

Environmental vs Genetic Factors Argumentation (CER) Prompts

8.MS-LS.1-5

Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Suggested Progression:

- FOSS Populations & Ecosystems
 - Investigation 3: Terrariums
 - **Place half of your terrariums in a dark closet to grow for a few days, until the grass starts sprouting up. Keep the others in the light as your control.
 - Students should fill out the data table on the next page.
- Writing Prompt
 - Graphic Organizer
 - Feedback (from peers or teacher)
 - Write prompt in paragraph form
 - Assess using rubric
- Follow-Up for animal portion of standard
 - Dog Prompt

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 _____

Terrarium Plant Observations

Data Table

Directions: Carefully observe the two different terrariums--one from the light and one from the dark. Pay attention to the three plants: wheat, rye grass, and alfalfa. Record your observations in the table below.

<i>Type of Grass</i>	<i>In the Light</i>	<i>In the Dark</i>
<i>Wheat</i>		
<i>Rye Grass</i>		
<i>Alfalfa</i>		

Name _____

Terrarium Plant Observations

SAMPLE Data Table

Directions: Carefully observe the two different terrariums--one from the light and one from the dark. Pay attention to the three plants: wheat, rye grass, and alfalfa. Record your observations in the table below.

<i>Type of Grass</i>	<i>In the Light</i>	<i>In the Dark</i>
<i>Wheat</i>	Tall, thick green blades of grass.	Tall and thick, but yellow in color.
<i>Rye Grass</i>	Blades of grass that are thinner than the wheat grass. Dark green in color.	Thin grass. Yellowish-green in color.
<i>Alfalfa</i>	White stems with two small round green leaves on top. Stems are a little curly.	White stems with two small round leaves on top. Stems are curly. Leaves are light yellow in color.

Environmental vs Genetic Factors Argumentation (CER) Prompt

8.MS-LS.1-5

Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

You probably noticed many differences between the types of grass in your terrariums as well as the differences between the two terrariums.

Use the data from your data table to answer the question:

Are the differences between the plants in the sun and in the dark caused by environmental factors or genetic factors?

Remember to include:

- *Claim: Answer the question.*
- *Evidence: Use specific observations from your data table to explain the differences and support your claim.*
- *Reasoning: Use information from readings or notes to explain why your evidence supports your claim.*

Name _____

Environmental vs Genetic Factors

Ideal Student Response

Answer the second question:

Are the differences between the plants in the sun and in the dark caused by environmental factors or genetic factors?

The differences between the plants in the dark and the ones in the light are caused by an environmental factor--sunlight. The alfalfa in the dark was mostly white, while the alfalfa in the sun had green leaves. In the dark, the wheat grass was yellow, but in the sun it was green. The rye grass was dark green in the sun but yellowish green in the dark. In each case, the plants turned green in the sun but remained white or yellowish in the dark. The green color is from chlorophyll, which is present in plants undergoing photosynthesis to gain energy from the sun. Without sunlight, the plants are using energy only from the seed's cotyledon. Eventually, these plants would run out of energy and die. The green plants in the sun are absorbing a lot of energy from the sun and will be able to continue growing. Because the difference in appearance is due to the plants' environment and not the genes or DNA, it is an example of the effect of an environmental factor.

*Teacher Rubric for Assessment: Environmental vs Genetic Factors
Plant Prompt*

	<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 differences between the plants in the light and the dark are the result of environmental factors, 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 differences between the plants in the light and the dark are the result of environmental factors, 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 questions but uses vague or unclear language. <input type="checkbox"/> Inaccurately or incompletely answers the questions. <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 completely inaccurate claims.
<i>Evidence</i>	<ul style="list-style-type: none"> <input type="checkbox"/> Provides specific, appropriate, and ample data or observations that supports claim, including detailed observations of each plant. 	<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"/> Includes 2-3 detailed observations of the plants. 	<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"/> Includes only one detailed observation of a plant. 	<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 environmental factors as the source of the differences between the plants in the light and those in the dark. <input type="checkbox"/> Discusses in depth the concepts of environmental and genetic factors. <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 environmental factors as the source of the differences between the plants in the light and those in the dark. <input type="checkbox"/> Discusses the concepts of environmental factors. 	<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 <input type="checkbox"/> Partially discusses the concepts of environmental factors. 	<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 or does not apply appropriate scientific concepts.
<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.

Name _____

Environmental vs Genetic Factors Argumentation (CER) Prompt

Carlos just learned that all dogs belong to the same species. "But that's impossible," he shouted. "They all look so different!"



Alaskan Malamute



Chihuahua



Golden Retriever



Poodle



Basset Hound



Doberman

Take a look at the dogs above, and then use detailed observations about the dogs to answer the question:

Are the differences between dog breeds (in the same species) caused by environmental factors or genetic factors?

Name _____

Environmental vs Genetic Factors

Ideal Student Response

Answer the question:

Are the differences between dog breeds (in the same species) caused by environmental factors or genetic factors?

The differences between the dog breeds are due to genetic factors. The basset hound and chihuahua are much shorter than the other dogs. While the basset hound has long, floppy ears, the doberman has pointy ears. Even the type of fur is quite different from breed to breed. The doberman and chihuahua have short hair; the Alaskan malamute and golden retriever have longer hair; and the poodle has naturally curly hair. All dogs belong to the same species, so these differences are due to genetic variations. Each dog inherits genetic traits from its parents, such as the type or color of hair. This information is found in segments of DNA called genes. DNA is found in the nucleus of every cell in the body (except red blood cells). The genes in the DNA give the cell's proteins instructions for each trait, making each dog a little different from other dogs. Even individual chihuahuas have slightly different traits. But dogs don't change color or height based on the weather or how much water they drink, so the differences are not due to environmental factors. In this case, the differences are the result of genetic factors.

*Teacher Rubric for Assessment: Environmental vs Genetic Factors
Dog Breeds Prompt*

	<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 differences between the dogs are the result of genetic factors, 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 differences between the dogs are the result of genetic factors, 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 questions but uses vague or unclear language. <input type="checkbox"/> Inaccurately or incompletely answers the questions. <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 completely inaccurate claims.
<i>Evidence</i>	<ul style="list-style-type: none"> <input type="checkbox"/> Provides specific, appropriate, and ample data or observations that supports claim, including detailed observations of 3-4 differences between the dogs. 	<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"/> Includes detailed observations of 2 differences between the dogs. 	<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"/> Includes only one detailed observation of a difference between the dogs. 	<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 genetic factors as the source of differences between the dogs. <input type="checkbox"/> Discusses in depth the concepts of environmental and genetic factors. <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 genetic factors as the source of differences between the dogs. <input type="checkbox"/> Discusses the concepts of environmental factors. 	<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 <input type="checkbox"/> Partially discusses the concepts of environmental factors. 	<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 or does not apply appropriate scientific concepts.
<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.