

MS-LS1-5 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

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

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Genetic factors as well as local conditions affect the growth of the adult plant.

Crosscutting Concepts

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	Articulating the explanation of phenomena		
	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including the idea that both environmental and genetic factors influence the growth of organisms.	
	b	Students use evidence and reasoning to construct a scientific explanation for the given phenomenon.	
2	Evidence		
	a	Students identify and describe* evidence (e.g., from students' own investigations, observations, reading material, archived data) necessary for constructing the explanation, including:	
		i.	Environmental factors (e.g., availability of light, space, water; size of habitat) and that they can influence growth.
		ii.	Genetic factors (e.g., specific breeds of plants and animals and their typical sizes) and that they can influence growth.
iii.	Changes in the growth of organisms as specific environmental and genetic factors change.		
b	Students use multiple valid and reliable sources of evidence to construct the explanation.		
3	Reasoning		
	a	Students use reasoning, along with the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future, to connect the evidence and support an explanation for a phenomenon involving genetic and environmental influences on organism growth. Students describe* their chain of reasoning that includes:	
	i.	Organism growth is influenced by multiple environmental (e.g., drought, changes in food availability) and genetic (e.g., specific breed) factors.	

	<p>ii. Because both environmental and genetic factors can influence organisms simultaneously, organism growth is the result of environmental and genetic factors working together (e.g., water availability influences how tall dwarf fruit trees will grow).</p>
	<p>iii. Because organism growth can have several genetic and environmental causes, the contributions of specific causes or factors to organism growth can be described only using probability (e.g., not every fish in a large pond grows to the same size).</p>