groups' projects.

Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
Student accurately argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, but evidence from their own or other groups' projects is missing or inaccurate .	Student accurately argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, supporting with general scientific reasoning rather than evidence .	Student accurately argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, supporting with one source of relevant evidence from their own or other groups' projects.	Student accurately argues that there are plant structures and animal behaviors that affect the probability of successful reproduction, supporting with multiple sources of relevant evidence from their own and other groups' projects.

**6th Grade Science Unit 4: A Warmer World
3-Dimensional Individual Project Rubric**

Rubric 4: Student explains that global warming likely causes negative effects on many organisms, supporting with evidence from their own and other groups’ projects.

Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
Student accurately explains that global warming likely causes negative effects on many organisms, but evidence from their own or other groups’ projects is missing, inaccurate, or irrelevant .	Student accurately explains that global warming likely causes negative effects on many organisms, supporting with general scientific reasoning rather than evidence .	Student accurately explains that global warming likely causes negative effects on many organisms, supporting with one source of evidence from their own or other groups’ projects.	Student accurately explains that global warming likely causes negative effects on many organisms, supporting with multiple sources of evidence from their own and other groups’ projects.

Rubric 5: Student describes their solution to monitor and minimize human impact on their chosen organism.

Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
Student describes their solution that does not monitor or minimize human impact on an organism.	Student describes their solution to monitor and minimize an irrelevant human impact on their chosen organism, which is not related to global warming .	Student describes their solution to monitor and minimize the relevant human impact on their chosen organism, using partial detail .	Student describes their solution to monitor and minimize the relevant human impact on their chosen organism, using sufficient detail .

Rubric 6: Student evaluates different solutions by identifying solutions that best meet the criteria and/or constraints of the problem and providing rationales.

Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
Student evaluates different solutions by identifying irrelevant solutions that do not meet the criteria and constraints of the problem.	Student evaluates different solutions by identifying relevant solutions that best meet the criteria and constraints of the problem, but rationale is missing .	Student evaluates different solutions by identifying relevant solutions that best meet the criteria and constraints of the problem and providing some rationale.	Student evaluates different solutions by identifying relevant solutions that best meet the criteria and constraints of the problem and providing detailed rationales.

**6th Grade Science Unit 4: A Warmer World
Project Organizer**



Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

You have been asked to create an advocacy video that describes the human impact on an organism and gives a potential solution. After each task, you will return to the table below to organize what you learn as you go through the unit. By the end of the three tasks, you will have all this information to use for your culminating project. For each activity, be sure to include answers to **ALL** the questions provided.

<p>Lift-Off Task: Bad News for Bees</p>	<p>Based on your discussion in groups today,</p> <ul style="list-style-type: none"> <input type="checkbox"/> Make a hypothesis: What do you think is causing the bee population to decrease? <input type="checkbox"/> Do you think other organisms around the world might also be affected by the same cause? How?
<p>Task 1: Heating Up</p>	<p>You have been provided with a list of organisms that are affected by rising temperatures. <u>As a group</u>, select an organism from the list to focus on for your culminating project and research your organism. Then <u>individually</u>,</p> <ul style="list-style-type: none"> <input type="checkbox"/> Define the problem: What is happening to global temperature and why might it be a problem? <input type="checkbox"/> Identify the criteria for a successful solution: How will you know if a solution addresses the problem? <input type="checkbox"/> Identify the constraints of solving this problem: What might make it hard to solve this problem?

**6th Grade Science Unit 4: A Warmer World
Project Organizer**



<p>Task 2: It Takes Two</p>	<p>Consider your chosen organism and do additional research, as necessary:</p> <ul style="list-style-type: none"> <input type="checkbox"/> What specialized structures OR behaviors does your organism have that help it survive and reproduce? Describe how these characteristics specifically help with survival and/or reproduction.
<p>Task 3: Feeling the Impact</p>	<p>In this task, you learned about how humans are impacting your chosen organism through global warming and are well on your way to coming up with a solution!</p> <ul style="list-style-type: none"> <input type="checkbox"/> Summarize the ideas from your poster here. <ul style="list-style-type: none"> ○ Describe the feedback you received from peers and how you plan to revise it based on that feedback. <input type="checkbox"/> Return to your criteria and constraints that you identified after Task 1. Based on what you have learned about your organism so far, how can you revise them or add to them?

6th Grade Science Unit 4: A Warmer World

Lift-Off Task: Bad News for Bees

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

In the last unit, you learned that an organism—algae—is being affected by changes to its environment. Take a look at the data below showing the population of another organism—bees:



Part A: If you wanted to know more about the world's bee population between 1947-2008, what questions would you ask? Individually record any questions you would need to ask to get a better understanding of the world's bee population.

6th Grade Science Unit 4: A Warmer World**Lift-Off Task: Bad News for Bees**

Part B: As a group,

- ✓ Discuss what questions each member wrote on his or her list.
- ✓ On a large piece of poster paper:
 - Write the phrase “The Changing Bee Population” in the middle of your poster and draw a circle around it.
 - Around the circle, record the questions that were similar across your group members.
 - Draw lines to link together questions that relate to each other.
 - Draft possible answers to the questions, using your prior knowledge. Connect these to the questions on your poster.
- ✓ Post your group poster on the wall.
- ✓ Walk around and look at each groups’ ideas.

Part C: As a whole class,

- ✓ Construct a class concept map with the phenomenon in the middle: “The Changing Bee Population”.
 - Decide which key questions you want to have on the concept map.
 - Draw lines with arrows between two key questions to show that there is a relationship.
 - Make as many connections as you can between the questions on the concept map.
- ✓ It’s important for everyone to share their ideas and it’s okay if you don’t agree.
- ✓ You will revise and add new questions and information to this concept map as you learn more about the causes and effects of the declining bee population.

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Connecting to the Culminating Project

You have been asked to create an advocacy video that describes the human impact on an organism and gives a potential solution. Based on your discussion in groups today,

- ✓ Make a hypothesis: What do you think is causing the bee population to decrease?
- ✓ Do you think other organisms around the world might also be affected by the same cause? How?

This should be completed individually in your Project Organizer.

6th Grade Science Unit 4: A Warmer World**Lift-Off Task: Bad News for Bees**

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Reflection

Individually reflect on the Lift-Off Task, using the questions provided:

1. At the beginning of this task, you made a list of all the questions you have about the declining bee population. Look back at your list: think about the questions your peers asked that you did not initially write down. How are their questions different from the ones you originally asked?

2. In this unit, we will be focusing on two crosscutting concepts:
 - **Cause and Effect:** Phenomena may have more than one cause, and sometimes relationships can only be described using probability.
 - **Stability and Change:** Stability might be disturbed by sudden events or the accumulation of gradual changes.Looking at your class concept map, give one example of how one of these crosscutting concepts came up in today's task.

3. Now that you understand what project you'll be working on over the course of this unit, what else do you need to know? What additional questions do you have?

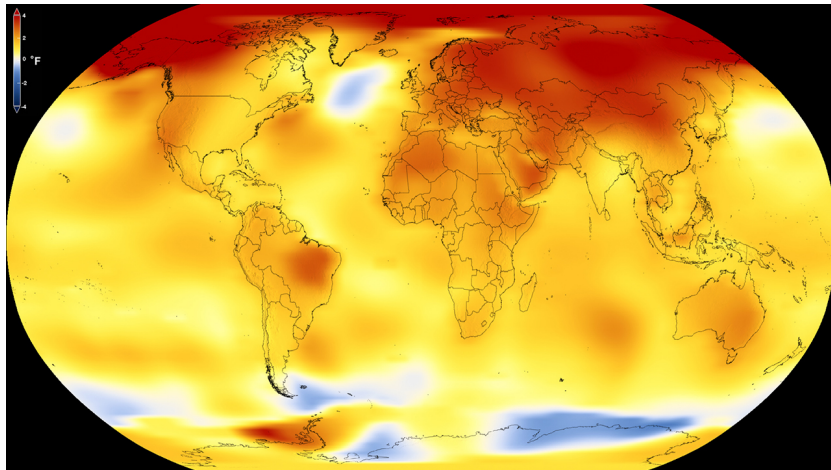
6th Grade Science Unit 4: A Warmer World

Task 1: Heating Up

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Engage

In the Lift-Off task, you saw that the bee population is declining. In the last unit, you learned that algal blooms have been on the rise in recent years. But why are these things happening? Why are we seeing changes like these in many different organisms around the world? To answer these questions, we first need to investigate how environments are changing around the world and why.



1. Watch the first minute of the following video: https://climate.nasa.gov/climate_resources/42/video-temperature-puzzle/.

Individually,

2. Make hypotheses:
 - a. What do you think is causing these rising temperatures?

 - b. Why do you think rising temperatures might affect organisms?

3. **Asking Questions:** What questions could you ask in order to find out more about these rising temperatures?

6th Grade Science Unit 4: A Warmer World

Task 1: Heating Up



Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Explore

Like any good scientist, we need to gather more evidence to figure out whether global temperatures are actually rising, and if so, why it’s happening. **Asking Questions:** Your teacher will be giving your group one piece of evidence at a time. For each piece of evidence, discuss with your group and record:

- What you think the evidence tells you
- Any questions you have about the piece of evidence or things the piece of evidence makes you want to know more about

Evidence	What does the evidence tell you?	What additional questions do you have?
Graph: Global Temperature Change		
Graph: Temperature and Carbon Dioxide		
Experiment: Temperature and Carbon Dioxide		
Graph: Carbon Emissions From Fossil Fuels		
Graph: Carbon Emissions From Volcanic Eruptions		

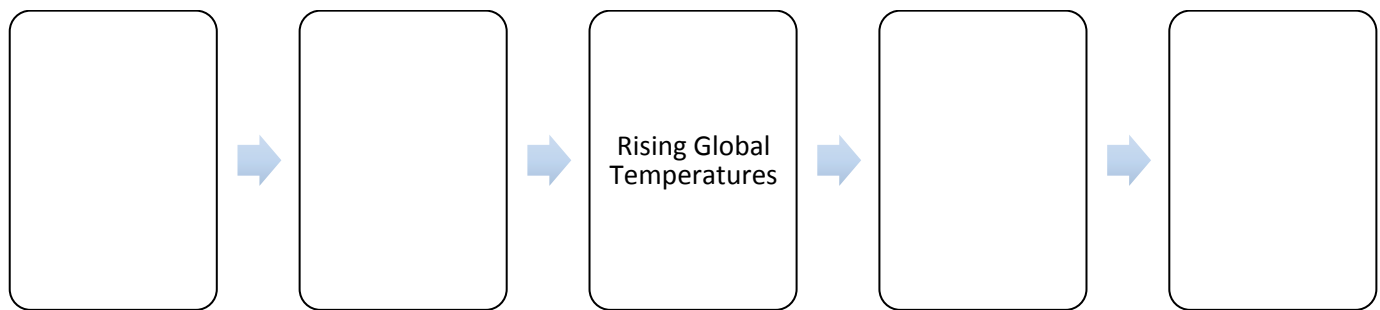
6th Grade Science Unit 4: A Warmer World

Task 1: Heating Up

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Explain

Now that you have seen all the evidence, let’s return to our original questions from the *Engage*: What do you think is causing these rising temperatures? Why do you think rising temperatures might affect organisms? Draw conclusions by individually filling out a cause and effect flowchart. You may use as many or as few of the boxes as you’d like:



Label the arrows above with the resource from the *Explore* that allowed you to make the connection.

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Elaborate

Stability and Change: Look back at the last two pieces of evidence in the *Explore*. Both graphs examine causes of carbon dioxide emissions. In partners, discuss:

1. Which one represents a sudden change? Which one represents gradual changes that have accumulated over time? Explain how you know.

2. Which cause seems to have more of an impact over time?

6th Grade Science Unit 4: A Warmer World

Task 1: Heating Up

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Evaluate: Connecting to the Culminating Project

You have been asked to create an advocacy video that describes the human impact on an organism and gives a potential solution. You have been provided with a list of organisms that are affected by rising temperatures. As a group, select an organism from the list to focus on for your culminating project and research your organism. Then individually,

- ✓ Define the **problem**: What is happening to global temperature and why might it be a problem?
- ✓ Identify the **criteria** for a successful solution: How will you know if a solution addresses the problem?
- ✓ Identify the **constraints** of solving this problem: What might make it hard to solve this problem?

This should be done individually in your Project Organizer.

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Reflection

Individually reflect on Task 1, using the questions provided:

1. At the beginning of this task, you were asked to hypothesize why temperatures are rising. Look at your hypotheses in the *Engage* and your flowchart in the *Explain*. How has your understanding changed over the course of the task?

2. In this task, we focused on the crosscutting concept of:
 - **Stability and Change**: Stability might be disturbed by sudden events or the accumulation of gradual changes.

Where do you see examples of **Stability and Change** in this task?

6th Grade Science Unit 4: A Warmer World**Task 1: Heating Up**

-
3. Now that you have learned more about the rise of global temperatures and its cause, what questions do you still have?

6th Grade Science Unit 4: A Warmer World

Task 2: It Takes Two

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Engage

In the last task, you saw evidence of rising global temperatures and the factors causing them. Why does a rise in global temperatures matter? How might this impact the Earth and its organisms? Before we can explore these questions, we first need to understand what actually affects the survival of organisms on Earth. In this task, you will explore examples of different animal behaviors and plant structures that allow organisms to successfully survive and reproduce.



In the Lift-Off, you learned that the bee population is declining. Scientists say that bees and flowering plants heavily rely on each other, so this could be a huge concern.

In partners, use your prior knowledge of bees and flowers to discuss and try to answer the following: What do you think scientists mean when they say bees and flowering plants rely on each other?

6th Grade Science Unit 4: A Warmer World

Task 2: It Takes Two



Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Explore

To explain this statement from scientists, we need more evidence about how animal behaviors and plant structures help organisms, like bees and flowering plants, to survive and reproduce. In groups, visit the stations and record your evidence in the table below:

Characteristic	What Organisms Do/Have This?	Explain how this helps survival and/or reproduction.
Nesting <i>Animal Behavior</i>		
Migration <i>Animal Behavior</i>		
Bright Flowers <i>Plant Structure</i>		
Sex Pheromones <i>Plant Structure</i>		

Discuss: In what examples did animal behaviors and plant structures seem related? Explain.

6th Grade Science Unit 4: A Warmer World

Task 2: It Takes Two

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Explain

Engaging in Argument From Evidence: Now that you have seen the different characteristics that help plants and animals survive and reproduce and how these are related, let's return to the *Engage* scenario: Scientists say that bees and flowering plants heavily rely on each other. Individually, write an argument that supports or refutes this statement using evidence from the *Explore* stations and your own scientific reasoning.

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Elaborate

Cause and Effect: You know from the Lift-Off that the bee population is declining. What do you think is likely to happen to plants if the bee population continues to decline? Discuss with a partner and record your prediction and reasoning below:

6th Grade Science Unit 4: A Warmer World

Task 2: It Takes Two

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Evaluate: Connecting to the Culminating Project

You have been asked to create an advocacy video that describes the human impact on an organism and gives a potential solution. Consider your chosen organism and do additional research, as necessary:

- ✓ What specialized structures OR behaviors does your organism have that help it survive and reproduce? Describe how these characteristics specifically help with survival and/or reproduction.

This should be individually in your Project Organizer.

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Reflection

Individually reflect on Task 2, using the questions provided:

1. At the beginning of this task, you were asked to explain what you thought scientists mean when they say plants and bees rely on each other. Look back at your responses in the *Engage* and your argument in the *Explain*. How has your thinking changed or remained the same over the course of this task?

2. In this task, we focused on the crosscutting concept of:
 - **Cause and Effect:** Phenomena may have more than one cause and sometimes relationships can only be described using probability.
Where do you see examples of **Cause and Effect** in this task?

3. Now that you have learned more about the characteristics that affect organisms' survival and reproduction, what questions do you still have?

6th Grade Science Unit 4: A Warmer World

Task 3: Feeling the Impact

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Engage

In Task 2, you learned about the different animal behaviors and plant structures that allow organisms to survive and reproduce. But remember that global temperatures are rising! What happens if an organism's environment changes in a way that affects their behaviors and structures? In this task, you will investigate how increasing temperatures are impacting organisms around the world.



Many of you have heard about global warming in the news or in prior science classes. In partners, brainstorm a list of plants and animals you've heard are being affected by rising global temperatures. For any plants or animals that you know more about, add a description of how they are being affected.

6th Grade Science Unit 4: A Warmer World

Task 3: Feeling the Impact

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Explore

Cause and Effect: In the last task, you saw examples of specific plant structures or animal behaviors that help an organism survive and reproduce. As global temperatures rise, we are seeing these plant structures and animal behaviors changing in response. How do you think this affects organisms?

As a group, for your Culminating Project you will be presenting a poster at a Science Conference that focuses on the question: How is global warming affecting organisms around the world? Research the organism you chose for the Culminating Project to figure out how it is being impacted by rising global temperatures. Use the space below to take notes based on your research:

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Explain

Cause and Effect: Now that you've done the research, it's time to create your poster! As a group, create a poster that describes your organism and the impact of rising global temperatures. Your poster should include:

- ✓ A description of your organism
- ✓ A description of the plant structure or animal behavior that helps it survive and/or reproduce
- ✓ An explanation for how it is affected by global warming
- ✓ Visuals and headers to get your audience interested!

Prepare to present your poster to your classmates!

6th Grade Science Unit 4: A Warmer World**Task 3: Feeling the Impact**

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Elaborate

We know that organisms around the world are being affected by global warming, but what can we do about it? Brainstorm some potential solutions to monitor and minimize this impact on your chosen organism. To do your brainstorm, use the “Design Thinking Post-It” Method:

1. Individually, use post-its to write down any and all ideas you have for solutions. These do not have to be well thought-out! The goal is to get as many ideas on the poster as possible.
2. As you write down ideas, post them as post-its on a blank poster paper.
3. Make sure EVERYONE’S ideas and post-its are shared!
4. As a group, cluster similar post-it ideas into groups.
5. Discuss and record your top ideas in the space below:

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Evaluate: Connecting to the Culminating Project

You have been asked to create an advocacy video that describes the human impact on an organism and gives a potential solution. In this task, you learned about how humans are impacting your chosen organism through global warming and are well on your way to coming up with a solution!

- ✓ Summarize the ideas from your poster here.
 - Describe the feedback you received from peers and how you plan to revise it based on that feedback.
- ✓ Return to your criteria and constraints that you identified after Task 1. Based on what you have learned about your organism so far, how can you revise them or add to them?

This should be individually in your Project Organizer.

6th Grade Science Unit 4: A Warmer World

Task 3: Feeling the Impact

Unit Essential Question: *How do humans impact organisms around the world and what can we do about it?*

Reflection

Individually reflect on Task 3, using the questions provided:

1. At the beginning of this task, you were asked to brainstorm a list of plants and animals affected by rising global temperatures. In what ways is your organism being affected similarly or differently by global warming?

2. In this task, we focused on the crosscutting concept of:

- **Cause and Effect:** Phenomena may have more than one cause, and sometimes relationships can only be described using probability.

Where do you see examples of **Cause and Effect** in this task?

3. Now that you have learned more about the impacts of global warming on organisms, what questions do you still have?