Teacher Guide

Science

Grade 8

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About This Guide

This MSAA Science Sample Item Teacher Guide can help educators use a subset of the sample items as a formative assessment tool, allowing educators to understand what students may be able to know and do based on these items, and how educators can respond to this information through instruction. This guide should be used in conjunction with the corresponding paper-based item PDF and Directions for Test Administration (DTA). The paper-based item PDF includes sample items for students to interact with and provide responses to. The DTA is for educators to follow to ensure proper administration of the sample items. All documents needed to use this tool can be found on the Sample Items page in the MSAA System year-round.

The MSAA Science items are aligned to the Extended Performance Expectations (EPEs). The EPEs serve as access points for the science content. The EPEs are what daily instruction of multidimensional science should be based on. The EPEs can be found at https://www.msaastates.com/ within the Standards link.

Guide Terminology

The MSAA Science Sample Item Teacher Guide for each grade includes the following:

- **Sample Item Blueprint Table.** A high-level overview of the items in each set that shows: the domain, standard (Extended Performance Expectation [EPE]), dimensions, item set type, and item position.
- **Item Set Information.** Information about item alignment, including learning targets, instructional strategies, and scaffolds and supports. The learning targets identified for each item set are displayed in order of complexity, starting with access points and increasing in complexity until the learning target aligns with the Level 3 EPE.
- **Student Item Thumbnail Image.** Item thumbnails are intended to help educators easily identify the specific items in the guide as they administer the sample items with the PDF of items and the DTA.

Item types, item sets, and dimensions addressed in the sample item guide include the following:

- **Selected-Response Items**
  - All science items are multiple choice. Students select one answer from three possible choices. The correct answer is identified with italicized font in the DTA under the “Record” section for each item.
- **Standalone Sets**
  - Contain three items (Level 1, Level 2, Level 3) authored to be a single EPE progression.
  - Items are independent of one another; each item includes its own stimulus text and optional graphic.
  - Presented in the following order: item stimulus, item question, three response options.
- **Cluster Sets**
  - Contain one shared stimulus (called a cluster stimulus) and six items: three items authored to one EPE progression and three items authored to a second EPE progression. A cluster stimulus is provided in both the DTA and paper-based item PDF prior to a cluster set. A cluster stimulus contains information that will be *shared* by more than one item. This can include a passage, informational text, graphics, and/or a diagram.
  - Items are independent of one another but are all related to the cluster stimulus science context.
  - Presented in the following order: the cluster stimulus (text and optional graphics); Level 1, Level 2, Level 3 items authored to the first EPE progression; Level 1, Level 2, Level 3 items authored to the second EPE progression. Each individual item repeats key information and graphics from the cluster stimulus, presents the item question, and then presents three response options.
- **Three Dimensions of Science Learning**
  - Science and Engineering Practices (SEPs). What students are expected to do.
  - Disciplinary Core Ideas (DCIs). What students are expected to know.
  - Crosscutting Concepts (CCCs). How students think and connect ideas.
    - The SEPs, DCIs, and CCCs are identified in the Sample Item Blueprint Table for each standard. The instructional strategies that are included in the item set information for each standard incorporate ideas on how to include the three dimensions into an educator’s daily instruction.

Introduction to Formative Assessment

It is important to remember that formative assessment is not a test. It is a process, a practice that is part of formative instruction. In effective formative instruction, educators use a variety of methods to determine what students understand and can do and adjust instruction accordingly.

Formative Assessment Data

Students and educators are the primary users of formative assessment data. These data have the greatest effect on learning and instruction because feedback for both student and educator occurs over a very short or nearly instantaneous time period. This allows for adjustments in instruction, reteaching, and additional practice with learning targets to occur.

How to Best Use the Science Sample Item Sets

The content in this section explains each component of the sample item sets and how they can best be incorporated into the classroom.

Science Sample Item Blueprint Table

The science blueprint table/overview should be used to help select the targeted EPE to be assessed, and the corresponding sample items that will provide the best evidence of student learning. The dimensions that correspond to each EPE are also identified. The table also indicates whether the associated item sets are standalone items or part of a cluster.

To obtain evidence of understanding for each grade-level standard, educators can

- Use item sets individually as the EPE is covered in class.
- Use the items in small groups to address a series of learning targets that focus on one standard.
- Use the entire sample item set to measure students' understanding of learning targets before, during, or after instruction.
- Use the items by level of complexity, starting with teaching to the Level 1 EPE, and once consistent accuracy is shown in response to instruction and the corresponding sample item, the educator can begin working toward the Level 2 EPE, and then the Level 3 EPE.
- Review sample item sets from lower grades to build understanding of prerequisite skills for a given standard.
- Review sample item sets from higher grades to know how standard and item information build from the target grade.
- Use the sample items as models to create additional items to assess the standards.

Next Steps for Formative Science Item Data

After obtaining data that serves as evidence of student understanding, educators should evaluate and interpret the data to identify gaps in student understanding.

Once gaps in understanding are identified, students need appropriate feedback and educators need to modify their instructional strategies to target those gaps.

After feedback is provided to students, educators should consider documenting the instructional modifications and supplementations provided to the students. Whether a student is undergoing relearning or learning a new concept, plans can be made, documented, and implemented on how best to scaffold that learning. Educators can use the learning targets to help guide which specific modifications, supplementations, and scaffolding will best support the student.

Grade 8 Sample Item Blueprint

Domain	EPE	Dimensions	Item Set Type	Item Position
Life Science	**MS-LS1-5.1** Ask questions to help identify factors that could be affecting the growth of an organism. **MS-LS1-5.2** Analyze data to determine whether a particular factor is affecting the growth of organisms. **MS-LS1-5.3** Use provided information to explain how the growth of organisms is influenced by various environmental and/or genetic factors.	**SEP: Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. ***Supporting:*** **Analyzing and Interpreting Data** **Asking Questions and Defining Problems**	Standalone	1–3
		DCI: LS1.B: Growth and Development of Organisms • Genetic factors as well as local conditions affect the growth of the adult plant.		
		CCC: Cause and Effect • Phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.		
	MS-LS2-1.1 Use data or observations to identify resources (e.g., food, water, nutrients, space) that are necessary for organisms and populations of organisms to grow and survive. **MS-LS2-1.2** Use data or observations to describe the effects of resource availability on organisms and/or populations of organisms. **MS-LS2-1.3** Analyze data to identify evidence for a cause-effect relationship between resource availability and growth of organisms and/or populations of organisms.	**SEP: Analyzing and Interpreting Data** • Analyze and interpret data to provide evidence for phenomena.	Cluster	4–6
		DCI: LS2.A Interdependent Relationships in Ecosystems • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. • In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. • Growth of organisms and population increases are limited by access to resources.		
		CCC: LS1.B: Growth and Development of Organisms • Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.		

Domain	EPE	Dimensions	Item Set Type	Item Position
Earth and Space Science	**MS-ESS3-3.1** Identify an environmental problem caused by human activities/impact. **MS-ESS3-3.2** Make a claim about how a particular method would work to reduce human impact on the environment. **MS-ESS3-3.3** Select or evaluate a design for a method for minimizing a human impact on the environment.	**SEP: Constructing Explanations and Designing Solutions** • Apply scientific principles to design an object, tool, process, or system. ***Supporting:*** **Engaging in Argument from Evidence Asking Questions and Defining Problems**	Cluster	7–9
		DCI: ESS3.C: Human Impacts on Earth Systems • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. • Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.		
		CCC: Cause and Effect • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.		
	MS-ESS2-4.1 Use a model to trace the path of water through Earth's systems. **MS-ESS2-4.2** Use a model to describe the state of water or state changes in various parts of the water cycle. **MS-ESS2-4.3** Develop a model to describe how the Sun's energy or the force of gravity moves water through the water cycle.	**SEP: Developing and Using Models** • Develop a model to describe unobservable mechanisms.	Cluster	10–12
		DCI: ESS2.C: The Roles of Water in Earth's Surface Processes • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. • Global movements of water and its changes in form are propelled by sunlight and gravity.		
		CCC: Energy and Matter • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.		

Domain	EPE	Dimensions	Item Set Type	Item Position
Physical Science	**MS-PS4-2.1** Use observations to identify whether a wave is being reflected, absorbed, or transmitted through a material. **MS-PS4-2.2** Use a model to describe the path of a wave that is reflected, absorbed, or transmitted through different materials. **MS-PS4-2.3** Develop a model to represent what happens to waves when they are reflected, absorbed, or transmitted through different materials.	**SEP: Developing and Using Models** • Develop and use a model to describe phenomena. ***Supporting:*** **Planning and Carrying Out Investigations** **DCIs:** **PS4.A: Wave Properties** • A sound wave needs a medium through which it is transmitted. **PS4.B: Electromagnetic Radiation** • When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. • The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air, and glass) where the light path bends. **CCC: Structure and Function** • Structures can be designed to serve particular functions by taking into account properties of different materials and how materials can be shaped and used.	Cluster	13–15
	MS-PS1-2.1 Use observations or informational resources (e.g., charts, data tables) to identify properties of a substance. **MS-PS1-2.2** Use data on the properties of two or more substances to determine if the samples are the same or different substances. **MS-PS1-2.3** Use data or observations on the properties of substances before and after an interaction to determine if a chemical reaction occurred.	**SEP: Analyzing and Interpreting Data** • Analyze and interpret data to determine similarities and differences in findings. ***Supporting:*** **Planning and Carrying Out Investigations** **DCIs:** **PS1.A: Structure and Properties of Matter** • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. **PS1.B: Chemical Reactions** • Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. **CCC: Patterns** • Macroscopic patterns are related to the nature of microscopic and atomic-level structure. ***Supporting:*** **Scale, Proportion, and Quantity**	Standalone	16–18

Science Sample Items 1–3 (Standalone)

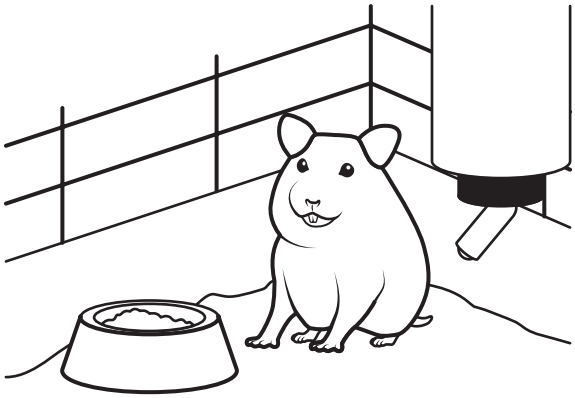
Alignment	**EPE MS-LS1-5.1 (Level 1):** Ask questions to help identify factors that could be affecting the growth of an organism. **EPE MS-LS1-5.2 (Level 2):** Analyze data to determine whether a particular factor is affecting the growth of organisms. **EPE MS-LS1-5.3 (Level 3):** Use provided information to explain how the growth of organisms is influenced by various environmental and/or genetic factors.

Learning Targets	Instructional Strategies	Scaffolds and Supports
I can define organism. I can identify factors that could be affecting an organism's growth. I can determine whether a particular factor is affecting an organism's growth. I can analyze data and ask questions to determine whether a particular factor is affecting an organism's growth. I can use provided information to explain how an organism's growth is influenced by various environmental and/or genetic factors.	**Real-World Demonstrations** • Provide relevant, real-world examples and uses, such as emphasizing during mealtimes at school that as an organism, eating and drinking is affecting your growth. • Utilize classroom plants to demonstrate growth as they are watered and placed in sunlight. • Use multimedia demonstrations, such as videos that compare two organisms in the same setting with different environmental or genetic factors, that show the difference between growth over time. Pause often to discuss observations, modeling to students how to ask scientific questions, and predict outcomes. Students can create visual representations afterward to explain what was observed. **Graphic Organizers in a Group Activity** • Define organism and provide different examples to students. • Pick one organism to focus on. • Create a large web (bubble map) with the identified organism in the center. • During discussions using questions, symbolic representations, and already-created options as needed, complete the webs of the organizer with various genetic and/or environmental factors that could affect the growth of the organism. **Task Analysis** • Present information about an organism. • Identify a factor from within the provided information that affects its growth. • Identify facts from within the provided information that support and explain how the identified growth is affected. • Input those findings into a "cause and effect" diagram.	• Assistive technology • Data tables • Line graphs, bar graphs, etc. • Providing a word bank with visual supports • Highlighted key takeaways in text • Graphic organizers—cause-and-effect chain, problem-and-solution map, fishbone diagram • Graphic organizers—web (bubble map) • Offering choices other than writing in a graphic organizer (dictating to a scribe, choice making, sorting words/pictures/objects, etc.) • Picture icons to accompany words to support nonreaders • Content delivered using multimedia (e.g., book, storyboard, video, computer)

Science Sample Items 1–3 (Standalone)		
Learning Targets	**Instructional Strategies**	**Scaffolds and Supports**
	Least-to-Most Prompts • Increase support as needed until the student has completed the task appropriately. • Include prompts such as gesturing, indirect/direct modeling, partial physical assistance, and full physical assistance from least to most. • Always begin by providing the student an opportunity to answer/complete tasks correctly on their own. • Always make certain the last prompt ensures the student responds correctly to the question/task to build understanding of expectations. • Provide positive reinforcement for all correct responses.	

Item 1

Jeanie has a baby hamster. She wants to be sure it grows up healthy. She feeds it every day.



Which question should Jeanie ask to find out how to help the hamster grow?

A. Is the hamster a boy or a girl?

B. What is the best name for the hamster?

C. Does the hamster get enough food and water?

Item 2

A scientist measured the growth of small plants growing on the ocean surface. Then, she added fertilizer to the plants and measured their growth again. Her data are shown in the data table.

Effect of Adding Fertilizer to Ocean Plants

	Before Fertilizer	After Fertilizer
Plant Growth Rate	0.25	0.65

According to the data table, which factor affected the growth of the ocean plants?

A. cloudy skies

B. ocean temperature

C. presence of fertilizer

Item 3

Scientists conducted an investigation to see how different foods available in spring affect geese. They captured geese and weighed them. Then, they weighed how much grass was in the stomach of each goose. The scientists released the geese and then captured them a second time, repeating their measurements. The data table lists their data.

How Does Eating Grass Affect Goose Weight?

Date	Average Weight of Grass Eaten (grams)	Average Goose Weight (kilograms)
March 1st	22.7	4.65
March 12th	26.2	5.27

Based on the data table, how does eating grass affect goose weight?

A. Goose weight increases when geese eat more grass.

B. Goose weight decreases when geese eat more grass.

C. Goose weight stays the same when geese eat more grass.

Science Sample Items 4–6 (Cluster – Part 1 of 2)

Alignment	**EPE MS-LS2-1.1 (Level 1):** Use data or observations to identify resources (e.g., food, water, nutrients, space) that are necessary for organisms and populations of organisms to grow and survive. **EPE MS-LS2-1.2 (Level 2):** Use data or observations to describe the effects of resource availability on organisms and/or populations of organisms. **EPE MS-LS2-1.3 (Level 3):** Analyze data to identify evidence for a cause-effect relationship between resource availability and growth of organisms and/or populations of organisms.

Learning Targets	Instructional Strategies	Scaffolds and Supports
I can define organism. I can identify resources (e.g., food, water, nutrients, space) that are necessary for organisms or populations of organisms to grow and survive. I can use data and observations to identify resources (e.g., food, water, nutrients, space) that are necessary for organisms or populations of organisms to grow and survive. I can use data and observations to describe the effects of resource availability on populations of organisms. I can analyze data to identify evidence for a cause-effect relationship between resource availability and growth of populations of organisms.	**Sort to Understand** • Provide examples, graphical representations, graphs, etc. of necessary resources and nonessential resources that are necessary for organisms to survive for students to sort. • Provide relevant, real-world examples and uses using multimedia presentations. Pause often to model how to ask questions about the organisms and provide detailed descriptions in answers. • Use models and graphical representations to symbolize patterns between resource availability and changes in population. **Gallery Walk** • The teacher makes a gallery in the classroom of various populations of organisms. This is a discussion technique that allows students to walk around the classroom and observe populations of different organisms, then discuss various factors that may impact their numbers. **Task Analysis** • Present information about an organism or a population of organisms. • Identify what resources are necessary for the organism to survive. • Identify the factors that may impact the availability of the necessary resource. • Input those findings into a “cause and effect” diagram. **Least-to-Most Prompts** • Increase support as needed until the student has completed the task appropriately.	• Assistive technology • Providing a word bank with visual supports • Highlighted key takeaways in text • Line graphs • Graphic organizers—cause-and-effect chain, problem-and-solution map, fishbone diagram • Offering choices other than writing in a graphic organizer (dictating to a scribe, choice making, sorting words/pictures/objects, etc.) • Physical and virtual models • Demonstrations using all types of models to cater to different learning styles • Picture icons to accompany words to support nonreaders • Content delivered using multimedia (e.g., book, storyboard, video, computer)

Item 4*

Levi notices young birds that visit the feeders in the nature area are becoming larger over time.

What resource is needed to help the birds grow?

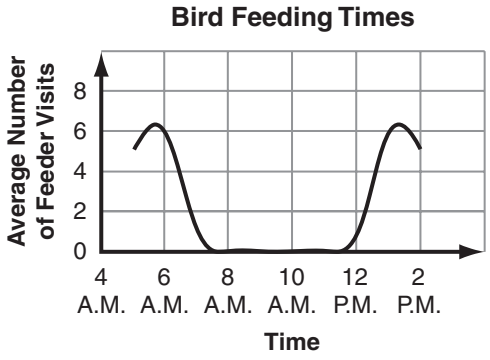
A. food

B. dirt

C. shoes

Item 5*

Levi wants to create a plan so that the bird feeders are always full. He examines a graph that models bird feeding behavior.



Based on this data, when is the **best** time for Levi to refill the bird feeders?

A. in the middle of the night

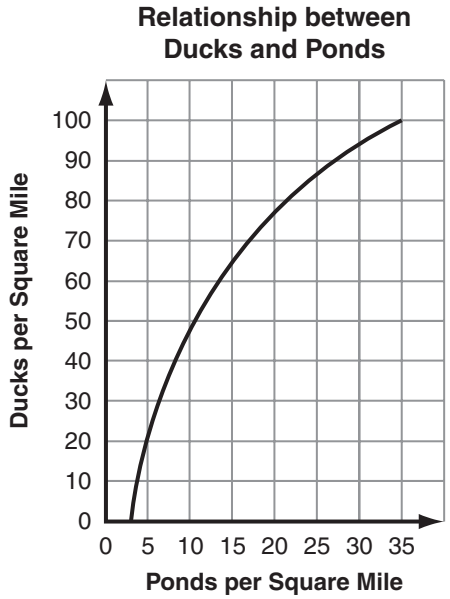
B. in the morning and late afternoon

C. in the middle of the day and early evening

**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

Item 6*

Levi also wants to restore a pond habitat near the nature area to attract ducks. He examines a graph showing the relationship between the number of ponds and the number of ducks.



Which cause-and-effect relationship is **best** described by this data?

A. clean pond water → more ducks per square mile

B. many pond habitats → more ducks per square mile

C. enough pond food to eat → more ducks per square mile

**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

Science Sample Items 7–9 (Cluster – Part 2 of 2)

Alignment	**EPE MS-ESS3-3.1 (Level 1):** Identify an environmental problem caused by human activities/impact. **EPE MS-ESS3-3.2 (Level 2):** Make a claim about how a particular method would work to reduce human impact on the environment. **EPE MS-ESS3-3.3 (Level 3):** Select or evaluate a design for a method for minimizing a human impact on the environment.

Learning Targets	Instructional Strategies	Scaffolds and Supports
I can define an environmental problem. I can identify an environmental problem. I can identify an environmental problem caused by human activities/ impact. I can identify a method that would work to reduce human activities/impact on the environment. I can make a claim about how a particular method would work to reduce human impact on the environment. I can select a design for a method for minimizing a human impact on the environment. I can evaluate a design for a method for minimizing a human impact on the environment.	**Sort to Understand** • Provide examples of environmental problems and non-environmental problems for students to sort. • Provide examples of environmental problems that occur naturally and environmental problems that are caused by human impact for students to sort. **Discuss to Understand** • Break students into small groups to discuss environmental problems they have seen or have heard about, strategies on how they might fix that problem, or how an already-existing design could be improved to limit human impact further. • Utilize conversation frames as needed. **Sketch-to-Stretch** • Sketch-to-stretch is a way for students to capture the main idea through drawing. After the students have completed reading information about environmental problems caused by human activities/impact, they can draw/create a visual representation about the main concept using details from the text to inform their artwork. **Issues, Evidence, and You** • This approach encourages students to consider the implications of human activities. Working individually or in small groups, students access factual scientific information provided by the teacher. Students then identify the human activity that was the issue, highlight the evidence and implications, and create a product (graphic organizer, text with highlighted details in different colors, drawing, etc.) to capture discussion.	• Assistive technology • Graphic organizers for classifying—web (bubble map), T-chart • Picture icons on graphic organizers to support nonreaders and visual learners • Reading frames, conversation frames, tables, and sentence strips (adapted with symbols as needed) • Interactive whiteboards • Mini whiteboards • Highlighted information within a text • Read-aloud texts • Content delivered using multimedia (e.g., book, storyboard, video, computer) • Models

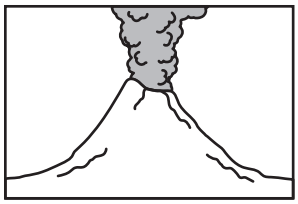
Science Sample Items 7–9 (Cluster – Part 2 of 2)		
Learning Targets	**Instructional Strategies**	**Scaffolds and Supports**
	Reading Frames • This strategy assists students in organizing essential information while reading scientific text. • Provide students with a table with headings that match a selection of text. • Provide students with sentence strips that contain the key takeaway to support the claim discussed. • The teacher can pause while reading the text and ask students the key takeaway from that portion of the text. • Students can populate the table with sentence strips throughout the reading, so the key takeaways are summarized.	

Item 7*

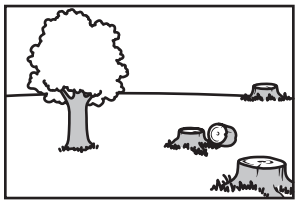
Levi knows that human activities can affect the environment.

Which environmental change is **most likely** caused by humans?

A. Waves remove sand from a beach.



B. A volcano erupts.



C. Some trees are cut down.

**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

Item 8*

Levi observes that the number of birds visiting the nature area has decreased over time. He thinks this is because humans have caused changes to the natural environment. There are not as many places for birds to build nests.

Levi researches how human effects on birds could be reduced. A list of his findings is shown.

Actions to Reduce Human Effects on Birds

- Plant native trees and bushes.
- Decrease the amount of city noise.

Which action would **best** help the birds in the nature area build sturdy nests?

A. Plant native trees and bushes.

B. Decrease the amount of city noise.

C. Clean the classrooms in the school.

Item 9*

Levi observes that birds are using the nature area. His science teacher tells him that human activities such as building roads have disrupted bird habitats. Without habitat for the birds to rest and have shelter, they cannot survive.

Levi makes a list of design changes to the nature area that could help protect the birds.

Possible Design Changes to Nature Area

- Build nesting boxes.
- Add clean birdbaths.
- Hang several bird feeders.

Which design change would make sure that the birds have shelter?

A. Build nesting boxes.

B. Add clean birdbaths.

C. Hang several bird feeders.

**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

Science Sample Items 10–12 (Cluster – Part 1 of 2)

Alignment	**EPE MS-ESS2-4.1 (Level 1):** Use a model to trace the path of water through Earth's systems. **EPE MS-ESS2-4.2 (Level 2):** Use a model to describe the state of water or state changes in various parts of the water cycle. **EPE MS-ESS2-4.3 (Level 3):** Develop a model to describe how the Sun's energy or the force of gravity moves water through the water cycle.

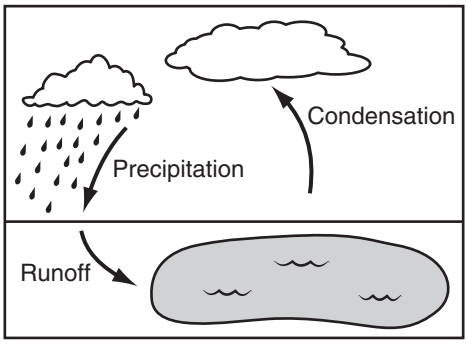
Learning Targets	Instructional Strategies	Scaffolds and Supports
I can identify where condensation, evaporation, and precipitation occur on a model. I can use a model to trace the path of water through Earth's systems. I can use a model to describe the state and changes of water in various parts of the water cycle. I can identify the effects of the Sun's energy. I can define gravity. I can describe how the Sun's energy moves water through the water cycle. I can describe how the force of gravity moves water through the water cycle. I can develop a model to describe how the Sun's energy or the force of gravity moves water through the water cycle.	**Models and Demonstrations** • Create a model that includes a body of water, a mountain, ground, sky, clouds, and rain. Students can use labels (condensation, evaporation, and precipitation) to identify where in the model each takes place. • Pour water over a model of a mountain and ask students what they observe as they watch the flow of water. Participate in discussions with students about why the water flows downward. Other models that can be utilized for a demonstration include stream tables as well as a tray with sand. • Pour an equal amount of water into two jars. Place a lid on one jar, leave the second jar uncovered. Mark the water level for both jars after every three hours and compare. Facilitate a discussion with students about what happened to the water that "disappeared" from the uncovered jar. • Pause modeling and/or other multimedia demonstrations to identify the exact time the state changes during the various water cycle processes as they are happening in real time. Ask students to complete a diagram on what they saw right before the change and then after. • Show students a model of two water cycle events. Have students identify what state of matter each process is in, what process of the water cycle happened between the two events, and what caused the process to occur. **Graphic Organizers** • Students can sort pictures into correct stages of the water cycle in a T-chart. • Students can complete a web that focuses on effects of the Sun's energy.	• Assistive technology • Providing a word bank with visual supports • Physical models • Demonstrations using all types of models to cater to different learning styles • Picture icons to accompany words to support nonreaders • Interactive whiteboards • Content delivered using multimedia (e.g., book, storyboard, video, computer) • Prepared objects, pictures, words, sentence strips, or recorded communication supports to provide access to content and facilitate responses during model demonstrations • Graphic organizers for classifying—web (bubble map), T-chart • Offering choices other than writing in a graphic organizer (dictating to a scribe, choice making, sorting words/pictures/objects, etc.)

Science Sample Items 10–12 (Cluster – Part 1 of 2)		
Learning Targets	**Instructional Strategies**	**Scaffolds and Supports**
	Least-to-Most Prompts • Increase support as needed until the student has completed the task appropriately. • Include prompts such as gesturing, indirect/direct modeling, partial physical assistance, and full physical assistance from least to most. • Always begin by providing the student an opportunity to answer/complete tasks correctly on their own. • Always make certain the last prompt ensures the student responds correctly to the question/task to build understanding of expectations. • Provide positive reinforcement for all correct responses. **Real-World Demonstrations** • Differentiate between the effects of Earth's gravity and the Sun's energy on the water cycle. • Provide relevant, real-world examples and uses using multimedia presentation and response options. **Mnemonics** • A tool to help students remember the stages of the water cycle by using the first letter of each process and using them to make a new word or phrase.	

Item 10*

Syreeta draws a model that shows part of the water cycle.

Drawing Model



Which list of steps describes how water moves in the model?

A. bus → school → classroom

B. imagination → travel → vacation

C. condensation → precipitation → runoff

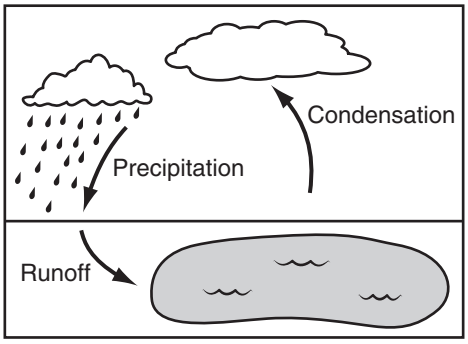
**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

Item 11*

In the early mornings, the lake is often foggy. One day, Syreeta raises her hand into the air and feels tiny water droplets on her hand.

Syreeta wonders where fog is represented on her drawing model that shows part of the water cycle.

Drawing Model



Which part of Syreeta's model represents fog?

A. friction

B. precipitation

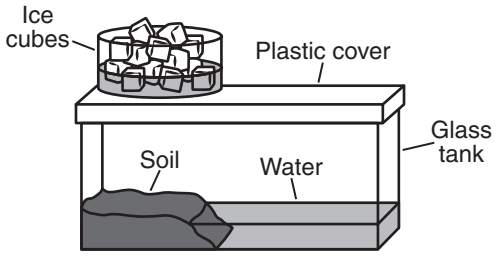
C. condensation

**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

Item 12*

Syreeta also builds a physical model of part of the water cycle that includes the water and soil of the lake. Syreeta starts with an empty glass tank. She pours soil into the bottom left side of the tank. Syreeta then fills the bottom right side of the tank with water. She places a plastic cover on top of the tank. Syreeta sets a container of ice cubes on the left side of the cover.

Physical Model



What should Syreeta add to her model to show how gravity moves water?

A. a plant in the soil, to clean the air

B. a rock on top of the soil, to represent a hill

C. a lamp shining light on the soil, to heat the tank

**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

Science Sample Items 13–15 (Cluster – Part 2 of 2)

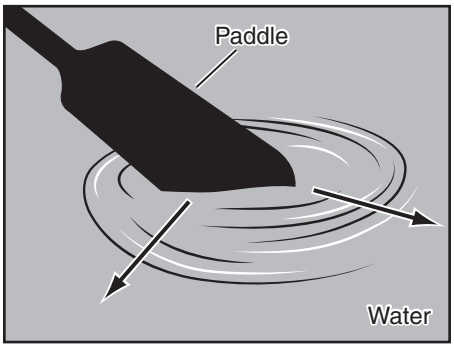
Alignment	**EPE MS-PS4-2.1 (Level 1):** Use observations to identify whether a wave is being reflected, absorbed, or transmitted through a material. **EPE MS-PS4-2.2 (Level 2):** Use a model to describe the path of a wave that is reflected, absorbed, or transmitted through different materials. **EPE MS-PS4-2.3 (Level 3):** Develop a model to represent what happens to waves when they are reflected, absorbed, or transmitted through different materials.

Learning Targets	Instructional Strategies	Scaffolds and Supports
I can define wave. I can define reflected, absorbed, and transmitted. I can use observations to identify whether a wave is being reflected by a material. I can use observations to identify whether a wave is being absorbed by a material. I can use observations to identify whether a wave is being transmitted through a material. I can use a model to describe the path of a wave that is reflected by different materials. I can use a model to describe the path of a wave that is absorbed by different materials. I can use a model to describe the path of a wave that is transmitted through different materials. I can develop a model to represent what happens to waves when they are reflected by different materials. I can develop a model to represent what happens to waves when they are absorbed by different materials. I can develop a model to represent what happens to waves when they are transmitted through different materials.	**Task Analysis** • Present information about a wave. • Identify different types of waves. • Identify wave movement including reflection, absorption, and transmission with visual models of each. • Describe ways that waves move through different materials and create visual models. **Graphic Organizers** • Use a T-chart to sort pictures of waves that are being reflected and waves that are being absorbed. • Create a web with wave in the center, where students fill in the rest with types of waves. **Explore with Observation Stations** • Students get hands-on experience with different centers focusing on how different materials interact with light and water. • Spring toys are a great wave model. **Gallery Walk** • The teacher makes a gallery in the classroom of various light displays being reflected, absorbed, or transmitted. This is a discussion technique that allows students to walk around the classroom and observe the different models, then discuss various factors that are occurring with the waves. **Dual Coding** • Students create a visual of what occurs with reflected, absorbed, and transmitted light and water waves while hearing/watching; students follow along on a visual model as the teacher demonstrates/uses other ways to combine words with visuals, etc.	• Assistive technology • Models • Visual vocabulary cards with graphic representations • Graphic organizer • Interactive whiteboards • Mini whiteboards • Multimedia presentations (e.g., book, storyboard, video, computer) • Online simulations • Prepared objects, pictures, words, sentence strips, or recorded communication supports to provide access to content and facilitate responses during model demonstrations • Provided parts of a model for students to organize correctly • Choices (picture sorts, cut and paste, etc.) • Provided examples and models for students to follow

Science Sample Items 13–15 (Cluster – Part 2 of 2)		
Learning Targets	**Instructional Strategies**	**Scaffolds and Supports**
	Group and Individual Models • Provide relevant real-world examples and models. • Drop a heavy object into water so waves form; repeat often and with various objects with different masses to vary wave size and discuss what the waves look like and where they go. Students can use individual response modes to recreate their own models of what they have seen (drawing, modeling clay, live demonstration, etc.) • Continue to build on this model upon mastery of waves to show absorption and transmission of light or sound waves, i.e., what happens when a wall is put in front of the wave? As you continue to add on to the model, the student can add on to theirs as well. **Least-to-Most Prompts** • Increase support as needed until the student has completed the task appropriately.	

Item 13*

Syreeta takes her boat onto the lake. She places a paddle in the water. She sees waves form circles around the paddle and move outward.



What happens to the water wave when Syreeta uses the paddle?

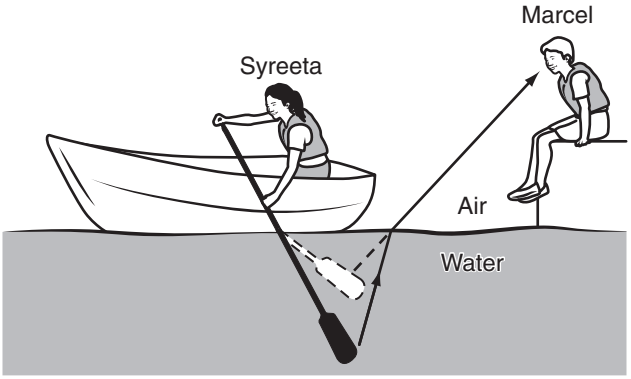
A. The cover protects the food.

B. The trees block the sunlight.

C. The water transmits the wave.

Item 14*

Syreeta's friend Marcel is watching her from the dock. He sees Syreeta place her paddle in the water. Syreeta's paddle appears to be bent under water. Marcel draws a model to show what he sees.



Which statement describes how light moves in Marcel's model?

A. The paddle pushes the boat forward in the lake.

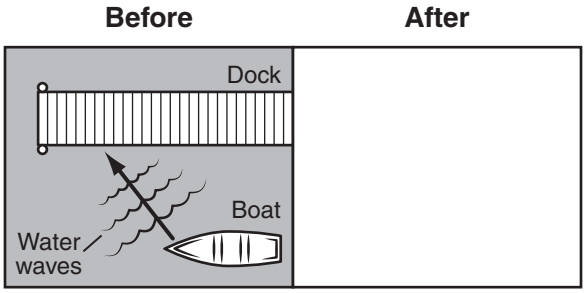
B. The light bends as it moves from the water into the air.

C. The bird eats many seeds as it walks through the grass.

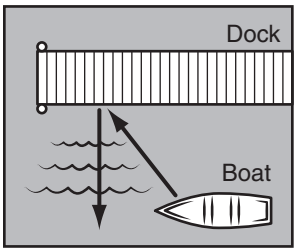
**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

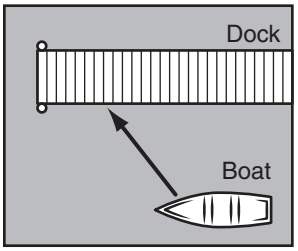
Item 15*

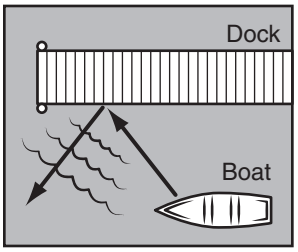
Syreeta notices that the waves from her boat are reflected off the dock. When she leaves her boat at the dock, she draws an incomplete model to show how water waves are reflected.



What diagram should Syreeta add to complete her model?

A.


B.


C.


**Please note: The cluster stimulus for this cluster may be accessed in the sample items PDF and Directions for Test Administration.*

Science Sample Items 16–18 (Standalone)

Alignment	**EPE MS-PS1-2.1 (Level 1):** Use observations or informational resources (e.g., charts, data tables) to identify properties of a substance. **EPE MS-PS1-2.2 (Level 2):** Use data on the properties of two or more substances to determine if the samples are the same or different substances. **EPE MS-PS1-2.3 (Level 3):** Use data or observations on the properties of substances before and after an interaction to determine if a chemical reaction occurred.

Learning Targets	Instructional Strategies	Scaffolds and Supports
I can define property. I can use observations to identify properties of a substance. I can use informational resources to identify properties of a substance. I can use data on the properties of substances to determine if the samples are the same. I can use data on the properties of substances to determine if the samples are different. I can identify a chemical reaction. I can use data on the properties of substances before and after an interaction to determine if a chemical reaction occurred. I can use observations on the properties of substances before and after an interaction to determine if a chemical reaction occurred.	**Sort to Understand** • Demonstrate/show the different properties of objects; sort (classify) different objects/materials by physical characteristics/uses/etc.; begin with tactiles/objects with properties that can be seen, felt, etc. and move to more abstract graphics. **Explore with Observation Stations** • Provide hands-on experience with different centers focusing on different properties. • Example: Place different objects in liquid and observe and record what happens. Do properties change? Does it dissolve? Does it stay the same? What are the commonalities in the objects that have the same reaction? • Create a classroom data table that reflects what observations were made for the different stations. Discuss what was observed to determine whether the group thinks a chemical reaction occurred. **Match to Same** • Match objects with the same properties. • Match objects that have the same chemical reaction when mixed with a specific substance. **Hands-on/Small Group Experiment** • Do safe/nontoxic chemical reaction experiments. • Place a cup of water and a cup of baking soda in front of students. • Show students various properties and have the students select the ones that describe water, then the ones that describe baking soda. • Mix the baking soda into the water. • Ask the students to identify any new properties and any properties that remain. • Discuss whether a chemical reaction occurred and why. • Repeat this activity with vinegar and baking soda.	• Assistive technology • Data tables • Visual vocabulary cards • Graphic organizer • Interactive whiteboards • Collaborative grouping • Multimedia presentations (e.g., book, storyboard, video, computer) • Highlighted text in informational resources • Color-coded (or otherwise) informational resources • Anchor charts on properties, chemical change • Cut and paste: labeled objects with specific property cards • Frayer model • Prepared objects, pictures, words, sentence strips, conversation frames, or recorded communication supports to provide access to content and facilitate responses during model demonstrations

Science Sample Items 16–18 (Standalone)		
Learning Targets	**Instructional Strategies**	**Scaffolds and Supports**
	Least-to-Most Prompts • Increase support as needed until the student has completed the task appropriately. **3 Observations – 2 Findings – 1 Question** • This strategy assists students in discerning between an observation and an inference. • Provide a chemical reaction for students to observe. • Ask students what they saw, heard, and/or smelled. • Instruct students to infer what these observations mean. • Ask students what questions they have about the chemical reaction.	

Item 16

Sanjay uses a spoon to mix baking soda with water. The baking soda cannot be seen in the water because it dissolves.

Which statement describes a property of baking soda?

A. Grass grows in sunlight.

B. Turtles hide in their shells.

C. Baking soda dissolves in water.

Item 17

Salma reads a data table that shows the solubility of flour, salt, and sugar. Solubility measures whether a substance can dissolve in water.

Solubility of Substances

Substance	Dissolves in Water
Flour	No
Salt	Yes
Sugar	Yes

Salma has an unknown substance that does not dissolve in water.

According to the data table, which substance could be Salma's unknown substance?

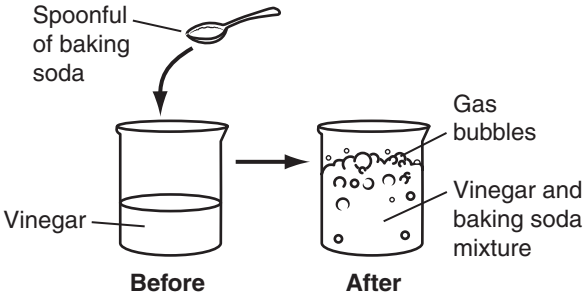
A. flour

B. salt

C. sugar

Item 18

Juan adds a spoonful of solid baking soda into a beaker of liquid vinegar. Some of the baking soda falls to the bottom of the beaker. Gas bubbles form in the beaker.



Which observation shows that a chemical reaction occurred?

A. Vinegar remains a liquid.

B. Gas bubbles form in the beaker.

C. Baking soda falls to the bottom of the beaker.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