

## MS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

- MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.** [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

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   |
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| <p><b>Constructing Explanations and Designing Solutions</b></p> <p>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 ideas, principles, and theories.</p> <ul style="list-style-type: none"> <li>Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.</li> </ul> | <p><b>LS2.A: Interdependent Relationships in Ecosystems</b></p> <ul style="list-style-type: none"> <li>Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.</li> </ul> | <p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>Patterns can be used to identify cause and effect relationships.</li> </ul> |

| 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 that similar patterns of interactions occur between organisms and their environment, regardless of the ecosystem or the species involved.  |    |  |     |   |      |   |     |   |    |   |
| b  | Students use evidence and reasoning to construct an explanation for the given phenomenon.  |    |  |     |   |      |   |     |   |    |   |
| 2  | Evidence   |    |  |     |   |      |   |     |   |    |   |
| a  | Students identify and describe* the evidence (e.g., from students' own investigations, observations, reading material, archived data) necessary for constructing the explanation, including evidence that: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">i.</td> <td>Competitive relationships occur when organisms within an ecosystem compete for shared resources (e.g., data about the change in population of a given species when a competing species is introduced).</td> </tr> <tr> <td>ii.</td> <td>Predatory interactions occur between organisms within an ecosystem.</td> </tr> <tr> <td>iii.</td> <td>Mutually beneficial interactions occur between organisms within an ecosystem. Organisms involved in these mutually beneficial interactions can become so dependent upon one another that they cannot survive alone.</td> </tr> <tr> <td>iv.</td> <td>Resource availability, or lack thereof, can affect interactions between organisms (e.g., organisms in a resource-limited environment may have a competitive relationship, while those same organisms may not be in competition in a resource-rich environment).</td> </tr> <tr> <td>v.</td> <td>Competitive, predatory, and mutually beneficial interactions occur across multiple, different, ecosystems</td> </tr> </table> | i. | Competitive relationships occur when organisms within an ecosystem compete for shared resources (e.g., data about the change in population of a given species when a competing species is introduced). | ii. | Predatory interactions occur between organisms within an ecosystem. | iii. | Mutually beneficial interactions occur between organisms within an ecosystem. Organisms involved in these mutually beneficial interactions can become so dependent upon one another that they cannot survive alone. | iv. | Resource availability, or lack thereof, can affect interactions between organisms (e.g., organisms in a resource-limited environment may have a competitive relationship, while those same organisms may not be in competition in a resource-rich environment). | v. | Competitive, predatory, and mutually beneficial interactions occur across multiple, different, ecosystems |
| i.   | Competitive relationships occur when organisms within an ecosystem compete for shared resources (e.g., data about the change in population of a given species when a competing species is introduced).   |    |  |     |   |      |   |     |   |    |   |
| ii.  | Predatory interactions occur between organisms within an ecosystem.  |    |  |     |   |      |   |     |   |    |   |
| iii.   | Mutually beneficial interactions occur between organisms within an ecosystem. Organisms involved in these mutually beneficial interactions can become so dependent upon one another that they cannot survive alone.  |    |  |     |   |      |   |     |   |    |   |
| iv.  | Resource availability, or lack thereof, can affect interactions between organisms (e.g., organisms in a resource-limited environment may have a competitive relationship, while those same organisms may not be in competition in a resource-rich environment).  |    |  |     |   |      |   |     |   |    |   |
| v.   | Competitive, predatory, and mutually beneficial interactions occur across multiple, different, ecosystems  |    |  |     |   |      |   |     |   |    |   |
| b  | Students use multiple valid and reliable sources for the evidence.   |    |  |     |   |      |   |     |   |    |   |
| 3  | Reasoning  |    |  |     |   |      |   |     |   |    |   |
| a  | Students identify and describe* quantitative or qualitative patterns of interactions among organisms that can be used to identify causal relationships within ecosystems, related to the given phenomenon.   |    |  |     |   |      |   |     |   |    |   |

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|---|--|
| b | Students describe* that regardless of the ecosystem or species involved, the patterns of interactions (competitive, mutually beneficial, predator/prey) are similar.   |
| c | <p>Students use reasoning to connect the evidence and support an explanation. In their reasoning, students use patterns in the evidence to predict common interactions among organisms in ecosystems as they relate to the phenomenon, (e.g., given specific organisms in a given environment with specified resource availability, which organisms in the system will exhibit competitive interactions). Students predict the following types of interactions:</p> <ul style="list-style-type: none"> <li data-bbox="267 409 1472 443">i. Predatory interactions.</li> <li data-bbox="267 443 1472 476">ii. Competitive interactions.</li> <li data-bbox="267 476 1472 512">iii. Mutually beneficial interactions.</li> </ul> |