Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project

Grade 8 Science

Unit 3 Task 2 Specification Tool & Verification of Alignment

Understanding Earth History and the Origin of Species

September 2023

The SIPS Grade 8 Science Unit 3 Task 2 Specification Tool & Verification of Alignment was developed with funding from the U.S. Department of Education under the Competitive Grants for State Assessments Program, CFDA 84.368A. The contents of this paper do not represent the policy of the U.S. Department of Education, and no assumption of endorsement by the Federal government should be made.

SIPS Grade 8 Unit 3 Task 2 Specification & Verification of Alignment

Grade: 8	Unit: 3	Task Number: 2	Task Title: Hold Your Horses!

NGSS Performance Expectations

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.]

MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [*Assessment Boundary: Assessment does not include Hardy Weinberg calculations.*]

Phenomena or Phenomena-rooted Design Problem

- The task focuses on evidence from the fossil record which suggests how species change due to natural selection as the environment changes over very long spans of time.

Scenario/Context/Situation/Boundaries

- Scenario introduces a topic related to physiological changes in the prehistoric to modern horse.
- Charts and tables provide students with a graphic that illustrates a geologic time scale of the fossil record of horse structure over time and a description of how the environment changed over time.
- The task closes with students examining evidence to support their explanation of what changes in prehistoric to modern horses occurred, why the changes occurred, and how the changes occurred via the process of natural selection.

Variable Features to Shift Complexity or Focus

- The complexity of the information provided.
- Domain-specific vocabulary and definitions.
- Graphic organizers presented may be diagrams, graphs, data tables, and/or drawings.
- Phenomenon addressed in the scenario, including but not limited to:
  - Environmental changes over time.
  - Changes in available resources.
- Data sets addressed in the scenario, including but not limited to:
  - The fossil 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.
- 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.

General Description of Task/Chain of Sensemaking

- Students graph the change in height of horses over time. **[Prompt 1, Part A: MS-LS4-6, KSA2]**
- Students analyze data to determine patterns of change in anatomical structures of the horse over time. **[Prompt 1, Part B: MS-LS4-6, KSA1]**
- Students describe anatomical similarities and differences between horses living today and organisms in the fossil record. **[Prompt 2: MS-LS4-2, KSA2]**
- Students support an explanation using evidence between traits and the cause-and-effect relationships between those traits that affect the probability of survival and reproduction of a given organism in a specific environment. **[Prompt 3: MS-LS4-4, KSA2]**

Targeted PE-related KSAs

MS-LS4-6, KSA2: Use mathematical representations to support an explanation of how a specific change in an environmental condition has led to an observed change in traits in a population over time.

MS-LS4-6, KSA1: Use mathematical representations that display a measurable change in selected traits in a population over time to support scientific conclusions.

MS-LS4-2, KSA2, KSA2: Identify or describe similarities and differences between modern organisms and fossil organisms.

MS-LS4-4, KSA2: Construct an explanation using evidence between traits and the cause-and-effect relationships between those traits that affect the probability of survival and reproduction of a given organism in a specific environment.

Cross-performance Expectations Related KSAs to Target

NA

Student Demonstrations of Learning

- Interprets graphs to identify patterns that show how traits that support successful survival and reproduction in the new environment become more common and those that do not become less common.
- 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.
- Describes how cause-and-effect relationships can be used to explain why some individuals survive and reproduce in a specific environment.

- Accurately describes how a given genetic trait can increase a population's chance of surviving.

Work Products

- Organize data into tables/charts/graphs.
- Constructed response.
- Interpret a diagram.
- 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
• 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.	• 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. • Give explicit prompts for each step in a sequential process.	• Solve problems using a variety of strategies. • Sentence starters. • Embed prompts to "show and explain your work".

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		**X**			**X**			**X**			**X**	
2		**X**			**X**		**X**			**X**		
3		**X**		**X**					**X**			**X**

Rubric Considerations

- Accuracy of the graph.
- 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-LS4-1**
  - Extinction is rare.
  - 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.
- **MS-LS4-4**

- Individual organisms can change their features to suit the environment.
- All individuals of the same species have the same features.
- Natural selection occurs within an organism's lifetime.
- All organisms in a population are able to adapt to environmental changes and survive.

Possible Technical Terms for Task

- geologic time scale, fossils, anatomical similarities and differences, fossil record, sedimentary layers, relative age, evolutionary relationships, natural selection, survival

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-LS4-1), (MS-LS4-2), (MS-LS4-4)**
- **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)**
- **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. **(MS-LS4-4)**

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-LS4-2), (MS-LS4-4)**
- **WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. **(MS-LS4-2), (MS-LS4-4)**

Common Core State Standards for Mathematics

Mathematical Content

- **6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **(MS-LS4-4)**
- **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-LS4-1), (MS-LS4-2)**
- **6.SP.B.5** Summarize numerical data sets in relation to their context. **(MS-LS4-4),**
- **7.RP.A.2** Recognize and represent proportional relationships between quantities. **(MS-LS4-4)**

Task Notes

SIPS Assessments Complexity Framework

	Component	Complexity		
		Low	Moderate	High
Connections to Curriculum and Instruction	**A.1 Degree and nature of sense-making about phenomena or problems**	• Requires one or two dimensions • One dimension may have a greater degree of emphasis than another • Requires previously learned ideas or concepts	• 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	• 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	**B.1 Complexity of the presentation**	• 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	• 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	• 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
	B.2 Cognitive demand of response development	• 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	• 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	• 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