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**Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project**

**Grade 5 Science**

**Unit** **3 Task 3 Specification Tool & Verification of Alignment**

**Earth Systems and the Solution of Water Problems**

**September 2023**

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| **Grade: 5** | **Unit: 3** | **Task Number: 3** | **Task Title: Protecting Earth’s Soil** |
| **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-ESS3-1** Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.  **3-5-ETS-1-2** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. | | | |
| **Phenomena or Phenomena-rooted Design Problem** | | | |
| * A family needs to design a solution to the problem of soil erosion on their farm. | | | |
| **Scenario/Context/Situation/Boundaries** | | | |
| * Scenario presents a scenario about a farm that has been experiencing more severe weather in recent years. * The problem the farm needs to solve is to reduce soil erosion. | | | |
| **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:   + Effect of water on the geosphere (e.g., beach deposition and erosion, river channel erosion, and deposition).   + Effect of plants on the geosphere (e.g., roots breaking rocks, reducing erosion, decaying leaves changing the composition of soil).   + Soil erosion. * Type of model showing how Earth’s systems interact. * Type of model showing how Earth’s systems interact in a specific event. * Function of the model to explain the system underlying a phenomenon. * Function of the model to describe a phenomenon. * Components and types of models used to explain/show how a specific environment is negatively/positively impacted by human interaction. * Number of different solutions for natural resource replenishment. | | | |
| **General Description of Task/Chain of Sensemaking** | | | |
| * Students identify a model showing how two of Earth’s systems are involved in an event related to soil erosion. **[Prompt 1, Part A: 5-ESS2-1, KSA4]** * Students identify and describe interactions and components interacting in two models interactions between Earth systems related to soil erosion with and without vegetation. **[Prompt 1, Part B: 5-ESS2-1, KSA5]** * Students identify and describe interactions and components between two systems using a model of wind erosion. **[Prompt 2, Parts A & B: 5-ESS2-1, KSA5]** * Students identify and describe the effects of human activity (i.e., agriculture) on Earth’s resources (i.e., topsoil). **[Prompt 3, Parts A & B: 5-ESS3-1, KSA7]** * Students identify how a solution (i.e., windbreak) helps humans to affect positive change based on ongoing processes (i.e., changing weather). **[Prompt 3, Part C: 5-ESS3-1 & 3-5-ETS1-2, KSA1]** * Students describe an experimental procedure appropriate to draw conclusions about the functioning of the windbreak. **[Prompt 4, Parts A & B: 5-ESS3-1 & 3-5-ETS1-3, KSA2]** | | | |
| **Targeted PE-related KSAs** | | | |
| **5-ESS2-1, KSA4:** Identify and describe interactions and components between two systems.  **5-ESS2-1, KSA5:** Use a provided model to describe how two systems interact.  **5-ESS2-1, KSA7:** Identify the effects of human activity (e.g., in agriculture, industry, everyday life) affecting the Earth’s resources and environments. | | | |
| **Cross-performance Expectations Related KSAs to Target** | | | |
| **5-ESS3-1 & 3-5-ETS1-2, KSA1:** Identifies how the design solution helps humans to affect positive change based on ongoing processes.  **5-ESS3-1 & 3-5-ETS1-2, KSA2:** Generate or select an experimental procedure appropriate to draw conclusions about the functioning of the solution. | | | |

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| **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. * From provided texts or resources, accurately explains the positive and/or negative human impacts on the environment, air, land, or water. * From provided texts or resources, accurately provides a solution to mitigate the human impacts on the environment, air, land, or water. * From provided texts or resources, accurately provides rationale to support a solution that mitigates the human impacts on the environment, air, land, or water. | | | |
| **Work Products** | | | |
| * Selected response. * Constructed response. | | | |
| **Application of Universal Design for Learning-based Guidelines to Promote Accessibility (**[**https://udlguidelines.cast.org/**](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**  **Part B** |  | **X** |  |  | **X** |  |  | **X** |  |  | **X** |  | | **2** |  | **X** |  | **X** |  |  |  | **X** |  |  | **X** |  | | **3**  **Parts A & B** |  | **X** |  | **X** |  |  |  |  | **X** |  | **X** |  | | **3 Part C** |  | **X** |  |  | **X** |  |  | **X** |  |  | **X** |  | | **4** |  | **X** |  | **X** |  |  |  |  | **X** |  | **X** |  | | | | | |
| **Rubric Considerations** | | | | |
| * Sophistication of the explanations. * Completeness and accuracy of response. | | | | |
| **Assessment Boundaries** | | | | |
| * Assessment is limited to the interactions of two systems at a time. | | | | |
| **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-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. * **3-5-ETS-1-2**   + Choices among design solutions should be made on aesthetic preference rather than on meeting the criteria/constraints of a problem.   + The wants or needs of a local community will not change over time. | | | | |
| **Possible Technical Terms for Task** | | | | |
| * atmosphere, hydrosphere, geosphere, biosphere, vegetation, soil, stream table, erosion | | | | |
| **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, 3-5-ETS1-2)** * **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-ESS3-1, 3-5-ETS1-2)** * **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, 3-5-ETS1-2)**   **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-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-ESS3-1, 3-5-ETS1-2)** * **MP.4** Model with mathematics. **(5-ESS2-1, 5-ESS3-1,** **3-5-ETS1-2)**   **Mathematics**   * **5.G.2** Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane and interpreting coordinate values of points in the context of the situation. **(5-ESS2-1)** * **3-5.OA** Operations and algebraic thinking **(3-5-ETS1-2)** | | | |
| **Task Notes** | | | |

SIPS Assessments Complexity Framework

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| **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 | |