Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project

Grade 5 Science

Unit 3 Task 2 Specification Tool & Verification of Alignment

Earth Systems and the Solution of Water Problems

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SIPS Grade 5 Unit 3 Task 2 Specification & Verification of Alignment

Grade: 5	Unit: 3	Task Number: 2	Task Title: Searching for Freshwater

NGSS Performance Expectations

5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] *[Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]*

5-ESS2-2 Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. *[Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]*

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Phenomena or Phenomena-rooted Design Problem

- Formation of freshwater springs as related to the interaction of two of Earth's spheres.

Scenario/Context/Situation/Boundaries

- The scenario introduces an example of the interaction of Earth's spheres along a hiking trail and the phenomenon of the formation of a freshwater spring.
- Graphics and descriptions of various habitats are used as the basis for identification of interactions among Earth's spheres.
- Distribution of Earth's surface freshwater sources is used to support a description of the phenomenon of freshwater springs.

Variable Features to Shift Complexity or Focus

- Complexity of scientific concept(s).
- Domain-specific vocabulary and definitions.
- The types of interaction between components of Earth's spheres.
- Context includes, but is not limited to:
  - Movement of water into and through aquifers.
  - Volumes/percentages of various reservoirs worldwide.
  - Volumes/percentages of freshwater reservoirs.
- Type of model showing how Earth's systems interact.
- Type of model showing how Earth's systems interact in a specific event.

- Format of "real-world" phenomenon under investigation: image, data, text, combination.
- Number, type, and complexity of representations of models, tables, graphs, and/or data sets.

General Description of Task/Chain of Sensemaking

- Students identify the components of Earth systems (hydrosphere, biosphere, geosphere, atmosphere) in the scenario. **[Prompt 1, Part A: 5-ESS2-1, KSA1]**
- Students identify and describe interactions and components in a single system in the scenario. **[Prompt 1, Parts B & C: 5-ESS2-1, KSA2]**
- Students identify and describe interactions and components between two systems using a description of a stream environment. **[Prompt 2: 5-ESS2-1, KSA4]**
- Students graph and communicate information to describe the proportions and distributions of water on Earth to explain the importance of freshwater springs to specific habitats. **[Prompt 3: Parts A & B: 5-ESS2-2 & 5-ESS3-1, KSA1, KSA2]**
- Students identify and describe components of a model to show the interaction of two of Earth's systems related to the formation of a freshwater spring. **[Prompt 4, Parts A & B: 5-ESS2-1, KSA4, KSA3]**
- Students use the model to support a description of how Earth's spheres interact which lead to the formation of the freshwater spring. **[Prompt 4, Part C: 5-ESS2-1, KSA6, KSA4]**

Targeted PE-related KSAs

5-ESS2-1, KSA1: Identify the components of each Earth system (Hydrosphere, Biosphere, Geosphere, Atmosphere.

5-ESS2-1, KSA2: Identify and describe interactions and components in a single system.

5-ESS2-1, KSA4: Identify and describe interactions and components between two systems.

5-ESS2-1, KSA3: Develop a model of a provided example to describe the relevant components of the system.

5-ESS2-1, KSA6: Complete a model that describes how two systems are interacting.

Cross-performance Expectations Related KSAs to Target

5-ESS2-2 & 5-ESS3-1, KSA1: Graph and use quantitative information to describe proportions between the reservoirs of water on Earth.

Student Demonstrations of Learning

- Correctly identifies and describes relevant interactions of components within a system.
- Describes a phenomenon that includes the interaction of two systems.
- Correctly identifies and describes relevant interactions between components of two systems.
- Analyzes a bar chart/graph accurately showing percentages of the distribution of freshwater on Earth.
- Describes a claim you could make about water on Earth supported with information from completed charts.

Work Products

- Complete a graph.
- Complete a model.
- Constructed response.

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 Part A	**X**			**X**				**X**		**X**		
1 Parts B & C		**X**		**X**				**X**			**X**	
2	**X**			**X**				**X**			**X**	
3		**X**			**X**				**X**		**X**	
4 Part A		**X**		**X**				**X**		**X**		
4 Parts B & C		**X**		**X**					**X**		**X**	

Rubric Considerations

- Accuracy of the graph (including the scale).
- Accuracy of the model.
- Sophistication of the explanations.
- Completeness and accuracy of response.

Assessment Boundaries

- Assessment is limited to the interactions of two systems at a time.
- Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.

Common Alternate Conceptions

- **5-ESS2-1**
  - There has been life on Earth since its formation.
  - The Earth does not change.
  - Hydrosphere includes only liquid water.
- **5-ESS2-2**

- Most water on Earth is freshwater.
- Most freshwater is available for human use.

- **5-ESS3-1**
  - Local behavior can only lead to local consequences (or that global behavior can only lead to global consequences).
  - Humans have total control over Earth's systems.
  - Local waste disposal is a termination stage in the cycling of Earth's matter (i.e., once it's in the garbage can, the waste disappears).
  - All naturally occurring substances in Earth are good and all substances added to Earth by humans are bad.

Possible Technical Terms for Task

- atmosphere, hydrosphere, geosphere, biosphere, ecosystem, mountain, rock, soil, sediment, salt water, fresh water, lakes, rivers, groundwater, glaciers, oceans, freshwater spring, aquifer

Common Core State Standards for Literacy

Reading Informational

- **RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. **(5-ESS3-1)**
- **RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. **(5-ESS2-1, 5-ESS2-2, 5-ESS3-1)**
- **RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. **(5-ESS3-1)**

Writing

- **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work and provide a list of sources. **(5-ESS2-2, 5-ESS3-1)**
- **W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. **(5-ESS3-1)**

Common Core State Standards for Mathematics

Mathematical Practice

- **MP.2** Reason abstractly and quantitatively. **(5-ESS2-1, 5-ESS2-2, 5-ESS3-1)**
- **MP.4** Model with mathematics. **(5-ESS2-1, 5-ESS2-2, 5-ESS3-1)**

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