MS-LS1-4 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

MS-LS1-4. **Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.** [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	**LS1.B: Growth and Development of Organisms** • Animals engage in characteristic behaviors that increase the odds of reproduction. • Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.	**Cause and Effect** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

	Observable features of the student performance by the end of the course:	
1	Supported claims	
	a	Students make a claim to support a given explanation of a phenomenon. In their claim, students include the idea that characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
2	Identifying scientific evidence	
	a	Students identify the given evidence that supports the claim (e.g., evidence from data and scientific literature), including:
		i. Characteristic animal behaviors that increase the probability of reproduction.
		ii. Specialized plant and animal structures that increase the probability of reproduction.
		iii. Cause-and-effect relationships between:
		1. Specialized plant structures and the probability of successful reproduction of plants that have those structures.
		2. Animal behaviors and the probability of successful reproduction of animals that exhibit those behaviors.
		3. Plant reproduction and the animal behaviors related to plant reproduction.
3	Evaluating and critiquing the evidence	
	a	Students evaluate the evidence and identify the strengths and weaknesses of the evidence used to support the claim, including:
		i. Validity and reliability of sources.
		ii. Sufficiency — including relevance, validity, and reliability — of the evidence to make and defend the claim.
		iii. Alternative interpretations of the evidence and why the evidence supports the student's claim, as opposed to any other claims.

4	Reasoning and synthesis	
	a	Students use reasoning to connect the appropriate evidence to the claim, using oral or written arguments. Students describe* the following chain of reasoning in their argumentation:
		i. Many characteristic animal behaviors affect the likelihood of successful reproduction.
		ii. Many specialized plant structures affect the likelihood of successful reproduction.
		iii. Sometimes, animal behavior plays a role in the likelihood of successful reproduction in plants.
		iv. Because successful reproduction has several causes and contributing factors, the cause-and-effect relationships between any of these characteristics, separately or together, and reproductive likelihood can be accurately reflected only in terms of probability.