

HS-LS4-5

Students who demonstrate understanding can:

- HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]**

The performance expectation above was developed using the following elements from *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Engaging in Argument from Evidence Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current or historical episodes in science.</p> <ul style="list-style-type: none"> Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. 	<p>LS4.C: Adaptation</p> <ul style="list-style-type: none"> Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline — and sometimes the extinction — of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Observable features of the student performance by the end of the course:

1	Identifying the given claims and evidence to be evaluated					
	a Students identify the given claims, which include the idea that changes in environmental conditions may result in: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">i. Increases in the number of individuals of some species;</td> </tr> <tr> <td style="padding-left: 20px;">ii. The emergence of new species over time; and</td> </tr> <tr> <td style="padding-left: 20px;">iii. The extinction of other species.</td> </tr> </table>	i. Increases in the number of individuals of some species;	ii. The emergence of new species over time; and	iii. The extinction of other species.		
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	b Students identify the given evidence to be evaluated.					
2	Identifying any potential additional evidence that is relevant to the evaluation					
	a Students identify and describe additional evidence (in the form of data, information, models, or other appropriate forms) that was not provided but is relevant to the claims and to evaluating the given evidence, including: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">i. Data indicating the change over time in: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">a) The number of individuals in each species;</td> </tr> <tr> <td style="padding-left: 20px;">b) The number of species in an environment; and</td> </tr> <tr> <td style="padding-left: 20px;">c) The environmental conditions.</td> </tr> </table> </td> </tr> <tr> <td style="padding-left: 20px;">ii. Environmental factors that can determine the ability of individuals in a species to survive and reproduce.</td> </tr> </table>	i. Data indicating the change over time in: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">a) The number of individuals in each species;</td> </tr> <tr> <td style="padding-left: 20px;">b) The number of species in an environment; and</td> </tr> <tr> <td style="padding-left: 20px;">c) The environmental conditions.</td> </tr> </table>	a) The number of individuals in each species;	b) The number of species in an environment; and	c) The environmental conditions.	ii. Environmental factors that can determine the ability of individuals in a species to survive and reproduce.
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3	Evaluating and critiquing	
	a	Students use their additional evidence to assess the validity, reliability, strengths, and weaknesses of the given evidence, along with its ability to support logical and reasonable arguments about the outcomes of group behavior.
	b	Students assess the ability of the given evidence to be used to determine causal or correlational effects between environmental changes, the changes in the number of individuals in each species, the number of species in an environment, and/or the emergence or extinction of species.
4	Reasoning and synthesis	
	a	Students evaluate the degree to which the given empirical evidence can be used to construct logical arguments that identify causal links between environmental changes and changes in the number of individuals or species based on environmental factors that can determine the ability of individuals in a species to survive and reproduce