Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project

Grade 5 Science
Unit 4 End of Unit Assessment Unpacking Tools
Earth and Its Gravitational Force and Motion
August 2023

The SIPS Grade 5 Science Unit 4 End of Unit Assessment Unpacking Tools, Earth and Its Gravitational Force and Motion 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 5 Unit 4 End of Unit Assessment Unpacking Tools

NGSS Performance Expectation: 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.]

	Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
Foundations	**SEP: Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Support an argument with evidence, data, or a model.	**DCI: PS2.B: Types of Interactions** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.	**CCC: Cause and Effect** Cause and effect relationships are routinely identified and used to explain change.
Key Aspects	• Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critique from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. • Identify evidence that supports a claim.	• Multiple lines of evidence that indicate that the Earth's shape is spherical (e.g., observation of ships sailing beyond the horizon, the shape of the Earth's shadow on the moon during an eclipse, the changing height of the North Star above the horizon as people travel north and south). • Objects dropped appear to fall straight down. • People live all around the spherical Earth, and they all observe that objects appear to fall straight down. • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. • The gravitational force exerted by the Earth on objects is directed "down" (towards the center of the Earth), no matter the height or location from which an object is released.	• Some parts of a system or phenomenon generate actions that result in a change in other parts of a system. • The change can be measured and tracked. • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause-and-effect relationship.
Prior Knowledge	• Identify arguments that are supported by evidence. • Distinguish between explanations that account for all gathered evidence and those that do not.	• Electrical and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for	**Relationships to SEPs:** **7) Engaging in Argument from** • Models can show the links between components of a system that show cause-and-effect relationships.

	• Analyze why some evidence is relevant to a scientific question and some is not. • Distinguish between opinions and evidence in one's own explanations. • Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument. • Construct an argument with evidence to support a claim. • Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.	forces between two magnets, on their orientation relative to each other. • Each force acts on one particular object and has both a strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. • How forces affect objects ○ Forces act as a push or a pull and can have different directions and strengths. ○ Forces can change the motion (direction or speed) of an object.	**Evidence and 4) Analyzing and Interpreting Data**	• Simple tests can be designed to gather evidence to support or refute student ideas about causes. • Draw a diagram that shows how changes to one component of the system affect components that are not directly connected to that component. • Identify cause-and-effect relationships in data. • Describe how cause-and-effect relationships can be used as evidence in data help to explain a phenomenon. • Develop a causal explanation of a phenomenon drawn from empirical data.

NGSS Performance Expectation: 5-ESS1-1 Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth. [*Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]*

	Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
Foundations	**SEP: Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Support an argument with evidence, data, or a model.	**DCI: ESS2.C: The Roles of Water in Earth's Surface Processes** Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.	**CCC: Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large.
Key Aspects	• Compare and refine arguments based on an evaluation of the evidence presented. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Respectfully provide and receive critique from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. • Construct and/or support an argument with evidence, data, and/or a model. • Use data to evaluate claims about cause and effect. • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. • Identify evidence that supports a claim.	• Some stars are closer/farther from Earth than others. • Stars appear brighter due to distance from Earth. • The sun and other stars are natural bodies in the sky that give off their own light. • Natural objects exist from the very small to the immensely large. • The sun is a star that appears larger and brighter than other stars because it is closer to Earth. • Stars range greatly in their distance from Earth. • Although stars are immensely large compared to Earth, they appear small and dim because they are so far away.	• Understand the units used to measure and compare quantities. • Describe relationships between natural objects which vary in size (very small to immensely large). • Understanding of scale involves not only understanding systems and processes vary in size, time span, and energy, but also different mechanisms operate at different scales.
Prior Knowledge	• Identify arguments that are supported by evidence. • Distinguish between explanations that account for all gathered evidence and those that do not. • Analyze why some evidence is relevant to a scientific question and some is not.	• Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted.	**Relationships to SEPs:** **7) Engaging in Argument from Evidence and 4) Analyzing** • Represent scale by using a model. • Represent how distance affects appearance of brightness. • Relative distance (closer/farther) scale is used to support an argument.

	• Distinguish between opinions and evidence in one's own explanations. • Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument. • Construct an argument with evidence to support a claim. • Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.		**and Interpreting Data**	• Draw a diagram that shows how changes to one component of the system affect components that are not directly connected to that component. • Identify cause-and-effect relationships in data. • Describe how cause-and-effect relationships can be used as evidence in data help to explain a phenomenon. • Develop a causal explanation of a phenomenon drawn from empirical data.

NGSS Performance Expectation: 5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. *[Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]*.

	Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
Foundations	**SEP: Analyzing and Interpreting Data** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.	**DCI: ESS1.B: Earth and the Solar System** The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.	**CCC: Patterns** Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena.
Key Aspects	• Record and organize data. • Analyze data to make sense of phenomena. • Analyze data to identify relationships. • Use a variety of graphical displays to reveal patterns. • Record information and represent data in tables and graphical displays. • Organize data in a way that facilitates analysis and interpretation. • Use empirical data to describe patterns and relationships. • Identify patterns (qualitative or quantitative) among variables represented in the data.	• As Earth moves around the sun and rotates on its axis, changes such as patterns of night and day can be observed. • There are daily changes in the length of day and night. • Relate the length and direction of shadows to the time of day as the Earth rotates on its axis. • Recognize change in the duration of sunlight, as determined by sunrise and sunset times, as it relates to the time of year as the Earth orbits the Sun. • Describe how some stars and/or constellations can be seen in the sky all year while others appear only at certain times of the year.	• Similarities in patterns can be used to sort simple rates of change (natural phenomena and designed products). • Differences in patterns can be used to classify simple rates of change (natural phenomena and designed products).
Prior Knowledge	• Record information (observations, thoughts, and ideas.) • Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems. • Analyze data from tests of an object or tool to determine if it works as intended.	• There are patterns in the rising and setting of the sun and the moon. • At different times of the year there are different amounts of daylight. • Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. • Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	**Relationships to SEPs:** **4) Analyzing and Interpreting Data and 7) Engaging in Argument** • Recognizing patterns in data. • Use observations to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems. • Represent data in graphical displays (bar graphs,

			from Evidence	pictographs and/or pie charts) to reveal patterns that indicate relationships. • Identify patterns/relationships in data to support an argument. • Describe how patterns/relationships can be used as evidence support and argument to explain a phenomenon. • Identify a pattern in the data that can be used to support the argument.