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

**Introduction**

In the last unit, students learned about how algae are being affected by human-caused environmental changes—excess fertilizer runoff and changing weather conditions associated with climate change. In this Lift-Off Task, students are introduced to another organism that is affected by human-caused environmental change—bees. After looking at an infographic showing bee population data, students begin to generate questions that might help them better make sense of what is happening to the bee population. These questions will guide students throughout the unit as they continue to make sense of the declining bee population, its cause and effects, and what can be done to address the issue.

**Alignment Table**

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| **Crosscutting Concept (\*depending upon student-generated questions)**   * Cause and Effect   + Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. * Stability and Change   + Stability might be disturbed either by sudden events or gradual changes that accumulate over time. |
| **Equity and Groupwork**   * Share and listen to broad and diverse student contributions. * Make connections between each other’s ideas. * Work together to co-construct a concept map. |
| **Language**   * Use connector words to link ideas. * Generate and write questions about the phenomenon. * Organize key questions in a concept map. |

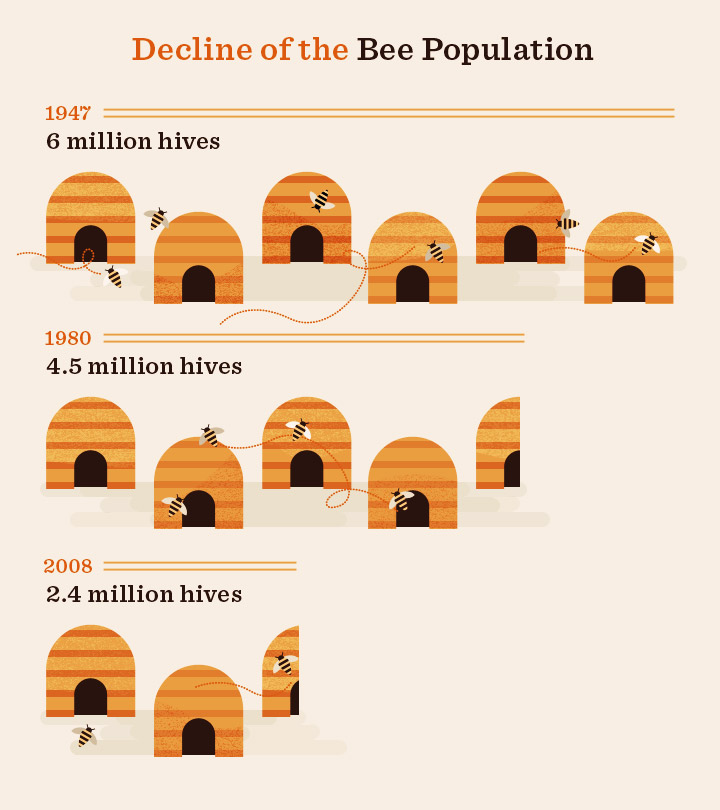
**Learning Goals**

This learning task introduces students to the phenomenon of the declining bee population so they can begin generating questions to guide them through the unit. More specifically, the purpose is to:

* Individually generate a list of questions about the bee population, using observations from the data shown in the infographic.
* Make connections between related questions.
* Generate possible answers to questions using prior knowledge.
* Use prior knowledge to hypothesize what might be causing the declining bee population and whether other organisms around the world might be affected similarly.

**Content Background for Teachers**

This task introduces students to the phenomenon of declining bee populations. In 2015, a United Nations group found that populations are declining for 37% of bee species, with 9% of butterfly and bee populations facing extinction. The main causes are the use of pesticides in industrial agriculture and global warming. Warming global temperatures pose a threat in the form of habitat loss by affecting the range of temperature required for a functional hive. Rising temperatures are also causing flowering plants to bloom earlier in the spring, thus putting bees out of sync with the flowering plants they normally pollinate. Because bees are a major pollinator, this poses a large concern for all ecosystems since a lack of pollination may lead to a drastic decrease in plant populations.



In this task, students create a concept map, which is a graphical tool that helps to organize and represent knowledge and questions, and is a successful academic language instruction tool. At this point, students will likely add only predictions about cause-and-effect relationships related to the bee population. As students learn more about the role of global warming and its impact on different organisms, they will add more complex questions and ideas to this concept map. If your students have not had previous experience making concept maps, please see the instructions in Part B below for strategies on teaching this skill.

**Academic Vocabulary**

* Organism
* Bee
* Population
* Decline
* Hive
* Advocacy
* Human Impact

\*Additional academic vocabulary will vary by class

**Time Needed (Based on 45-Minute Periods)**

2 Days

* Introduction, Part A and Part B: 1 period
* Class Concept Map, Project Overview, and Project Organizer: 1 period

**Materials**

* Unit 4, Lift-Off Task Student Version

Part B

* Poster paper and markers
* Post-Its (Optional)

Part C

* Class Poster Paper and markers
* \*See Instructions below for other optional materials to use for the class concept map

Connecting to the Culminating Project

* Culminating Project Handout
* Project Organizer Handout

**Instructions**

1. Introduce students to the unit by reading or projecting the Unit Essential Question aloud.
2. Organisms around the world are suffering from human-caused environmental changes. In this task, students are introduced to one example—the changing bee population.
3. First, have students look at the infographic in their Student Guides so they can make observations about the bee population data.

**Part A**

1. In this section of the task, students will generate questions to help them make sense of the phenomenon—the declining bee population. Using these self-generated questions throughout the unit will help students develop a better understanding of the declining bee population, including the causes and associated effects.
2. Have students complete this section individually in their student guide.

* For students who need more support, encourage them to look back at the data, and consider any questions they have. They might also think back to the phenomenon of the algal blooms from Unit 3.
* Here is a list of some potential questions students might generate: “Why is the bee population declining? Does this data show a large decline or is this a relatively small decline in population? Why is it bad if bees are dying? Why does this matter? What effect do bees have on their ecosystems? How is the decline of the bee population similar to algal blooms? How might other organisms be affected by the same thing that is killing off bees? Is something eating the bees? What about animals that eat the bees, are they declining too?”

**Part B:**

1. In this part of the task, students create a concept map as a group.

* Remind students to refer to the directions on their student guide to help them make their concept map. First, students should compare each member’s list of questions and record/connect key questions on a piece of poster paper. They will then draft possible answers to the questions, using prior knowledge.
* Remind students that there are no right or wrong questions or predictions, so students feel encouraged to contribute any and all questions and ideas they think of.
* Because this is a collaborative task, it is recommended that you remind students of group work norms and assign group roles, such as Resource Manager, Facilitator, Recorder, and Harmonizer (See “How to Use this Curriculum” for more details).

1. Students will post their posters on a wall and then walk around and look at each group’s ideas. One suggestion for gallery walks is for students to interact with the posters in some way. For example, students are required to initial or leave post-its on three questions that they are also excited about on other posters.

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| Macintosh HD:Users:laurenstoll:Downloads:Sample Concept Map (1).jpg**How to Concept Map**  For students who have not had a lot of experience making concept maps, we have detailed a strategy below for introducing concept mapping using more familiar content. An example is also provided, but this will vary depending on what your students come up with as you make your own model.   1. Write the phenomenon in the middle of the poster, in this case “Humans breathe harder when they exercise.” 2. Ask students to share questions they might ask to make sense of this phenomenon and make a list of these questions on the board. 3. Model the process of reviewing the list and finding similarities amongst the questions.    * Place these key questions on the concept map poster, modeling how to put similar questions near each other on the poster. Circle these to signify that these are questions, not content knowledge. 4. Ask students to look at the key questions and see if any of the questions are connected: Would answering one question lead to one of the other questions? Model making these connections by drawing arrows between the circles. 5. In this Lift-Off task, students will only be drafting possible answers to the questions, not actually gathering and recording learned concepts. However, throughout the unit, they will be adding content they have learned. Model this by recording a student’s prior knowledge to one of the questions, using boxes to signify that these are pieces of content knowledge rather than questions.    * Use connector words to identify the relationships between the content boxes (See image above for an example). 6. Optional: To emphasize crosscutting concepts using a concept map, make a key of different colors for the crosscutting concepts emphasized in this unit. Identify questions that clearly show evidence of the different crosscutting concepts and circle them with the corresponding colors. Explain to students how you made that choice by pointing out the language that hints at that crosscutting concept. \*Note: not all boxes and circles will necessarily have a crosscutting concept. |

**Part C**

1. Construct a whole-class concept map that begins to help students make sense of the phenomenon of the decline of the bee population.

* Start with the phenomenon in the middle.
* Then ask students to share out the questions that were most common across all the posters in the classroom. As you record questions on the poster, organize them based on connections you see. Draw circles around each question (as you add to the concept map throughout the unit, you’ll also be adding concepts learned, which can be written in boxes to distinguish them from the questions).
* Ask students to identify any connections they see between the questions and record these as lines between the questions.
  + Recommended: Give pairs of students think time to come up with 1-2 connections to add to the class concept map and call on pairs using equity sticks. This encourages more equitable participation in this class-wide activity.
* The purpose of this concept map is to facilitate generation of student questions, promote language development, and support understanding of the science content throughout the unit. Allowing students to ask their own questions and use their own words to make meaning of the concepts will not only help them make deep connections about science content but will also help their oral and written language development.
* This whole class concept map will be revisited at the end of each task, asking students questions like: Are there any new questions you have about the phenomenon? Are there any connections you want to add or change? What is your reason for that addition/revision? Are there more connections we can make between the questions/ideas already on the map? Do you want to add any new ideas/concepts to the map?

1. Because this concept map will be added to and revised throughout the unit, here are some practical options for implementation.

* If you have access to white board paper, we encourage you to use these for class posters since it will allow you and your students to make revisions throughout the unit.
* Another option is to use smaller pieces of paper for each class and project using a document camera; this will save space as opposed to doing large class posters.
* We highly recommend students keep their own version of this concept map in their notebooks, adding questions and concepts as they go through the unit.

1. Once the draft concept map is complete, introduce students to the crosscutting concepts for this unit. We recommend posting posters of each crosscutting concept in your classroom (See beginning of teacher guide for templates).

* The crosscutting concepts for this unit are **Cause and Effect** and **Stability and Change**. Assign a color for each crosscutting concept that can be used throughout the unit.
* Have students analyze the class concept map for as many examples of the crosscutting concepts as they can find. Depending on the questions they have, they may be able to find an example of each of the crosscutting concepts or perhaps just one.
* We recommend modeling this process by picking a question, identifying the crosscutting concept, and tracing the circle in the corresponding color. Explain the key words that helped you identify the crosscutting concept in this question. Some identifying words that students might look for are:
  + **Cause and Effect:** These could be phrases such as, “that results in,” “that causes,” “that explains why,” “is due to,” etc.
  + **Stability and Change**: These could be phrases such as, “remains the same”, “is changed by”, “is disrupted by”, “changes”, “disrupts,” etc.

**Connecting to the Culminating Project**

1. Hand out the Culminating Project Task Card and read the Challenge and Group Project Criteria for Success aloud as a class.
   * Take questions for clarification.
2. Pass out their Project Organizer and explain that they will complete a section of this after each task in class. Students should independently complete the Lift-Off Task section of the Project Organizer in class. Revisions can be done for homework, depending upon student’s needs and/or class scheduling.

* Students have been asked to create an advocacy video that describes the human impact on an organism and gives a potential solution. The student prompt is as follows: 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?

**Reflection**

1. At the end of the task, ask students to reflect on what they have learned over the course of this task by answering the following three questions in their student guide:
   * 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?
   * 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.
   * 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?
2. There are no right answers but encourage students to look back at their initial lists and their class concept map. They should not change their initial responses, but rather use this reflection space to add to their questions and ideas based on what they have learned through this task. By generating more of their own questions, students continue to engage in sense-making of the phenomenon and the gathering of knowledge and skills for their final project.