

BEE-haviors

Argumentation (CER) Prompt

7.MS-LS.1-4 (MA Draft Revised Science and Technology/Engineering Standards)

Explain, based on evidence, how characteristic animal behaviors as well as specialized plant structures increase the probability of successful reproduction of animals and plants respectively.

Before your visit:

- FOSS Diversity of Life, Investigation 7
 - Flower dissection
 - *Flowers to Seeds* reading
- Flower CER
 - https://docs.google.com/document/d/1iyTYrZVo0iThxOjkRmv4zAmbKd3CBejcwqKfR_tpJOo/edit?usp=sharing
 - May be completed either before or after visit!
- Read about the honey bee life cycle:
 - <http://www.honey.com/images/uploads/general/HoneyFilesWeb.pdf>
(worksheets #2 & #5)
 - <http://climatekids.nasa.gov/bees/>
 - <https://www.youtube.com/watch?v=K0GP1zZ7qvs>
 - <http://www.buzzaboutbees.net/honey-bee-life-cycle.html>
 - <http://mocomi.com/life-cycle-of-bees/>
- Preview with students:
 - How to find the queen bee
 - <http://www.wikihow.com/Identify-a-Queen-Bee>
- Live Cam of a Bee Hive:
 - <http://explore.org/live-cams/player/honey-bee-hive-cam>
- Video of Bee Hive:
 - <https://www.youtube.com/watch?v=pfwTfLS1OTA>
 - Preview before showing students. Show with sound OFF so students truly observe without being guided by narration.

During your visit:

- Visit the Honey Bee colony in the back right corner of the Hall of Human Life (Green Wing, 2nd Floor)
 - Use the worksheet to make observations
 - **NOTE: Best in Fall and Spring months. Hives are not as active from December-March.**
 - Other sites with observation hives:
 - Boston Nature Center, Mattapan

After your visit: See progression on next page

Teacher Note

1. Before your hive visit, preview with students the three main castes (queen, worker, drone) and how to identify the queen.
2. After the initial observations (first three columns), have the students learn a little about bees by watching a video and/or reading a short article describing honey bee behavior.

Possible resources:

- Honey Bee Natural Resource YouTube Video:
 - <https://www.youtube.com/watch?v=VsCmSWoF8PY>
 - Page 20 of big packet: (a little tough to read)
 - http://pubs.ext.vt.edu/380/380-070/380-070_pdf.pdf
 - Pages 5-7 of a 4-H packet:
 - http://extension.unh.edu/resources/files/Resource002757_Rep4058.pdf
3. Then have students fill out the fourth column, and discuss as a class, guiding students to be able to see how these behaviors help aid bee reproduction.
 4. Next, have students fill out the notes sheet to come to class agreement on the functions of each behavior.
 - Evidence for the claim will come from students' observations on their initial data table because they have observed these behaviors first-hand
 - Reasoning can come from the reading, the notes sheet, or notes from the video

Notes for Teachers:

- Graphic Organizers:
 - Try to offer a menu of graphic organizers for prewriting (including a blank page if students have a different structure in mind).
 - When using a graphic organizer, be clear to students about the purpose for the structure.
 - e.g. The reason there is a "Reasoning" box below every "Evidence" box is because we need to explain how each piece of evidence supports the claim.
- Rubrics--there are two different rubrics provided here
 - Teacher Rubric for Assessment
 - Clear outline for teachers of how to assess this particular prompt
 - DO NOT give to students--it clearly lists the expected claim, evidence, and line of reasoning.
 - Student Rubric
 - Share with students
 - Outline of what good claims, evidence, and reasoning are in general

Name _____

BEE-haviors Argumentation (CER) Prompt

Visit an observation hive. Find the queen bee. She is only a little larger than the ones around her, but she is usually surrounded by a few bees who all face her direction. She may have a colored dot painted on the back of her thorax to make her easy to spot. Look inside some of the cells--this might be difficult until the bees move so you can see inside. Try to spot eggs and larvae. A small flashlight may be helpful to see inside the cells.

Carefully observe the bees' behaviors for 5 minutes. Focus on one-half of one panel of the hive. In the data table below, record your observations:

<i>Type of Bee (Queen, Worker, or Drone)</i>	<i>Observation: What is the bee doing?</i>	<i>Function: Why do you think it is doing that?</i>	<i>Function: <u>After Reading/Video</u></i>

Now think about this question:

*Over the long term, why do the bees engage in
all of the different behaviors in the hive?*

Name _____

BEE-haviors

Sample Data Table

Visit an observation hive. Find the queen bee. She is only a little larger than the ones around her, but she is usually surrounded by a few bees who all face her direction. She may have a colored dot painted on the back of her thorax to make her easy to spot. Look inside some of the cells--this might be difficult until the bees move so you can see inside. Try to spot eggs and larvae. A small flashlight may be helpful to see inside the cells.

Carefully observe the bees' behaviors for 5 minutes. Focus on one-half of one panel of the hive. In the data table below, record your observations:

<i>Type of Bee (Queen, Worker, or Drone)</i>	<i>Observation: What is the bee doing?</i>	<i>Function: Why do you think it is doing that?</i>	<i>Function: <u>After Reading/Video</u></i>
Queen	laying eggs	to make more bees	
Queen	looking into empty cell	to make sure it's empty and clean for her egg	
Worker	Feeding the Queen	so the queen can keep laying eggs	
Worker	Taking a dead bee out of the hive	so that the hive stays clean	
Worker	Dancing	Showing the other workers where to find pollen & nectar	
Worker	Feeding larvae	To help them grow strong	
Worker	Just fanning the hive (flapping their wings)	to help the hive keep cool for the larvae & pupae	
Worker	Gathering pollen & nectar	For food!	

Now think about this question:

Over the long term, why do the bees engage in all of the different behaviors in the hive?

Name_____

BEE-haviors Bee Notes

*How does each example of honey bee behavior
help the colony reproduce?*

<i>Type of Bee</i>	<i>Description of Behavior</i>	<i>How the Behavior Helps the Colony Successfully Reproduce</i>
Queen	checking the cells	
Queen	laying eggs	
Worker	feeding the queen	
Worker	feeding the larvae	
Worker	gathering pollen & nectar	
Worker	waggle dance	
Worker	fanning the hive	
Worker	removing dead bees from the hive	
Worker	guarding the entrance	
Worker	building the honeycomb	
Drone	mating with the queen	

Name _____

Bee-Notes TEACHER VERSION

How does each example of honey bee behavior help the colony reproduce?

<i>Type of Bee</i>	<i>Description of Behavior</i>	<i>How the Behavior Helps the Colony Successfully Reproduce</i>
Queen	checking the cells	cells must be empty and clean to make sure the egg will successfully grow into a bee
Queen	laying eggs	lays eggs which will develop into larvae, pupae, and eventually adults
Worker	feeding the queen	saves the queen's energy so she can focus only on laying eggs
Worker	feeding the larvae	so they can gain energy to develop into pupae and eventually adults
Worker	gathering pollen & nectar	used for food for larvae, helping them develop into adults
Worker	waggle dance	communicating where more food can be found for the larvae
Worker	fanning the hive	keeps the hive the right temperature for larvae to develop into pupae and adults
Worker	removing dead bees from the hive	prevents disease, and avoids pests that might be attracted by dead bees
Worker	guarding the entrance	keeps out intruders who might eat honey or larvae
Worker	building the honeycomb	makes cells for eggs, larvae, pupae, and food
Drone	mating with the queen	fertilizes the eggs so they can develop into workers and queens

Name_____

BEE-haviors

Ideal Student Response

Answer the question:

Over the long term, why do the bees engage in all of the different behaviors in the hive?

The different behaviors in the hive all help the colony successfully reproduce. The queen bee checked a cell before laying her egg there. She probably was checking to make sure it was empty and clean so that her egg had a good chance to survive. The worker bees surrounding her seemed to groom her and feed her. This helped her focus on just laying eggs, her primary role in life. She didn't need to worry about finding food on her own, so all of her time and effort were directed towards reproduction. Finally, the nurse worker bees stayed around the eggs and larvae the entire time, feeding them. The larvae never need to worry about food when there are bees whose only job it is to feed them. Even collecting nectar and pollen ultimately helps reproduction because from pollen and nectar, bees make royal jelly, which is used to feed larvae.

Teacher Rubric for Assessment: Honey Bee CER

	<i>4-Exemplary</i>	<i>3-Proficient</i>	<i>2-Needs Improvement</i>	<i>1-Critical Area</i>
<i>Claim</i>	<ul style="list-style-type: none"> <input type="checkbox"/> Accurately states that honey bee behaviors are helpful for survival and reproduction, using specific language that corresponds to the question. <input type="checkbox"/> Written in complete, easy to understand sentence(s). 	<ul style="list-style-type: none"> <input type="checkbox"/> Accurately states that bee behaviors are helpful for reproduction, using language that generally corresponds to the question. <input type="checkbox"/> Written in complete, easy to understand sentence(s). 	<ul style="list-style-type: none"> <input type="checkbox"/> Answers the question but uses vague or unclear language. <input type="checkbox"/> Inaccurately or incompletely answers the question. <input type="checkbox"/> Not written in complete, easy to understand sentence(s). 	<ul style="list-style-type: none"> <input type="checkbox"/> Does not make a claim, or makes a completely inaccurate claim.
<i>Evidence</i>	<ul style="list-style-type: none"> <input type="checkbox"/> Provides specific, appropriate, and ample data or observations that supports claim, including at least four observations of behaviors from the data table. 	<ul style="list-style-type: none"> <input type="checkbox"/> Provides specific, appropriate, and sufficient data or observations that supports claim. May include some inappropriate evidence <input type="checkbox"/> Addresses 2-3 observations of behaviors from the data table. 	<ul style="list-style-type: none"> <input type="checkbox"/> Provides appropriate, but insufficient or unclear data or observations to support claim. May include some inappropriate evidence <input type="checkbox"/> Addresses only 1 observation of behaviors from the data table. 	<ul style="list-style-type: none"> <input type="checkbox"/> Does not provide data or observations, or only provides inappropriate evidence (evidence that does not support claim).
<i>Reasoning</i>	<ul style="list-style-type: none"> <input type="checkbox"/> Correctly and clearly connects the evidence to the claim, showing how it supports how the bee behaviors help survival and reproduction. <input type="checkbox"/> Applies concepts that go beyond the prompt, as appropriate 	<ul style="list-style-type: none"> <input type="checkbox"/> Correctly and adequately connects the evidence to the claim, showing how it supports how the bee behaviors help survival and reproduction. 	<ul style="list-style-type: none"> <input type="checkbox"/> Correctly connects the evidence to the claim, but leaves out important details, and/or <input type="checkbox"/> Restates the evidence without connecting it to the claim 	<ul style="list-style-type: none"> <input type="checkbox"/> Does not provide reasoning, or only provides reasoning that does not connect evidence to the claim, and/or <input type="checkbox"/> Provides an incomplete generalization.
<i>Writing:</i> <i>Use appropriate structure, grammar, and mechanics to communicate your argument.</i>	<ul style="list-style-type: none"> <input type="checkbox"/> Writing contains no grammatical or spelling errors. <input type="checkbox"/> Writing is clear, concise, and persuasive. 	<ul style="list-style-type: none"> <input type="checkbox"/> Writing contains very few grammatical or spelling errors. <input type="checkbox"/> Writing is clear, mostly concise, and well developed. 	<ul style="list-style-type: none"> <input type="checkbox"/> Writing is fairly clear, with some grammatical or spelling errors. <input type="checkbox"/> Writing could be more concise. 	<ul style="list-style-type: none"> <input type="checkbox"/> Writing is difficult to follow, with many grammatical errors and no clear structure. <input type="checkbox"/> Writing is either too wordy or too incomplete.