Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project

Grade 5 Science
Unit 3 End of Unit Assessment Design Patterns
Earth Systems and the Solution of Water Problems
August 2023

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SIPS Grade 5 Unit 3 End of Unit Assessment Design Patterns (5-ESS2-1, 5-ESS2-2, 5-ESS3-1)

Grade 5 SIPS Design Pattern for 5-ESS2-1

Element	Description
Knowledge and Practices (DCI, SEP, CCC)	In this task, students: • demonstrate an understanding of the ways the geosphere, biosphere, hydrosphere and/or atmosphere interact. • develop and use models to demonstrate understanding of the disciplinary core ideas. The crosscutting concept of applying systems and system models in terms of their components and interactions is the organizing concept for these DCIs.
Performance Expectation	**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.*]
Knowledge, Skills, & Abilities (KSAs)	**KSA 1:** Identify the components of each Earth system (Hydrosphere, Biosphere, Geosphere, Atmosphere). **KSA2:** Identify and describe interactions and components in a single system. **KSA3:** Develop a model of a provided example to describe the relevant components of the system. **KSA4:** Identify and describe interactions and components between two systems. **KSA5:** Use a provided model to describe how two systems interact. **KSA6:** Complete a model that describes how two systems are interacting. **KSA7:** Develop a model to describe the interaction of two systems.
Student Demonstration of Learning	• Correctly identifies and describes relevant interactions of components within a system. • Describes a phenomenon that includes the interaction of two systems. • Model accurately captures all systemic components of the observable phenomena.

	• Correctly identifies and describes relevant interactions between components of two systems. • Model accurately describes the interaction of two systems
Work Product	• Develop a model. • Complete a model. • Constructed-response. • Complete a table or chart.
Task Features	• The task focuses on performances for which students' opportunity to learn has prepared them. • The task is based on the assessed KSA(s) and driven by a high-quality scenario that focuses on a phenomenon or design problem. • The task scenario is grounded in the phenomena and problems being addressed. • The task prompts students to make connections between observed phenomena or evidence and reasoning underlying the observation/evidence. • The task provides ways for students to make connections of meaningful local, global, or universal relevance. • The task scenario is sufficient, engaging, relevant, and accessible to a wide range of students. • The task is accessible, appropriate, and cognitively demanding for all learners, including students with disabilities, students who are English learners, or those who are working below or above grade level. • All prompts within a task are fair and equitable and include a range of presentation and response modes. • The task requires students to use scientific reasoning and process skills to produce evidence that can be used by educators to make inferences about student learning. • The task requires students to use reasoning and integrate multiple dimensions (i.e., SEP, DCI, CCC) to support sense-making about phenomena or problems. • All tasks elicit core ideas as defined in the PE. • The task uses information that is scientifically accurate. • The task elicits core ideas as defined in the PE. • The task uses active voice and present tense. • The task is written at or below grade level.
Variable Features (Aspects of an assessment task that <u>can be varied</u> to shift complexity or focus.)	• Complexity of scientific concept(s) to be modeled. • Domain-specific vocabulary and definitions. • Format of "real-world" phenomenon under investigation: image, data, text, or a combination.

	● Phenomenon addressed in the scenario, including but not limited to: ○ Long-term and short-term geological events. ○ Mountain building. ○ Impact of geological features on climate. ○ Effect of water on the geosphere (e.g., beach deposition and erosion, river channel erosion, and deposition). ○ Movement of water into and through aquifers. ○ Effect of plants on the atmosphere. ○ Effect of glaciers on the land and ocean. ○ Effect of plants on the geosphere (e.g., roots breaking rocks, reducing erosion, decaying leaves changing the composition of soil). ○ Effect of the ocean on the climate of coastal areas. ○ Effect of large volcanic eruptions on the atmosphere. ● Type of model showing how Earth's systems interact. ● Type of model showing how Earth's systems interact in a specific event. ● Number, type, and complexity of representations of models, tables, graphs, and/or data sets. ● Function of the model to explain the system underlying a phenomenon. ● Function of the model to describe a phenomenon. ● Number of data sources to represent the phenomena. ● Number of components to identify. ● Degree to which components of the model are provided. ● Model may be provided for revision or be created from scratch. ● Representation of model. ● Number of effect examples. ● What system is being modeled and the number of systems being modeled.
Assessment Boundaries	● Assessment is limited to the interactions of two systems at a time.
Technical Terms	• Atmosphere, hydrosphere, geosphere, biosphere, landforms, ecosystems, interactions

Grade 5 SIPS Design Pattern for 5-ESS2-2

Element	Description
Knowledge and Practices (DCI, SEP, CCC)	Students: • demonstrate an understanding that nearly all of Earth's available water is in the ocean. • demonstrate an understanding that most fresh water is in glaciers or underground and only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. • use mathematics and computational thinking to describe and represent quantities to address scientific questions and to demonstrate understanding of the disciplinary core ideas. The crosscutting concept of applying scale, proportion, and quantity is the organizing concept for these DCIs.
Performance Expectation	**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.*]
Knowledge, Skills, & Abilities (KSAs)	**KSA1:** Identify the difference between salt and freshwater and where both are found. **KSA2**: Compare the characteristics of the most common bodies of water on Earth. **KSA3**: Analyze data about varying reservoirs on Earth. **KSA4:** Graph given data (using standard units) showing the distribution of saltwater and freshwater reservoirs on Earth. **KSA5**: Use graphs to describe proportions between the reservoirs of water on Earth. **KSA6**: Use graphs to describe that most of the Earth's freshwater is stored in glaciers or underground. **KSA7**: Graph given data (using standard units) showing the distribution of saltwater and freshwater reservoirs on Earth. **KSA8**: Graph quantities to visually represent the distribution of water on Earth.
Student Demonstration of Learning	• Analyzes a bar chart/graph accurately showing percentages of the distribution of both salt and freshwater on Earth. • 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. • Makes a prediction based on the data provided about water distribution in an area.

Work Product	• A bar chart or graph. • Selected response. • Constructed response. • Interpretation and/or representation of data (e.g., diagrams, flowcharts).
Task Features	• The task focuses on performances for which students' opportunity to learn has prepared them. • The task is based on the assessed KSA(s) and driven by a high-quality scenario that focuses on a phenomenon or design problem. • The task scenario is grounded in the phenomena and problems being addressed. • The task prompts students to make connections between observed phenomena or evidence and reasoning underlying the observation/evidence. • The task provides ways for students to make connections of meaningful local, global, or universal relevance. • The task scenario is sufficient, engaging, relevant, and accessible to a wide range of students. • The task is accessible, appropriate, and cognitively demanding for all learners, including students with disabilities, students who are English learners, or those who are working below or above grade level. • All prompts within a task are fair and equitable and include a range of presentation and response modes. • The task requires students to use scientific reasoning and process skills to produce evidence that can be used by educators to make inferences about student learning. • The task requires students to use reasoning and integrate multiple dimensions to (i.e., SEP, DCI, CCC) to support sense-making about phenomena or problems. • All tasks elicit core ideas as defined in the PE. • The task uses information that is scientifically accurate. • The task elicits core ideas as defined in the PE. • The task uses active voice and present tense. • The task is written at or below grade level.
Variable Features (Aspects of an assessment task that <u>can be varied</u> to shift complexity or focus.)	• Complexity of scientific concept(s) to be modeled/ • Number, type, and complexity of representations of models (e.g., mathematical and/or computational models). • Type of mathematical measurement and representations used to describe characteristics and patterns of a scientific phenomenon.

	● Convert among different-sized standard measurement units within a given measurement system and use these conversions to explain changes that occur. ● Domain-specific vocabulary and definitions. ● Format of "real-world" phenomenon under investigation: image, data, text, or a combination. ● Phenomena include, but are not limited to: ○ Volumes/percentages of various reservoirs worldwide. ○ Volumes/percentages of freshwater reservoirs. ○ Volumes/percentages of surface water and groundwater. ○ Areas of watersheds and volumes of water draining from them. ○ Changes in glacial coverage or glacial volume over time. ○ Water well data to illustrate changes in a water table over time. ● Number, type, and complexity of representations of models, tables, graphs, and/or data sets.
Assessment Boundaries	● Assessment is limited to oceans, lakes, rivers, glaciers, groundwater, and polar ice caps, but does not include the atmosphere.
Technical Terms	• Salt water, fresh water, lakes, rivers, ground water, polar ice caps, wetlands, oceans

Grade 5 SIPS Design Pattern for 5-ESS3-1

Element	Description
Knowledge and Practices (DCI, SEP, CCC)	Students: • demonstrate an understanding that human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. • demonstrate an understanding that individuals and communities do things to help protect Earth's resources and environments. • obtain and combine information to explain phenomena or solutions to a design problem. The crosscutting concept of applying systems and system models is the organizing concept for these DCIs.
Performance Expectation	**5-ESS3-1:** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
Knowledge, Skills, & Abilities (KSAs)	**KSA1:** Combine and synthesize information on the effects of a given human activity on the environment (e.g., air pollution) to determine how humans have impacted air quality. **KSA2:** Combine and synthesize information on the effects of a given human activity on the environment (e.g., water pollution) to determine how humans have impacted water quality. **KSA3:** Summarize information about how humans have protected natural resources (e.g., air, water, land, habitats). **KSA4:** Explain, using evidence, the ways in which communities have positively impacted the air. **KSA5:** Explain, using evidence, the ways in which communities have positively impacted the environment and habitats. **KSA6:** Explain, using evidence, the ways in which communities have positively impacted water sources. **KSA7:** Identify the effects of human activity (e.g., in agriculture, industry, everyday life) affecting the Earth's resources and environments.
Student Demonstration of Learning	• From provided texts or resources, accurately selects a text/resource that shows positive human impact on the environment, air, land, or water. • From provided texts or resources, correctly summarizes information using evidence that shows positive human impacts on the environment, air, land, or water.

	● 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 a rationale to support a solution that mitigates the human impacts on the environment, air, land, or water. ● Creates written information (tables, diagrams, and charts) that shows understanding of texts/resources that are about human impacts on the environment. ● Uses multiple data sources to explain how human activities impact resources or the environment. ● From provided texts or resources, accurately identifies causes of pollution.
Work Product	● Selected response. ● Constructed response. ● Interpretation and/or representation of data (e.g., diagrams, flowcharts). ● Support an argument with evidence, data, or a model. ● Development of a model to describe phenomena.
Task Features	● The task focuses on performances for which students' opportunity to learn has prepared them. ● The task is based on the assessed KSA(s) and driven by a high-quality scenario that focuses on a phenomenon or design problem. ● The task scenario is grounded in the phenomena and problems being addressed. ● The task prompts students to make connections between observed phenomena or evidence and reasoning underlying the observation/evidence. ● The task provides ways for students to make connections of meaningful local, global, or universal relevance. ● The task scenario is sufficient, engaging, relevant, and accessible to a wide range of students. ● The task is accessible, appropriate, and cognitively demanding for all learners, including students with disabilities, students who are English learners, or those who are working below or above grade level. ● All prompts within a task are fair and equitable and include a range of presentation and response modes.

	- The task requires students to use scientific reasoning and process skills to produce evidence that can be used by educators to make inferences about student learning. - The task requires students to use reasoning and integrate multiple dimensions to (i.e., SEP, DCI, CCC) to support sense-making about phenomena or problems. - All tasks elicit core ideas as defined in the PE. - The task uses information that is scientifically accurate. - The task elicits core ideas as defined in the PE. - The task uses active voice and present tense. - The task is written at or below grade level.
Variable Features (Aspects of an assessment task that <u>can be varied</u> to shift complexity or focus.)	- Complexity of scientific concept(s) to be modeled. - Domain-specific vocabulary and definitions. - Examples of human activities that can have positive environmental impacts or activities which have known negative impacts. - Scale of human activity (e.g., single-sourced, collective action, locally occurring, globally occurring, etc.). - Contexts include, but are not limited to: - Pollution - Acid precipitation - Soil erosion - Habitat destruction - Invasive species - Recycling - Restoration and protection of natural habitats - Environmental regulations - Water conservation - Number of items in a list showing causes of environmental changes. - Number of different solutions for natural resource replenishment. - Amount, range of data, complexity, and length of the text related to a determined number of positive human impacts on the environment. - Amount, range of data, complexity, and length of the text related to a determined number of negative human impacts on the environment. - Amount, range of data, complexity, and length of the text related to a determined number of positive human impacts on natural resources.

	• Amount, range of data, complexity, and length of the text related to a determined number of negative human impacts on natural resources. • Number of the evidence-based impacts humans have on Earth's environment or natural resources. • Components and types of models used to explain/show how a specific environment is negatively/positively impacted by human interaction.
Assessment Boundaries	• Assessment should not cover global warming or the ability to assess the credibility and accuracy of a text
Technical Terms	• Oceans, soil erosion, habitat destruction, conservation, invasive species, pollution, recycling

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