

## MS-LS4-1 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

- MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.** [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

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

#### Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings.

#### Connections to Nature of Science

#### Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations.

### Disciplinary Core Ideas

#### LS4.A: Evidence of Common Ancestry and Diversity

- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.

### Crosscutting Concepts

#### Patterns

- Graphs, charts, and images can be used to identify patterns in data.

#### Connections to Nature of Science

#### Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.

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

1	Organizing data
a	Students organize the given data (e.g., using tables, graphs, charts, images), including the appearance of specific types of fossilized organisms in the fossil record as a function of time, as determined by their locations in the sedimentary layers or the ages of rocks.
b	Students organize the data in a way that allows for the identification, analysis, and interpretation of similarities and differences in the data.
2	Identifying relationships
a	Students identify: <ol style="list-style-type: none"> <li>Patterns between any given set of sedimentary layers and the relative ages of those layers.</li> <li>The time period(s) during which a given fossil organism is present in the fossil record.</li> <li>Periods of time for which changes in the presence or absence of large numbers of organisms or specific types of organisms can be observed in the fossil record (e.g., a fossil layer with very few organisms immediately next to a fossil layer with many types of organisms).</li> <li>Patterns of changes in the level of complexity of anatomical structures in organisms in the fossil record, as a function of time.</li> </ol>
3	Interpreting data
a	Students analyze and interpret the data to determine evidence for the existence, diversity, extinction, and change in life forms throughout the history of Earth, using the assumption that natural laws operate today as they would have in the past. Students use similarities and differences in the observed patterns to provide evidence for: <ol style="list-style-type: none"> <li>When mass extinctions occurred.</li> <li>When organisms or types of organisms emerged, went extinct, or evolved.</li> <li>The long-term increase in the diversity and complexity of organisms on Earth.</li> </ol>