



Stackable Instructionally- embedded Portable Science (SIPS) Assessments Project

Grade 8 Science

Unit 3 Task 1 Specification Tool & Verification of Alignment

Understanding Earth History and the Origin of Species

September 2023

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SIPS Grade 8 Unit 3 Task 1 Specification & Verification of Alignment

Grade: 8

Unit: 3

Task Number: 1

Task Title: A Whale of a Tale!

NGSS Performance Expectations

MS-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how geologic time scale is used to organize Earth’s 4.6-billion-year-old history. *[Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth’s history. Examples of Earth’s major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.]* *[Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]*

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.]*

MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. *[Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]*

Phenomena or Phenomena-rooted Design Problem

- The task focuses on the fossil record which suggests prehistoric creatures with whale-like features living on land show the gradual accumulation of aquatic adaptations that led to modern-day whales.

Scenario/Context/Situation/Boundaries

- The scenario introduces a topic related to geologic evidence of Earth’s history.
- Figures and tables provide students with geoscience data in order to understand processes and events in Earth’s history.
- The task closes with students examining evidence to support their explanation of how patterns in the fossil record show relationships between modern organisms and their common ancestors.

Variable Features to Shift Complexity or Focus

- Complexity of scientific concept(s).
 - Domain-specific vocabulary and definitions.
 - Graphic organizers presented may be diagrams, graphs, data tables, and/or drawings.
 - Data sets addressed in the scenario, including but not limited to:
 - Rock strata.
 - Rock layers may contain information about the environment when the rock formed, such as relative age when compared to other layers.
 - Patterns of layering.
 - Interpret cross-sections using fossils, faults, and other evidence.
 - Compare age and history of rock layers at different locations using widespread and recognizable events, such as volcanic eruptions.
 - Disruption of layers from major geologic events (e.g., volcanic eruptions, asteroid impacts, earthquakes, tsunamis, etc.)
 - The fossil record.
 - Correlate fossil evidence in similar rock layers at different locations to describe changes through geologic time.
 - Mass extinctions of organisms have occurred and are evident in the geologic record.
 - Changes in the size and function of anatomical structures over time.
 - Evidence for the emergence and extinction of species.
 - Comparison of homologous, analogous, or vestigial structures.
 - Adaptations for aquatic or terrestrial life.
 - Trends in complexity over geologic time.
 - Comparison of extant vs. extinct fossils.
 - Interpolating gaps in the fossil record.
 - Patterns to be used as evidence of existence, extinction, diversity, and/or change in life forms in the fossil record.
 - Number and type of organism(s).
 - Degree and type of similarities and differences of organisms.
 - Type of evidence/data that supports a claim.
 - Use of cause-and-effect relationships to explain changes.
 - Number and types of relationships and patterns in the data.
 - Sentence starters.
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- Number and types of life forms.
 - Geologic period.
 - Patterns to be used as evidence of similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
 - Type and number of anatomical similarities and differences among modern organisms and between modern organisms and fossil organisms.
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General Description of Task/Chain of Sensemaking

- Students interpret a visual representation of a pair of fossils to reconstruct aspects of Earth’s history and interpret ancient environments. **[Prompt 1, Part A: MS-ESS1-4, KSA2]**
 - Students evidence and reasoning to describe how relative ordering is determined using rock strata. **[Prompt 1, Part B: MS-ESS1-4, KSA1]**
 - Students organize a representation of the fossil record that is consistent with the description. **[Prompt 2, Part A: MS-LS4-1, KSA2]**
 - Students describe evidence of similarities and differences in anatomical patterns that support a conclusion. **[Prompt 2, Part B: MS-LS4-2, KSA3]**
 - Students support a conclusion about evolutionary relationships using patterns of changes in the level of complexity of anatomical structures in organisms in the fossil record. **[Prompt 2, Part C: MS-LS4-1 & MS-LS4-2, KSA1]**
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Targeted PE-related KSAs

MS-ESS1-4, KSA2: Analyze rock strata and fossils to reconstruct aspects of Earth’s history and interpret ancient environments.

MS-ESS1-4, KSA1: Analyze rock strata and fossils to determine the relative age of the rock or fossils.

MS-LS4-1, KSA2: Students use graphs, charts, and images to identify patterns within the fossil record (e.g., observed patterns in the fossil record as evidence for when mass extinctions occurred).

MS-LS4-2, KSA3: Apply scientific ideas to construct explanations for evolutionary relationships between modern and fossil organisms.

Cross-performance Expectations Related KSAs to Target

MS-LS4-1 & MS-LS4-2, KSA1: Support a conclusion about the cause-and-effect relationships between changes in organisms throughout the history of life on Earth and the relationships between modern organisms and their common ancestors.

Student Demonstrations of Learning

- Applies rules that can be applied to rock strata and fossils to determine relative age.
 - Identifies and describes how fossils and rock strata can be used to reconstruct aspects of Earth’s history and interpret ancient environments.
 - Analyzes and interprets data to find patterns in rock layers to determine the age of fossils.
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- Makes logical and conceptual connections between evidence in the fossil record and explanations about the existence, diversity, extinction, and change in many life forms throughout the history of life on Earth.
- Identifies patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth.
- Constructs an appropriate explanation related to how an organism or organisms evolve based on similarities and differences between modern organisms and fossil organisms based on the provided data.
- Supports an explanation with relevant and accurate evidence for evolutionary relationships evidenced by similarities or differences in the gross appearance of anatomical structures.

Work Products

- Produce or analyze a chart, graph, or timeline.
- Constructed response.
- Organize data into tables/charts/graphs.
- Apply evidence.

Application of Universal Design for Learning-based Guidelines to Promote Accessibility (<https://udlguidelines.cast.org/>)

Multiple Means of Engagement	Multiple Means of Representation	Multiple Means of Action & Expression
<ul style="list-style-type: none"> • Context or content. • Age appropriate. • Appropriate for different groups. • Makes sense of complex ideas in creative ways. • Vary the degree of challenge or complexity within prompts. 	<ul style="list-style-type: none"> • Provide visual diagrams and charts. • Make explicit links between information provided in texts and any accompanying representation of that information in illustrations, equations, charts, or diagrams. • Activate relevant prior knowledge. • Highlight or emphasize key elements in text, graphics, diagrams, and formulas. • Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships. 	<ul style="list-style-type: none"> • Solve problems using a variety of strategies. • Sentence starters. • Embed prompts to “show and explain your work.”

- Give explicit prompts for each step in a sequential process.

SIPS Assessments Complexity Framework Components

Prompt	A.1 Degree and nature of sense-making about phenomena or problems			B.1 Complexity of the presentation			B.2 Cognitive demand of response development			B.3 Cognitive demand of response production		
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
1 Part A		X			X		X			X		
1 Part B		X			X			X				X
2 Parts A & B		X			X				X			X
2 Part C		X		X				X				X

Rubric Considerations

- Accuracy of the data/chart/table.
- Sophistication of the explanations.
- Completeness and accuracy of response.

Assessment Boundaries

- Assessment does not include recalling the names of specific periods or epochs and events within them.
- Assessment does not include the names of individual species or geological eras in the fossil record.

Common Alternate Conceptions

- **MS-ESS1-4**
 - Earth is relatively young.
 - Earth has not changed much over time.
 - There is very little evidence that Earth has changed over time.
- **MS-LS4-1**
 - Extinction is rare.

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- Most of the species that lived in the past are still alive today.
 - Anatomical change occurs quickly.
 - There has always been great diversity and complexity of life on Earth.
 - **MS-LS4-2**
 - Species that are similar can share a common ancestor, but species that have no apparent, obvious, or superficial similarities cannot share a common ancestor.
 - Plants and animals cannot share a common ancestor.
 - Humans do not share a common ancestor with other living organisms.

Possible Technical Terms for Task

- rock strata, geologic time scale, fossils, anatomical, fossil record, sedimentary layers, relative age, evolutionary relationships

Common Core State Standards for Literacy

Reading Informational

- **RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts. **(MS-ESS1-4), (MS-LS4-1)**
- **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **(MS-LS4-1)**

Writing

- **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **(MS-ESS1-4), (MS-LS4-2)**
- **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. **(MS-LS4-2)**

Common Core State Standards for Mathematics

Mathematical Content

- **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or depending on the purpose at hand, any number in a specified set. **(MS-ESS1-4), (MS-LS4-1), (MS-LS4-2)**
- **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities. **(MS-ESS1-4)**

Task Notes

SIPS Assessments Complexity Framework

Component	Complexity		
	Low	Moderate	High
Connections to Curriculum and Instruction	<p>A.1 Degree and nature of sense-making about phenomena or problems</p> <ul style="list-style-type: none"> Requires one or two dimensions One dimension may have a greater degree of emphasis than another Requires previously learned ideas or concepts 	<ul style="list-style-type: none"> Requires integration of two dimensions in the service of sense-making Requires integration of same or different combinations of dimensions as represented in the PE bundle Requires a combination of previously learned ideas or concepts and newly presented information 	<ul style="list-style-type: none"> Requires integration of three dimensions in the service of sense-making Requires integration of same or different combinations of dimensions as represented in the PE bundle Requires a combination of previously learned ideas or concepts and newly presented information
Characteristics of the Tasks	<p>B.1 Complexity of the presentation</p> <ul style="list-style-type: none"> The amount and type of information provided in the scenario supports limited simple connections among ideas or concepts Provides few, simple graphics/data/models Includes definitions or examples Phenomenon or problem presented in a concrete way with high level of certainty 	<ul style="list-style-type: none"> The amount and type of information provided in the scenario supports multiple evident connections among ideas or concepts Provides graphics/data/models Limited use of definitions or examples Phenomenon or problem presented with some level of uncertainty 	<ul style="list-style-type: none"> The amount and type of information provided in the scenario supports multiple and varied complex connections among ideas or concepts Provides complex graphics/data/models Phenomenon or problem presented with high-degree of uncertainty
	<p>B.2 Cognitive demand of response development</p> <ul style="list-style-type: none"> Requires well-defined set of actions or procedures Requires a connection or retrieval of factual information Response requires a low level of sophistication with routinely encountered well-practiced applications 	<ul style="list-style-type: none"> Requires application of ideas and practices given cues and guidance Requires drawing relationships and connecting ideas and practices Response requires a moderate level of sophistication with typical but relatively complex representation of ideas and application of skills 	<ul style="list-style-type: none"> Requires selection and application of multiple complex ideas and practices Requires high degree of sense-making, reasoning, and/or transfer Response requires a high level of sophistication with non-routine or abstract representation of ideas and application of skills

**B.3 Cognitive demand
of response production**

- Responses include selection from a small set of options presented as text (e.g., word, short phrase) or other formats (e.g., a simple graphic or process)

- Responses include one or more sentences or a paragraph, a moderately complex graphic, or multiple steps in a simple or moderately complex process

- Responses include multiple paragraphs, multiple graphics of at least moderate complexity, or multiple steps in a complex process
