Appendix A Content Resources by Grade Level

Appendix A provides content detail to assist K-5 educators. Table specifications will be linked to each standard for easy access.

Content Resource: K Grade Earth Science K-ESS2-1 Earth's Systems

Observable features of the student performance by the end of the grade:		
1		Organizing data
	a	With guidance, students organize data from given observations (firsthand or from media) about local weather conditions using graphical displays (e.g., pictures, charts). The weather condition data include:
		i. The number of sunny, cloudy, rainy, windy, cool, or warm days.
		ii. The relative temperature at various times of the day (e.g., cooler in the morning, warmer during the day, cooler at night).
2		Identifying relationships
	a	Students identify and describe* patterns in the organized data, including:
		i. The relative number of days of different types of weather conditions in a month.
		ii. The change in the relative temperature over the course of a day.
3		Interpreting data
	a	Students describe* and share that:
		i. Certain months have more days of some kinds of weather than do other months (e.g., some months have more hot days, some have more rainy days).
		ii. The differences in relative temperature over the course of a day (e.g., between early morning and the afternoon, between one day and another) are directly related to the time of day.

Content Resource: K Grade Earth Science K-ESS2-2 Earth's Systems

Observable features of the student performance by the end of the grade:		
1		Supported claims
	a	Students make a claim to be supported about a phenomenon. In their claim, students include the idea that plants and animals (including humans) can change the environment to meet their needs.
2		Identifying scientific evidence
	a	Students identify and describe* the given evidence to support the claim, including:
		i. Examples of plants changing their environments (e.g., plant roots lifting sidewalks).
		ii. Examples of animals (including humans) changing their environments (e.g., ants building an ant hill, humans clearing land to build houses, birds building a nest, squirrels digging holes to hide food).
		iii. Examples of plant and animal needs (e.g., shelter, food, room to grow).
3		Evaluating and critiquing evidence
	a	Students describe* how the examples do or do not support the claim.
4		Interpreting data
	a	Reasoning and synthesis
		Students support the claim and present an argument by logically connecting various needs of plants and animals to evidence about how plants/animals change their environments to meet their needs. Students include:
		i. Examples of how plants affect other parts of their systems by changing their environments to meet their needs (e.g., roots push soil aside as they grow to better absorb water).
4		ii. Examples of how animals affect other parts of their systems by changing their environments to meet their needs (e.g., ants, birds, rabbits, and humans use natural materials to build shelter; some animals store food for winter).

Content Resource: K Grade Earth Science K-ESS3-1 Earth and Human Activity

Observable features of the student performance by the end of the grade:		
1		Components of the model
	a	From the given model (e.g., representation, diagram, drawing, physical replica, diorama, dramatization, storyboard) of a phenomenon involving the needs of living things and their environments, students identify and describe* the components that are relevant to their representations, including:
		i. Different plants and animals (including humans).
		ii. The places where the different plants and animals live.
		iii. The things that plants and animals need (e.g., water, air, and land resources such as wood, soil, and rocks).
2		Relationships
	a	Students use the given model to represent and describe* relationships between the components, including:
		i. The relationships between the different plants and animals and the materials they need to survive (e.g., fish need water to swim, deer need buds and leaves to eat, plants need water and sunlight to grow).
		ii. The relationships between places where different plants and animals live and the resources those places provide.
		iii. The relationships between specific plants and animals and where they live (e.g., fish live in water environments, deer live in forests where there are buds and leaves, rabbits live in fields and woods where there is grass to eat and space for burrows for homes, plants live in sunny and moist areas, humans get resources from nature [e.g., building materials from trees to help them live where they want to live]).
3		Connections
	a	Students use the given model to represent and describe*, including:
		i. Students use the given model to describe* the pattern of how the needs of different plants and animals are met by the various places in which they live (e.g., plants need sunlight so they are found in places that have sunlight; fish swim in water so they live in lakes, rivers, ponds, and oceans; deer eat buds and leaves so they live in the forest).
		ii. Students use the given model to describe* that plants and animals, the places in which they live, and the resources found in those places are each part of a system, and that these parts of systems work together and allow living things to meet their needs.

Content Resource: K Grade Earth Science K-ESS3-2 Earth and Human Activity

Observable features of the student performance by the end of the grade:		
1		Addressing phenomena of the natural world
	a	Students formulate questions about local severe weather, the answers to which would clarify how weather forecasting can help people avoid the most serious impacts of severe weather events.
2		Identifying the scientific nature of the question
	a	Students' questions are based on their observations.
3		Obtaining information
	a	Students collect information (e.g., from questions, grade appropriate texts, media) about local severe weather warnings (e.g., tornado alerts, hurricane warnings, major thunderstorm warnings, winter storm warnings, severe drought alerts, heat wave alerts), including that:
		i. There are patterns related to local severe weather that can be observed (e.g., certain types of severe weather happen more in certain places).
		ii. Weather patterns (e.g., some events are more likely in certain regions) help scientists predict severe weather before it happens.
		iii. Severe weather warnings are used to communicate predictions about severe weather.
		iv. Weather forecasting can help people plan for, and respond to, specific types of local weather (e.g., responses: stay indoors during severe weather, go to cooling centers during heat waves; preparations: evacuate coastal areas before a hurricane, cover windows before storms).

Content Resource: K Grade Earth Science K-ESS3-3 Earth and Human Activity

Observable features of the student performance by the end of the grade:		
1	Communicating information	
	a	Students use prior experiences and observations to describe* information about:
		i. How people affect the land, water, air, and/or other living things in the local environment in positive and negative ways.
		ii. Solutions that reduce the negative effects of humans on the local environment.
	b	Students communicate information about solutions that reduce the negative effects of humans on the local environment, including:
		i. Examples of things that people do to live comfortably and how those things can cause changes to the land, water, air, and/or living things in the local environment.
		ii. Examples of choices that people can make to reduce negative impacts and the effect those choices have on the local environment.
	c	Students communicate the information about solutions with others in oral and/or written form (which include using models and/or drawings.

Content Resource: K Grade Life Science K-LS1-1 Molecules to Organisms: Structures and Processes

Observable features of the student performance by the end of the grade:		
1	Organizing data	
	a	With guidance, students organize the given data from observations (firsthand or from media) using graphical displays (e.g., pictures, charts), including:
		i. Different types of animals (including humans).
		ii. Data about the foods different animals eat.
		iii. Data about animals drinking water.
		iv. Data about plants' need for water (e.g., observations of the effects on plants in a classroom or school when they are not watered, observations of natural areas that are very dry).
		v. Data about plants' need for light (e.g., observations of the effect on plants in a classroom when they are kept in the dark for a long time; observations about the presence or absence of plants in very dark places, such as under rocks or porches).
2	Identifying relationships	
	a	Students identify patterns in the organized data, including that:
		i. All animals eat food.
		1. Some animals eat plants.
		2. Some animals eat other animals.
		3. Some animals eat both plants and animals.
		4. No animals do not eat food.
		ii. All animals drink water.
		iii. Plants cannot live or grow if there is no water.
		iv. Plants cannot live or grow if there is no light.
3	Interpreting data	
	a	Students describe* that the patterns they identified in the data provide evidence that:
		i. Plants need light and water to live and grow.
		ii. Animals need food and water to live and grow.
		iii. Animals get their food from plants, other animals, or both.

Content Resource: K Grade Physical Science K-PS2-1 Motion and Stability: Forces and Interactions

Observable features of the student performance by the end of the grade:		
	Identifying the phenomenon to be investigated	
1	a	With guidance, students collaboratively identify the phenomenon under investigation, which includes the following idea: the effect caused by different strengths and directions of pushes and pulls on the motion of an object.
1	b	With guidance, students collaboratively identify the purpose of the investigation, which includes gathering evidence to support or refute student ideas about causes of the phenomenon by comparing the effects of different strengths of pushes and pulls on the motion of an object.
	Identifying the evidence to address this purpose of the investigation	
2.	a	With guidance, students collaboratively develop an investigation plan to investigate the relationship between the strength and direction of pushes and pulls and the motion of an object (i.e., qualitative measures or expressions of strength and direction; e.g., harder, softer, descriptions* of “which way”).
2.	b	Students describe* how the observations they make connect to the purpose of the investigation, including how the observations of the effects on object motion allow causal relationships between pushes and pulls and object motion to be determined
2	c	Students predict the effect of the push of pull on the motion of the object, based on prior experiences.
	Conducting the investigation	
3	a	In the investigation plan, students describe*:
		i. The object whose motion will be investigated.
		ii. What will be in contact with the object to cause the push or pull.
		iii. The relative strengths of the push or pull that will be applied to the object to start or stop its motion or change its speed.
		iv. The relative directions of the push or pull that will be applied to the object.
		v. How the motion of the object will be observed and recorded.
		vi. How the push or pull will be applied to vary strength or direction.
4		Collecting the data
	a.	According to the investigation plan, students collaboratively make observations that would allow them to compare the effect on the motion of the object caused by changes in the strength or direction of the pushes and pulls and record their data.

Content Resource: K Grade Physical Science K-PS2-2 Motion and Stability: Forces & Interactions

Observable features of the student performance by the end of the grade:		
	Organizing data	
	a	With guidance, students organize given information using graphical or visual displays (e.g., pictures, pictographs, drawings, written observations, tables, charts). The given information students organize includes:
1	a	i. The relative speed or direction of the object before a push or pull is applied (i.e., qualitative measures and expressions of speed and direction; e.g., faster, slower, descriptions* of “which way”).
	a	ii. The relative speed or direction of the object after a push or pull is applied.
	a	iii. How the relative strength of a push or pull affects the speed or direction of an object (i.e., qualitative measures or expressions of strength; e.g., harder, softer).
2	Identifying relationships	
	a	Using their organization of the given information, students describe* relative changes in the speed or direction of the object caused by pushes or pulls from the design solution.
3	Interpreting data	
	a	Students describe* the goal of the design solution.
	b	Students describe* their ideas about how the push or pull from the design solution causes the change in the object’s motion.
	c	Based on the relationships they observed in the data, students describe* whether the push or pull from the design solution causes the intended change in speed or direction of motion of the object.

Content Resource: K Grade Physical Science K-PS3-1 Energy

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon to be investigated
	a	From the given investigation plan, students describe* (with guidance) the phenomenon under investigation, which includes the following idea: sunlight warms the Earth's surface.
	b	Students describe* (with guidance) the purpose of the investigation, which includes determining the effect of sunlight on Earth materials by identifying patterns of relative warmth of materials in sunlight and shade (e.g., sand, soil, rocks, water).
2		Identifying the evidence to address the purpose of the investigation
	a	Based on the given investigation plan, students describe* (with guidance) the evidence that will result from the investigation, including observations of the relative warmth of materials in the presence and absence of sunlight (i.e., qualitative measures of temperature; e.g., hotter, warmer, colder).
	b	Students describe* how the observations they make connect to the purpose of the investigation.
3		Planning the investigation
	a	Based on the given investigation plan, students describe* (with guidance):
		i. The materials on the Earth's surface to be investigated (e.g., dirt, sand, rocks, water, grass).
		ii. How the relative warmth of the materials will be observed and recorded.
4		Collecting the data
	a	According to the given investigation plan and with guidance, students collect and record data that will allow them to:
		i. Compare the warmth of Earth materials placed in sunlight and the same Earth materials placed in shade.
		ii. Identify patterns of relative warmth of materials in sunlight and in shade (i.e., qualitative measures of temperature; e.g., hotter, warmer, colder).
		iii. Describe* that sunlight warms the Earth's surface.

Content Resource: K Grade Physical Science K-PS3-2 Energy

Observable features of the student performance by the end of the grade:		
1		Using scientific knowledge to generate design solutions
	a	Students use given scientific information about sunlight's warming effect on the Earth's surface to collaboratively design and build a structure that reduces warming caused by the sun.
	b	With support, students individually describe*:
		i. The problem.
		ii. The design solution.
		iii. In what way the design solution uses the given scientific information.
2		Describing* specific features of the design solution, including quantification when appropriate
	a	Students describe* that the structure is expected to reduce warming for a designated area by providing shade.
	b	Students use only the given materials and tools when building the structure.
3		Evaluating potential solutions
	a	Students describe* whether the structure meets the expectations in terms of cause (structure blocks sunlight) and effect (less warming of the surface).

Content Resource: K Grade K-ETS1-1 Engineering & Technology

		Addressing phenomena of the natural or designed world
1		Students ask questions and make observations to gather information about a situation that people want to change. Students' questions, observations, and information gathering are focused on:
	a	i. A given situation that people wish to change.
		ii. Why people want the situation to change.
		iii. The desired outcome of changing the situation.
2		Identifying the scientific nature of the question
	a	Students' questions are based on observations and information gathered about scientific phenomena that are important to the situation.
		Identifying the problem to be solved
3	a	Students use the information they have gathered, including the answers to their questions, observations they have made, and scientific information, to describe* the situation people want to change in terms of a simple problem that can be solved with the development of a new or improved object or tool.
		Defining the features of the solution
4	a	With guidance, students describe* the desired features of the tool or object that would solve the problem, based on scientific information, materials available, and potential related benefits to people and other living things.

Content Resource: K Grade K-ETS1-2 Engineering & Technology

		Observable features of the student performance by the end of the grade:
		Components of the model
1	a	Students develop a representation of an object and the problem it is intended to solve. In their representation, students include the following components:
		i. The object.
		ii. The relevant shape(s) of the object.
		iii. The function of the object.
	b	Students use sketches, drawings, or physical models to convey their representations.
		Relationships
2		Students identify relationships between the components in their representation, including:
	a	i. The shape(s) of the object and the object's function.
		ii. The object and the problem is it designed to solve.
		Connections
3	a	Students use their representation (simple sketch, drawing, or physical model) to communicate the connections between the shape(s) of an object, and how the object could solve the problem.

Content Resource: K Grade K-ETS1-3 Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Organizing data
	a	With guidance, students use graphical displays (e.g., tables, pictographs, line plots) to organize given data from tests of two objects, including data about the features and relative performance of each solution.
2		Identifying relationships
	a	Students use their organization of the data to find patterns in the data, including:
		i. How each of the objects performed, relative to:
		1. The other object.
		2. The intended performance.
		ii. How various features (e.g., shape, thickness) of the objects relate to their performance (e.g., speed, strength).
3		Interpreting data
	a	Students use the patterns they found in object performance to describe*:
		i. The way (e.g., physical process, qualities of the solution) each object will solve the problem.
		ii. The strengths and weaknesses of each design.
		iii. Which object is better suited to the desired function, if both solve the problem.

Content Resource: 1st Grade Earth Science ESS1-1 Earth's Place in the Universe

Observable features of the student performance by the end of the grade:		
1	Organizing data	
	a	With guidance, students use graphical displays (e.g., picture, chart) to organize data from given observations (firsthand or from media), including:
		i. Objects (i.e., sun, moon, stars) visible in the sky during the day.
		ii. Objects (i.e., sun, moon, stars) visible in the sky during the night.
		iii. The position of the sun in the sky at various times during the day.
		iv. The position of the moon in the sky at various times during the day or night.
2	Identifying relationships	
	a	Students identify and describe* patterns in the organized data, including:
		i. Stars are not seen in the sky during the day, but they are seen in the sky during the night.
		ii. The sun is at different positions in the sky at different times of the day, appearing to rise in one part of the sky in the morning and appearing to set in another part of the sky in the evening.
		iii. The moon can be seen during the day and at night, but the sun can only be seen during the day.
		iv. The moon is at different positions in the sky at different times of the day or night, appearing to rise in one part of the sky and appearing to set in another part of the sky.
3	Interpreting data	
	a	Students use the identified patterns of the motions of objects in the sky to provide evidence that future appearances of those objects can be predicted (e.g., if the moon is observed to rise in one part of the sky, a prediction can be made that the moon will move across the sky and appear to set in a different portion of the sky; if the sun is observed to rise in one part of the sky, a prediction can be made about approximately where the sun will be at different times of day).
	b	Students use patterns related to the appearance of objects in the sky to provide evidence that future appearances of those objects can be predicted (e.g., when the sun sets and can no longer be seen, a prediction can be made that the sun will rise again in the morning; a prediction can be made that stars will only be seen at night).

Content Resource: 1st Grade Earth Science ESS1-2 Earth's Place in the Universe

Observable features of the student performance by the end of the grade:		
		Identifying the phenomenon under investigation
1	a	Students identify and describe* the phenomenon and purpose of the investigation, which include the following idea: the relationship between the amount of daylight and the time of year.
		Identifying evidence to address the purpose of the investigation
2	a	Based on the given plan for the investigation, students (with support) describe* the data and evidence that will result from the investigation, including observations (firsthand or from media) of relative length of the day (sunrise to sunset) throughout the year.
	b	Students individually describe* how these observations could reveal the pattern between the amount of daylight and the time of year (i.e., relative lightness and darkness at different relative times of the day and throughout the year).
		Planning the investigation
		Based on the given investigation plan, students describe* (with support):
3	a	i. How the relative length of the day will be determined (e.g., whether it will be light or dark when waking in the morning, at breakfast, when having dinner, or going to bed at night).
		ii. When observations will be made and how they will be recorded, both within a day and across the year.
4		Collecting the data
	a	According to the given investigation plan, students collaboratively make and record observations about the relative length of the day in different seasons to make relative comparisons between the amount of daylight at different times of the year (e.g., summer, winter, fall, spring).

Content Resource: 1st Grade Life Science LS1-1 From Molecules to organisms: Structures & Processes **********Rewrite**********

Observable features of the student performance by the end of the grade:		
1		Using scientific knowledge to generate design solutions
	a	Students describe* the given human problem to be solved by the design.
	b	With guidance, students use given scientific information about plants and/or animals to design the solution, including:
		i. How external structures are used to help the plant and/or animal grow and/or survive.
		ii How animals use external structures to capture and convey different kinds of information they need.
		iii. How plants and/or animals respond to information they receive from the environment.
	c	Students design a device (using student-suggested materials) that provides a solution to the given human problem by mimicking how plants and/or animals use external structures to survive, grow, and/or meet their needs. This may include:
		i. Mimicking the way a plant and/or animal uses an external structure to help it survive, grow, and/or meet its needs.
		ii. Mimicking the way an external structure of an animal captures and conveys information.
		iii. Mimicking the way an animal and/or plant responds to information from the environment.
2		Describing* specific features of the design solution, including quantification when appropriate
	a	Students describe* the specific expected or required features in their designs and devices, including:
		i. The device provides a solution to the given human problem.
		ii. The device mimic plant and/or animal external parts, and/or animal information-processing
		iii. The device use the provided materials to develop solutions.
3		Evaluating potential solutions
	a	Students describe* how the design solution is expected to solve the human problem.
	b	Students determine and describe* whether their device meets the specific required features.

Content Resource: 1st Grade Life Science LS1-2 From Molecules to Organisms: Structures and Processes

Observable features of the student performance by the end of the grade:		
1		Obtaining information
	a	Students use grade-appropriate books and other reliable media to obtain the following scientific information:
		i. Information about the idea that both plants and animals can have offspring.
		ii. Information about behaviors of animal parents that help offspring survive (e.g., keeping offspring safe from predators by circling the young, feeding offspring).
		iii. Information about behaviors of animal offspring that help the offspring survive (e.g., crying, chirping, nuzzling for food).
2		Evaluating information
	a	Students evaluate the information to determine and describe* the patterns of what animal parents and offspring do to help offspring survive (e.g., when a baby cries, the mother feeds it; when danger is present, parents protect offspring; some young animals become silent to avoid predators).

Content Resource: 1st Grade Life Science LS3-1 Heredity: Inheritance and Variation of Traits

Observable features of the student performance by the end of the grade:		
	Articulating the explanation of phenomena	
1	a	Students articulate a statement that relates a given phenomenon to a scientific idea, including the idea that young plants and animals are like, but not exactly like, their parents (not to include animals that undergo complete metamorphoses, such as insects or frogs).
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.
	Evidence	
2	a	Students describe* evidence from observations (firsthand or from media) about patterns of features in plants and animals, including:
		i. Key differences between different types of plants and animals (e.g., features that distinguish dogs versus those that distinguish fish, oak trees vs. bean plants).
		ii. Young plants and animals of the same type have similar, but not identical features (e.g., size and shape of body parts, color and/or type of any hair, leaf shape, stem rigidity).
		iii. Adult plants and animals (i.e., parents) of the same type have similar, but not identical features (e.g., size and shape of body parts, color and/or type of any hair, leaf shape, stem rigidity).
		iv. Patterns of similarities and differences in features between parents and offspring.
	Reasoning	
3	a	Students logically connect the evidence of observed patterns in features to support the evidence- based account by describing* chains of reasoning that include:
		i. Young plants and animals are very similar to their parents.
		ii. Young plants and animals are not exactly the same as their parents.
		iii. Similarities and differences in features are evidence that young plants and animals are very much, but not exactly, like their parents.
		iv. Similarities and differences in features are evidence that although individuals of the same type of animal or plant are recognizable as similar, they can also vary in many ways.

Content Resource: 1st Grade Physical Science PS4-1 Waves and Their Application in Technology

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon under investigation
	a	Students identify and describe* the phenomenon and purpose of the investigation, which include providing evidence to answer questions about the relationship between vibrating materials and sound.
2		Identifying the evidence to address the purpose of the investigation
	a	Students collaboratively develop an investigation plan and describe* the evidence that will result from the investigation, including:
		i. Observations that sounds can cause materials to vibrate.
		ii. Observations that vibrating materials can cause sounds.
		iii. How the data will provide evidence to support or refute ideas about the relationship between vibrating materials and sound.
	b	Students individually describe* (with support) how the evidence will address the purpose of the investigation.
3		Planning the investigation
	a	In the collaboratively developed investigation plan, students individually identify and describe*:
		i. The materials to be used.
		ii. How the materials will be made to vibrate to make sound.
		iii. How resulting sounds will be observed and described*.
		iv. What sounds will be used to make materials vibrate.
		v. How it will be determined that a material is vibrating.
4		Collecting the data
	a	According to the investigation plan they develop, students collaboratively collect and record observations about:
		i. Sounds causing materials to vibrate.
		ii. Vibrating materials causing sounds.

Content Resource: 1st Grade Physical Science PS4-2 Waves and Their Application in Technology

Observable features of the student performance by the end of the grade:		
1	Articulating the explanation of phenomena	
	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that when an object in the dark is lit (e.g., turning on a light in the dark space or from light the object itself gives off), it can be seen.
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.
2	Evidence	
	a	Students make observations (firsthand or from media) to serve as the basis for evidence, including:
		i. The appearance (e.g., visible, not visible, somewhat visible but difficult to see) of objects in a space with no light.
		ii. The appearance (e.g., visible, not visible, somewhat visible but difficult to see) of objects in a space with light.
		iii. The appearance (e.g., visible, not visible, somewhat visible but difficult to see) of objects (e.g., light bulbs, glow sticks) that give off light in a space with no other light.
	b	Students describe* how their observations provide evidence to support their explanation.
3	Reasoning	
	a	Students logically connect the evidence to support the evidence-based account of the phenomenon. Students describe* lines of reasoning that include:
		i. The presence of light in a space causes objects to be able to be seen in that space.
		ii. Objects cannot be seen if there is no light to illuminate them, but the same object in the same space can be seen if a light source is introduced.
		iii. The ability of an object to give off its own light causes the object to be seen in a space where there is no other light.

Content Resource: 1st Grade Physical Science PS4-3 Waves and Their Application in Technology

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon under investigation
	a	Students identify and describe* the phenomenon and purpose of the investigation, which include:
		i. Answering a question about what happens when objects made of different materials (that allow light to pass through them in different ways) are placed in the path of a beam of light.
		ii. Designing and conducting an investigation to gather evidence to support or refute student ideas about putting objects made of different materials in the path of a beam of light.
2		Identifying the evidence to address the purpose of the investigation
	a	Students collaboratively develop an investigation plan and describe* the data that will result from the investigation, including:
		i. Observations of the effect of placing objects made of different materials in a beam of light, including:
		1. A material that allows all light through results in the background lighting up.
		2. A material that allows only some light through results in the background lighting up, but looking darker than when the material allows all light in.
		3. A material that blocks all of the light will create a shadow.
		4. A material that changes the direction of the light will light up the surrounding space in a different direction.
	b	Students individually describe* how these observations provide evidence to answer the question under investigation.
3		Planning the investigation
	a	In the collaboratively developed investigation plan, students individually describe* (with support):
		i. The materials to be placed in the beam of light, including:
		1. A material that allows all light through (e.g., clear plastic, clear glass).
		2. A material that allows only some light through (e.g., clouded plastic, wax paper).
		3. A material that blocks all of the light (e.g., cardboard, wood).
		4. A material that changes the direction of the light (e.g., mirror, aluminum foil).
		ii. How the effect of placing different materials in the beam of light will be observed and recorded.
		iii. The light source used to produce the beam of light.
4		Collecting the data
	a	Students collaboratively collect and record observations about what happens when objects made of materials that allow light to pass through them in different ways are placed in the path of a beam of light, according to the developed investigation plan.

Content Resource: 1st Grade Physical Science PS4-4 Waves and Their Application in Technology

Observable features of the student performance by the end of the grade:		
1		Using scientific knowledge to generate design solutions
	a	Students describe* a given problem involving people communicating over long distances.
	b	With guidance, students design and build a device that uses light or sound to solve the given problem.
	c	With guidance, students describe* the scientific information they use to design the solution.
2		Describing* specific features of the design solution, including quantification when appropriate
	a	Students describe* that specific expected or required features of the design solution should include:
		i. The device is able to send or receive information over a given distance.
		ii. The device must use light or sound to communicate.
	b	Students use only the materials provided when building the device.
3		Evaluating potential solutions
	a	Students describe* whether the device:
		i. Has the expected or required features of the design solution,
		ii. Provides a solution to the problem involving people communicating over a distance by using light or sound.
	b	Students describe* how communicating over long distances helps people.

Content Resource: 1st Grade K-2 ETS1-1 Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Addressing phenomena of the natural or designed world
	a	Students ask questions and make observations to gather information about a situation that people want to change. Students' questions, observations, and information gathering are focused on:
		i. A given situation that people wish to change.
		ii. Why people want the situation to change.
		iii. The desired outcome of changing the situation.
2		Identifying the scientific nature of the question
	a	Students' questions are based on observations and information gathered about scientific phenomena that are important to the situation.
3		Identifying the problem to be solved
	a	Students use the information they have gathered, including the answers to their questions, observations they have made, and scientific information, to describe* the situation people want to change in terms of a simple problem that can be solved with the development of a new or improved object or tool.
4		Defining the features of the solution
	a	With guidance, students describe* the desired features of the tool or object that would solve the problem, based on scientific information, materials available, and potential related benefits to people and other living things.

Content Resource: 1st Grade K-2 ETS1-2 Engineering & Technology

Observable features of the student performance by the end of the grade:		
	Components of the model	
1	a	Students develop a representation of an object and the problem it is intended to solve. In their representation, students include the following components:
		i. The object.
		ii. The relevant shape(s) of the object.
		iii. The function of the object.
	b	Students use sketches, drawings, or physical models to convey their representations.
	Relationships	
2		Students identify relationships between the components in their representation, including:
	a	i. The shape(s) of the object and the object's function.
		ii. The object and the problem is it designed to solve.
	Connections	
3	a	Students use their representation (simple sketch, drawing, or physical model) to communicate the connections between the shape(s) of an object, and how the object could solve the problem.

Content Resource: 1st Grade K-2 ETS1-3 Engineering & Technology

Observable features of the student performance by the end of the grade:		
	Organizing data	
1	a	With guidance, students use graphical displays (e.g., tables, pictographs, line plots) to organize given data from tests of two objects, including data about the features and relative performance of each solution.
	Identifying relationships	
2		Students use their organization of the data to find patterns in the data, including:
		i. How each of the objects performed, relative to:
	a	1. The other object.
		2. The intended performance.
		ii. How various features (e.g., shape, thickness) of the objects relate to their performance (e.g., speed, strength).
	Interpreting data	
3		Students use the patterns they found in object performance to describe*:
	a	i. The way (e.g., physical process, qualities of the solution) each object will solve the problem.
		ii. The strengths and weaknesses of each design.
		iii. Which object is better suited to the desired function, if both solve the problem.

Content Resource: 2nd Grade Earth Science ESS1-1 Earth's Place in the Universe

Observable features of the student performance by the end of the grade:		
1		Articulating the explanation of phenomena
	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that Earth events can occur very quickly or very slowly.
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.
2		Evidence
	a	Students describe* the evidence from observations (firsthand or from media; e.g., books, videos, pictures, historical photos), including:
		i. That some Earth events occur quickly (e.g., the occurrence of flood, severe storm, volcanic eruption, earthquake, landslides, erosion of soil).
		ii. That some Earth events occur slowly.
		iii. Some results of Earth events that occur quickly.
		iv. Some results of Earth events that occur very slowly (e.g., erosion of rocks, weathering of rocks).
		v. The relative amount of time it takes for the given Earth events to occur (e.g., slowly, quickly, hours, days, years).
	b	Students make observations using at least three sources
3		Reasoning
	a	Students use reasoning to logically connect the evidence to construct an evidence-based account. Students describe* their reasoning, including:
		i. In some cases, Earth events and the resulting changes can be directly observed; therefore those events must occur rapidly.
		ii. In other cases, the resulting changes of Earth events can be observed only after long periods of time; therefore these Earth events occur slowly, and change happens over a time period that is much longer than one can observe.

Content Resource: 2nd Grade Earth Science ESS2-1 Earth's Systems

Observable features of the student performance by the end of the grade:		
1		Using scientific knowledge to generate design solutions
	a	Students describe* the given problem, which includes the idea that wind or water can change the shape of the land by washing away soil or sand.
	b	Students describe* at least two given solutions in terms of how they slow or prevent wind or water from changing the shape of the land.
2		Describing* specific features of the design solution, including quantification where appropriate
	a	Students describe* the specific expected or required features for the solutions that would solve the given problem, including:
		i. Slowing or preventing wind or water from washing away soil or sand.
		ii. Addressing problems created by both slow and rapid changes in the environment (such as many mild rainstorms or a severe storm and flood).
3		Evaluating potential solutions
	a	Students evaluate each given solution against the desired features to determine and describe* whether and how well the features are met by each solution.
	b	Using their evaluation, students compare and contrast the given solutions to each other.

Content Resource: 2nd Grade Earth Science ESS2-2 Earth's Systems

Observable features of the student performance by the end of the grade:		
1		Components of the model
	a	Students develop a model (i.e., a map) that identifies the relevant components, including components that represent both land and bodies of water in an area.
2		Relationships
	a	In the model, students identify and describe* relationships between components using a representation of the specific shapes and kinds of land (e.g., playground, park, hill) and specific bodies of water (e.g., creek, ocean, lake, river) within a given area.
	b	Students use the model to describe* the patterns of water and land in a given area (e.g., an area may have many small bodies of water; an area may have many different kinds of land that come in different shapes).
3		Connections
	a	Students describe* that because they can map the shapes and kinds of land and water in any area, maps can be used to represent many different types of areas.

Content Resource: 2nd Grade Earth Science ESS2-3 Earth's Systems

Observable features of the student performance by the end of the grade:		
1		Obtaining information
	a	Students use books and other reliable media as sources for scientific information to answer scientific questions about:
		i. Where water is found on Earth, including in oceans, rivers, lakes, and ponds.
		ii. The idea that water can be found on Earth as liquid water or solid ice (e.g., a frozen pond, liquid pond, frozen lake).
		iii. Patterns of where water is found, and what form it is in.
2		Evaluating Information
	a	Students identify which sources of information are likely to provide scientific information (e.g., versus opinion).

Content Resource: 2nd Grade Life Science LS2-1 Ecosystems: Interactions, Energy and Dynamics

Observable features of the student performance by the end of the grade:		
1	Identifying the phenomenon under investigation	
	a. Students identify and describe* the phenomenon and purpose of the investigation, which include answering a question about whether plants need sunlight and water to grow.	
2	Identifying the evidence to address the purpose of the investigation	
	a	Students describe* the evidence to be collected, including:
		i. Plant growth with both light and water.
		ii. Plant growth without light but with water.
		iii. Plant growth without water but with light.
		iv. Plant growth without water and without light.
	b	Students describe* how the evidence will allow them to determine whether plants need light and water to grow.
3	Planning the investigation	
	a	Students collaboratively develop an investigation plan. In the investigation plan, students describe* the features to be part of the investigation, including:
		i. The plants to be used.
		ii. The source of light.
		iii. How plants will be kept with/without light in both the light/dark test and the water/no water test.
		iv. The amount of water plants will be given in both the light/dark test and the water/no water test.
		v. How plant growth will be determined (e.g., observations of plant height, number and size of leaves, thickness of the stem, number of branches).
	b	Students individually describe* how this plan allows them to answer the question.
4	Collecting the data	
	a	According to the investigation plan developed, students collaboratively collect and record data on the effects on plant growth by:
		i. Providing both light and water,
		ii. Withholding light but providing water
		iii. Withholding water but providing light, or
		iv. Withholding both water and light.

Content Resource: 2nd Grade Life Science LS2-2 Ecosystems: Interactions, Energy and Dynamics

Observable features of the student performance by the end of the grade:		
	Components of the model	
1	a	Students develop a simple model that mimics the function of an animal in seed dispersal or pollination of plants. Students identify the relevant components of their model, including those components that mimic the natural structure of an animal that helps it disperse seeds (e.g., hair that snares seeds, squirrel cheek pouches that transport seeds) or that mimic the natural structure of an animal that helps it pollinate plants (e.g., bees have fuzzy bodies to which pollen sticks, hummingbirds have bills that transport pollen). The relevant components of the model include:
		ii. Relevant structures of the animal.
		ii. Relevant structures of the plant.
		iii. Pollen or seeds from plants.
	Relationships	
2	a	In the model, students describe* relationships between components, including evidence that the developed model mimics how plant and animal structures interact to move pollen or disperse seeds.
		i. Students describe* the relationships between components that allow for movement of pollen or seeds.
		ii. Students describe* the relationships between the parts of the model they are developing and the parts of the animal they are mimicking.
	Connections	
3	a	Students use the model to describe*:
		i. How the structure of the model gives rise to its function.
		ii. Structure-function relationships in the natural world that allow some animals to disperse seeds or pollinate plants.

Content Resource: 2nd Grade Life Science LS4-1 Biological Evolution

Observable features of the student performance by the end of the grade:		
	Identifying the phenomenon under investigation	
1	a	Students identify and describe* the phenomenon and purpose of the investigation, which includes comparisons of plant and animal diversity of life in different habitats.
	Identifying the evidence to address the purpose of the investigation	
2	a	Based on the given plan for the investigation, students describe* the following evidence to be collected:
		i. Descriptions* based on observations (firsthand or from media) of habitats, including land habitats (e.g., playground, garden, forest, parking lot) and water habitats (e.g., pond, stream, lake).
		ii. Descriptions* based on observations (firsthand or from media) of different types of living things in each habitat (e.g., trees, grasses, bushes, flowering plants, lizards, squirrels, ants, fish, clams).
		iii. Comparisons of the different types of living things that can be found in different habitats.
	b	Students describe* how these observations provide evidence for patterns of plant and animal diversity across habitats.
	Planning the investigation	
3	a	Based on the given investigation plan, students describe* how the different plants and animals in the habitats will be observed, recorded, and organized.
	Collecting the data	
4	a	Students collect, record, and organize data on different types of plants and animals in the habitats.

Content Resource: 2nd Grade Physical Science PS1-1 Matter and Its Interactions

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon under investigation
	a	Students identify and describe* the phenomenon under investigation, which includes the following idea: different kinds of matter have different properties, and sometimes the same kind of matter has different properties depending on temperature.
	b	Students identify and describe* the purpose of the investigation, which includes answering a question about the phenomenon under investigation by describing* and classifying different kinds of materials by their observable properties.
2		Identifying the evidence to address the purpose of the investigation
	a	Students collaboratively develop an investigation plan and describe* the evidence that will be collected, including the properties of matter (e.g., color, texture, hardness, flexibility, whether is it a solid or a liquid) of the materials that would allow for classification, and the temperature at which those properties are observed.
	b	Students individually describe* that:
		i. The observations of the materials provide evidence about the properties of different kinds of materials.
		ii. Observable patterns in the properties of materials provide evidence to classify the different kinds of materials.
3		Planning the investigation
	a	In the collaboratively developed investigation plan, students include:
		i. Which materials will be described* and classified (e.g., different kinds of metals, rocks, wood, soil, powders).
		ii. Which materials will be observed at different temperatures, and how those temperatures will be determined (e.g., using ice to cool and a lamp to warm) and measured (e.g., qualitatively or quantitatively).
		iii. How the properties of the materials will be determined.
		iv. How the materials will be classified (i.e., sorted) by the pattern of the properties.
	b	Students individually describe* how the properties of materials, and the method for classifying them, are relevant to answering the question.
4		Collecting the data
	a	According to the developed investigation plan, students collaboratively collect and record data on the properties of the materials.

Content Resource: 2nd Grade Physical Science PS1-2 Matter and Its Interactions

Observable features of the student performance by the end of the grade:		
1		Organizing data
	a	Using graphical displays (e.g., pictures, charts, grade-appropriate graphs), students use the given data from tests of different materials to organize those materials by their properties (e.g., strength, flexibility, hardness, texture, ability to absorb).
2		Identifying relationships
	a	Students describe* relationships between materials and their properties (e.g., metal is strong, paper is absorbent, rocks are hard, sandpaper is rough).
	b	Students identify and describe* relationships between properties of materials and some potential uses purpose (e.g., hardness is good for breaking objects or supporting objects; roughness is good for keeping objects in place; flexibility is good to keep materials from breaking, but not good for keeping materials rigidly in place).
3		Interpreting data
	a	Students describe* which properties allow a material to be well suited for a given intended use (e.g., ability to absorb for cleaning up spills, strength for building material, hardness for breaking a nut).
	b	Students use their organized data to support or refute their ideas about which properties of materials allow the object or tool to be best suited for the given intended purpose relative to the other given objects/tools (e.g., students could support the idea that hardness allows a wooden shelf to be better suited for supporting materials placed on it than a sponge would be, based on the patterns relating property to a purpose; students could refute an idea that a thin piece of glass is better suited to be a shelf than a wooden plank would be because it is harder than the wood by using data from tests of hardness and strength to give evidence that the glass is less strong than the wood) .
	c	Students describe* how the given data from the test provided evidence of the suitability of different materials for the intended purpose.

Content Resource: 2nd Grade Physical Science PS1-3 Matter & Its Interactions

Observable features of the student performance by the end of the grade:		
1		Articulating the explanation of phenomena
	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that an object made of a small set of pieces can be disassembled and made into a new object.
	b	Students use evidence and reasoning to construct an evidence-based account of the phenomenon.
2		Evidence
	a	Students describe* evidence from observations (firsthand or from media), including:
		i. The characteristics (e.g., size, shape, arrangement of parts) of the original object.
		ii. That the original object was disassembled into pieces.
		iii. That the pieces were reassembled into a new object or objects.
		iv. The characteristics (e.g., size, shape, arrangement of parts) of the new object or objects.
3		Reasoning
	a	Students use reasoning to connect the evidence to support an explanation. Students describe* a chain of reasoning that includes:
		i. The original object was disassembled into its pieces and is reassembled into a new object or objects.
		ii. Many different objects can be built from the same set of pieces.
		iii. Compared to the original object, the new object or objects can have different characteristics, even though they were made of the same set of pieces.

Content Resource: 2nd Grade Physical Science PS1-4 Matter & Its Interactions

Observable features of the student performance by the end of the grade:		
	Supported claims	
1	a	Students make a claim to be supported about a phenomenon. In their claim, students include the idea that some changes caused by heating or cooling can be reversed and some cannot.
	Identifying scientific evidence	
2	a	Students describe* the given evidence, including:
		i. The characteristics of the material before heating or cooling.
		ii. The characteristics of the material after heating or cooling.
		iii. The characteristics of the material when the heating or cooling is reversed.
	Evaluating and critiquing the evidence	
3	a	Students evaluate the evidence to determine:
		i. The change in the material after heating (e.g., ice becomes water, an egg becomes solid, solid chocolate becomes liquid).
		ii. Whether the change in the material after heating is reversible (e.g., water becomes ice again, a cooked egg remains a solid, liquid chocolate becomes solid but can be a different shape).
		iii. The change in the material after cooling (e.g., when frozen, water becomes ice, a plant leaf dies).
		iv. Whether the change in the material after cooling is reversible (e.g., ice becomes water again, a plant leaf does not return to normal).
	b	Students describe* whether the given evidence supports the claim and whether additional evidence is needed.
	Reasoning and synthesis	
4	a	Students use reasoning to connect the evidence to the claim. Students describe* the following chain of reasoning:
		i. Some changes caused by heating or cooling can be reversed by cooling or heating (e.g., ice that is heated can melt into water, but the water can be cooled and can freeze back into ice [and vice versa]).
		ii. Some changes caused by heating or cooling cannot be reversed by cooling or heating (e.g., a raw egg that is cooked by heating cannot be turned back into a raw egg by cooling the cooked egg, cookie dough that is baked does not return to its uncooked form when cooled, charcoal that is formed by heating wood does not return to its original form when cooled).

Content Resource: *2nd* Grade K-2 1-1. Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Addressing phenomena of the natural or designed world
	a	Students ask questions and make observations to gather information about a situation that people want to change. Students' questions, observations, and information gathering are focused on:
		i. A given situation that people wish to change.
		ii. Why people want the situation to change.
		iii. The desired outcome of changing the situation.
2		Identifying the scientific nature of the question
	a	Students' questions are based on observations and information gathered about scientific phenomena that are important to the situation.
3		Identifying the problem to be solved
	a	Students use the information they have gathered, including the answers to their questions, observations they have made, and scientific information, to describe* the situation people want to change in terms of a simple problem that can be solved with the development of a new or improved object or tool.
4		Defining the features of the solution
	a	With guidance, students describe* the desired features of the tool or object that would solve the problem, based on scientific information, materials available, and potential related benefits to people and other living things.

Content Resource: 2nd Grade K-2 1-2. Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Components of the model
	a	Students develop a representation of an object and the problem it is intended to solve. In their representation, students include the following components:
		i. The object.
		ii. The relevant shape(s) of the object.
		iii. The function of the object.
	b	Students use sketches, drawings, or physical models to convey their representations.
2		Relationships
	a	Students identify relationships between the components in their representation, including:
		i. The shape(s) of the object and the object's function.
		ii. The object and the problem is it designed to solve.
3		Connections
	a	Students use their representation (simple sketch, drawing, or physical model) to communicate the connections between the shape(s) of an object, and how the object could solve the problem.

Content Resource: 2nd Grade K-2 1-3. Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Organizing data
	a	With guidance, students use graphical displays (e.g., tables, pictographs, line plots) to organize given data from tests of two objects, including data about the features and relative performance of each solution.
2		Identifying relationships
	a	Students use their organization of the data to find patterns in the data, including:
		i. How each of the objects performed, relative to:
		1. The other object.
		2. The intended performance.
		ii. How various features (e.g., shape, thickness) of the objects relate to their performance (e.g., speed, strength).
3		Interpreting data
	a	Students use the patterns they found in object performance to describe*:
		i. The way (e.g., physical process, qualities of the solution) each object will solve the problem.
		ii. The strengths and weaknesses of each design.
		iii. Which object is better suited to the desired function, if both solve the problem.

Content Resource: 3rd Grade 3-5 ETS1-1 Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Identifying the problem to be solved
	a	Students use given scientific information and information about a situation or phenomenon to define a simple design problem that includes responding to a need or want.
	b	The problem students define is one that can be solved with the development of a new or improved object, tool, process, or system.
	c	Students describe* that people's needs and wants change over time.
2		Defining the boundaries of the system
	a	Students define the limits within which the problem will be addressed, which includes addressing something people want and need at the current time.
3		Defining the criteria and constraints
	a	Based on the situation people want to change, students specify criteria (required features) of a successful solution.
	b	Students describe* the constraints or limitations on their design, which may include:
		i. Cost.
		ii. Materials.
		iii. Time.

Content Resource: 3rd Grade 3-5 ETS1-2 Engineering & Technology

Observable features of the student performance by the end of the grade:		
1	Using scientific knowledge to generate design solutions	
	a	Students use grade-appropriate information from research about a given problem, including the causes and effects of the problem and relevant scientific information.
	b	Students generate at least two possible solutions to the problem based on scientific information and understanding of the problem.
	c	Students specify how each design solution solves the problem.
	d	Students share ideas and findings with others about design solutions to generate a variety of possible solutions.
	e	Students describe* the necessary steps for designing a solution to a problem, including conducting research and communicating with others throughout the design process to improve the design [note: emphasis is on what is necessary for designing solutions, not on a step-wise process].
2	Describing* criteria and constraints, including quantification when appropriate	
	a	Students describe*:
		i. The given criteria (required features) and constraints (limits) for the solutions, including increasing benefits, decreasing risks/costs, and meeting societal demands as appropriate.
		ii. How the criteria and constraints will be used to generate and test the design solutions.
3	Evaluating potential solutions	
	a	Students test each solution under a range of likely conditions and gather data to determine how well the solutions meet the criteria and constraints of the problem.
	b	Students use the collected data to compare solutions based on how well each solution meets the criteria and constraints of the problem.

Content Resource: 3rd Grade 3-5 ETS1-3 Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Identifying the purpose of the investigation
	a	Students describe* the purpose of the investigation, which includes finding possible failure points or difficulties to identify aspects of a model or prototype that can be improved.
2		Identifying the evidence to be address the purpose of the investigation
	a	Students describe* the evidence to be collected, including:
		i. How well the model/prototype performs against the given criteria and constraints.
		ii. Specific aspects of the prototype or model that do not meet one or more of the criteria or constraints (i.e., failure points or difficulties).
		iii. Aspects of the model/prototype that can be improved to better meet the criteria and constraints.
	b	Students describe* how the evidence is relevant to the purpose of the investigation.
3		Planning the investigation
	a	Students create a plan for the investigation that describes* different tests for each aspect of the criteria and constraints. For each aspect, students describe*:
		i. The specific criterion or constraint to be used.
		ii. What is to be changed in each trial (the independent variable).
		iii. The outcome (dependent variable) that will be measured to determine success.
		iv. What tools and methods are to be used for collecting data.
		v. What is to be kept the same from trial to trial to ensure a fair test.
4		Collecting the data
	a	Students carry out the investigation, collecting and recording data according to the developed plan.

Content Resource: 3rd Grade Earth Science ESS2-1 Earth's Systems

Observable features of the student performance by the end of the grade:		
1		Organizing data
	a	Students use graphical displays (e.g., table, chart, graph) to organize the given data by season using tables, pictographs, and/or bar charts, including:
		i. Weather condition data from the same area across multiple seasons (e.g., average temperature, precipitation, wind direction).
		ii. Weather condition data from different areas (e.g., hometown and nonlocal areas, such as a town in another state).
2		Identifying relationships
	a	Students identify and describe* patterns of weather conditions across:
		i. Different seasons (e.g., cold and dry in the winter, hot and wet in the summer; more or less wind in a particular season).
		ii. Different areas (e.g., certain areas (defined by location, such as a town in the Pacific Northwest), have high precipitation, while a different area (based on location or type, such as a town in the Southwest) have very little precipitation).
3		Interpreting data
	a	Students use patterns of weather conditions in different seasons and different areas to predict:
		i. The typical weather conditions expected during a particular season (e.g., "In our town in the summer it is typically hot, as indicated on a bar graph over time, while in the winter it is typically cold; therefore, the prediction is that next summer it will be hot and next winter it will be cold.").
		ii. The typical weather conditions expected during a particular season in different areas.

Content Resource: 3rd Grade Earth Science ESS2-2 Earth's Systems

Observable features of the student performance by the end of the grade:		
1		Obtaining information
	a	Students use books and other reliable media to gather information about:
		i. Climates in different regions of the world (e.g., equatorial, polar, coastal, mid-continental).
		ii. Variations in climates within different regions of the world (e.g., variations could include an area's average temperatures and precipitation during various months over several years or an area's average rainfall and temperatures during the rainy season over several years).
2		Evaluating information
	a	Students combine obtained information to provide evidence about the climate pattern in a region that can be used to make predictions about typical weather conditions in that region.
3		Communicating information
	a	Students use the information they obtained and combined to describe*:
		i. Climates in different regions of the world.
		ii. Examples of how patterns in climate could be used to predict typical weather conditions.
		iii. That climate can vary over years in different regions of the world.

Content Resource: 3rd Grade Earth Science ESS3-1 Earth and Human Activity

Observable features of the student performance by the end of the grade:		
1		Supported claims
	a	Students make a claim about the merit of a given design solution that reduces the impact of a weather-related hazard.
2		Identifying scientific evidence
	a	Students describe* the given evidence about the design solution, including evidence about:
		i. The given weather-related hazard (e.g., heavy rain or snow, strong winds, lightning, flooding along river banks).
		ii. Problems caused by the weather-related hazard (e.g., heavy rains cause flooding, lightning causes fires).
		iii. How the proposed solution addresses the problem (e.g., dams and levees are designed to control flooding, lightning rods reduce the chance of fires) [note: mechanisms are limited to simple observable relationships that rely on logical reasoning].
3		Evaluating and critiquing evidence
	a	Students evaluate the evidence using given criteria and constraints to determine:
		i. How the proposed solution addresses the problem, including the impact of the weather- related hazard after the design solution has been implemented.
		ii. The merits of a given solution in reducing the impact of a weather-related hazard (i.e., whether the design solution meets the given criteria and constraints].
		iii. The benefits and risks a given solution poses when responding to the societal demand to reduce the impact of a hazard.

Content Resource: 3rd Grade Life Science LS1-1 From Molecules to Organisms: Structures & Processes

Observable features of the student performance by the end of the grade:		
1		Components of the model
	a	Students develop models (e.g., conceptual, physical, drawing) to describe* the phenomenon. In their models, students identify the relevant components of their models including:
		i. Organisms (both plant and animal).
		ii. Birth.
		iii. Growth.
		iv. Reproduction.
		v. Death.
2		Relationships
	a	In the models, students describe* relationships between components, including:
		i. Organisms are born, grow, and die in a pattern known as a life cycle.
		ii. Different organisms' life cycles can look very different.
		iii. A causal direction of the cycle (e.g., without birth, there is no growth; without reproduction, there are no births).
3		Connections
	a	Students use the models to describe* that although organisms can display life cycles that look different, they all follow the same pattern.
	b	Students use the models to make predictions related to the phenomenon, based on patterns identified among life cycles (e.g., prediction could include that if there are no births, deaths will continue and eventually there will be no more of that type of organism).

Content Resource: 3rd Grade Life Science LS2-1 Ecosystems: Interactions, Energy & Dynamics

Observable features of the student performance by the end of the grade:		
1	Supported claims	
	a	Students make a claim to be supported about a phenomenon. In their claim, students include the idea that some animals form groups and that being a member of that group helps each member survive.
2.	Identifying scientific evidence	
	a	Students describe* the given evidence, data, and/or models necessary to support the claim, including:
		i. Identifying types of animals that form or live in groups of varying sizes.
		ii. Multiple examples of animals in groups of various sizes:
		1. Obtaining more food for each individual animal compared to the same type of animal looking for food individually.
		2. Displaying more success in defending themselves than those same animals acting alone.
		3. Making faster or better adjustments to harmful changes in their ecosystem than would those same animals acting alone.
3	Evaluating and critiquing evidence	
	a	Students evaluate the evidence to determine its relevance, and whether it supports the claim that being a member of a group has a survival advantage.
	b	Students describe* whether the given evidence is sufficient to support the claim and whether additional evidence is needed.
4		Reasoning and synthesis
	a.	Students use reasoning to construct an argument connecting the evidence, data and/or models to the claim. Students describe* the following reasoning in their argument:
		i. The causal evidence that being part of a group can have the effect of animals being more successful in obtaining food, defending themselves, and coping with change supports the claim that being a member of a group helps animals survive.
		ii. The causal evidence that an animal losing its group status can have the effect of the animal obtaining less food, not being able to defend itself, and not being able to cope with change supports the claim that being a member of a group helps animals survive.

Content Resource: 3rd Grade Life Science LS3-1 Heredity: Inheritance and Variation of Traits

Observable features of the student performance by the end of the grade:		
	Organizing data	
1	a	Students organize the data (e.g., from students' previous work, grade-appropriate existing datasets) using graphical displays (e.g., table, chart, graph). The organized data include:
		i. Traits of plant and animal parents.
		ii. Traits of plant and animal offspring.
		iii. Variations in similar traits in a grouping of similar organisms.
	Identifying relationships	
2	a	Students identify and describe* patterns in the data, including:
		i. Similarities in the traits of a parent and the traits of an offspring (e.g., tall plants typically have tall offspring).
		ii. Similarities in traits among siblings (e.g., siblings often resemble each other).
		iii. Differences in traits in a group of similar organisms (e.g., dogs come in many shapes and sizes, a field of corn plants have plants of different heights).
		iv. Differences in traits of parents and offspring (e.g., offspring do not look exactly like their parents).
		v. Differences in traits among siblings (e.g., kittens from the same mother may not look exactly like their mother).
	Interpreting data	
3	a	Students describe* that the pattern of similarities in traits between parents and offspring, and between siblings, provides evidence that traits are inherited.
	b	Students describe* that the pattern of differences in traits between parents and offspring, and between siblings, provides evidence that inherited traits can vary.
	c	Students describe* that the variation in inherited traits results in a pattern of variation in traits in groups of organisms that are of a similar type.

Content Resource: 3rd Grade Life Science LS3-2 Heredity: Inheritance and Variation of Traits

Observable features of the student performance by the end of the grade:		
	Articulating the explanation of phenomena	
1	a	Students identify the given explanation to be supported, including a statement that relates the phenomenon to a scientific idea, including that many inherited traits can be influenced by the environment.
	Evidence	
2	a	Students describe* the given evidence that supports the explanation, including:
		i. Environmental factors that vary for organisms of the same type (e.g., amount or food, amount of water, amount of exercise an animal gets, chemicals in the water) that may influence organisms' traits.
		ii. Inherited traits that vary between organisms of the same type (e.g., height or weight of a plant or animal, color or quantity of the flowers).
		iii. Observable inherited traits of organisms in varied environmental conditions
	Reasoning	
3	a	Students use reasoning to connect the evidence and support an explanation about environmental influences on inherited traits in organisms. In their chain of reasoning, students describe* a cause- and-effect relationship between a specific causal environmental factor and its effect of a given variation in a trait (e.g., not enough water produces plants that are shorter and have fewer flowers than plants that had more water available).

Content Resource: 3rd Grade Life Science LS4-1 Biological Natural Selection: Unity and Diversity

Observable features of the student performance by the end of the grade:		
	Organizing data	
1	a	Students use graphical displays (e.g., table, chart, graph) to organize the given data, including data about:
		i. Fossils of animals (e.g., information on type, size, type of land on which it was found).
		ii. Fossils of plants (e.g., information on type, size, type of land on which it was found).
		iii. The relative ages of fossils (e.g., from a very long time ago).
		iv. Existence of modern counterparts to the fossilized plants and animals and information on where they currently live.
	Identifying relationships	
2	a	Students identify and describe* relationships in the data, including:
		i. That fossils represent plants and animals that lived long ago.
		ii. The relationships between the fossils of organisms and the environments in which they lived (e.g., marine organisms, like fish, must have lived in water environments).
		iii. The relationships between types of fossils (e.g., those of marine animals) and the current environments where similar organisms are found.
		iv. That some fossils represent organisms that lived long ago and have no modern counterparts.
		v. The relationships between fossils of organisms that lived long ago and their modern counterparts.
		vi. The relationships between existing animals and the environments in which they currently live.
	Interpreting data	
3	a	Students describe* that:
		i. Fossils provide evidence of organisms that lived long ago but have become extinct (e.g., dinosaurs, mammoths, other organisms that have no clear modern counterpart).
		ii. Features of fossils provide evidence of organisms that lived long ago and of what types of environments those organisms must have lived in (e.g., fossilized seashells indicate shelled organisms that lived in aquatic environments).
3	a	iii. By comparing data about where fossils are found and what those environments are like, fossilized plants and animals can be used to provide evidence that some environments look very different now than they did a long time ago (e.g., fossilized seashells found on land that is now dry suggest that the area in which those fossils were found used to be aquatic; tropical plant fossils found in Antarctica, where tropical plants cannot live today, suggests that the area used to be tropical).

Content Resource: 3rd Grade Life Science LS4-2 Biological Natural Selection: Unity and Diversity

Observable features of the student performance by the end of the grade:		
	Articulating the explanation of phenomena	
1	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
1	b	Students use evidence and reasoning to construct an explanation for the phenomenon.
	2 Evidence	
2	a	Students describe* the given evidence necessary for the explanation, including:
2	a	i. A given characteristic of a species (e.g., thorns on a plant, camouflage of an animal, the coloration of moths).
2	a	ii. The patterns of variation of a given characteristic among individuals in a species (e.g., longer or shorter thorns on individual plants, dark or light coloration of animals).
2	a	iii. Potential benefits of a given variation of the characteristic (e.g., the light coloration of some moths makes them difficult to see on the bark of a tree).
	Reasoning	
3	a	Students use reasoning to logically connect the evidence to support the explanation for the phenomenon. Students describe* a chain of reasoning that includes:
3	a	i. That certain variations in characteristics make it harder or easier for an animal to survive, find mates, and reproduce (e.g., longer thorns prevent predators more effectively and increase the likelihood of survival; light coloration of some moths provides camouflage in certain environments, making it more likely that they will live long enough to be able to mate and reproduce).
3	a	ii. That the characteristics that make it easier for some organisms to survive, find mates, and reproduce give those organisms an advantage over other organisms of the same species that don't have those traits.
3	a	iii. That there can be a cause-and-effect relationship between a specific variation in a characteristic (e.g., longer thorns, coloration of moths) and its effect on the ability of the individual organism to survive and reproduce (e.g., plants with longer thorns are less likely to be eaten, darker moths are less likely to be seen and eaten on dark trees).

Content Resource: 3rd Grade Life Science LS4-3 Biological Evolution: Unity and Diversity

Observable features of the student performance by the end of the grade:		
	Supported claims	
1	a	Students make a claim to be supported about a phenomenon. In their claim, students include the idea that in a particular habitat, some organisms can survive well, some can survive less well, and some cannot survive at all.
	Identifying scientific evidence	
2	a	Students describe* the given evidence necessary for supporting the claim, including:
		i. Characteristics of a given particular environment (e.g., soft earth, trees and shrubs, seasonal flowering plants).
		ii. Characteristics of a particular organism (e.g., plants with long, sharp leaves; rabbit coloration).
		iii. Needs of a particular organism (e.g., shelter from predators, food, water).
	Evaluating and critiquing evidence	
3	a	Students evaluate the evidence to determine:
		i. The characteristics of organisms that might affect survival.
		ii. The similarities and differences in needs among at least three types of organisms.
		iii. How and what features of the habitat meet the needs of each of the organisms (i.e., the degree to which a habitat meets the needs of an organism).
		iv. How and what features of the habitat do not meet the needs of each of the organisms (i.e., the degree to which a habitat does not meet the needs of an organism).
	b	Students evaluate the evidence to determine whether it is relevant to and supports the claim.
	c	Students describe* whether the given evidence is sufficient to support the claim, and whether additional evidence is needed.
	Reasoning and synthesis	
4	a	Students use reasoning to construct an argument, connecting the relevant and appropriate evidence to the claim, including describing* that any particular environment meets different organisms' needs to different degrees due to the characteristics of that environment and the needs of the organisms. Students describe* a chain of reasoning in their argument, including the following cause-and-effect relationships:
		i. If an environment fully meets the needs of an organism, that organism can survive well within that environment.
		ii. If an environment partially meets the needs of an organism, that organism can survive less well (e.g., lower survival rate, increased sickliness, shorter lifespan) than organisms whose needs are met within that environment.

Content Resource: 3rd Grade Life Science LS4-4 Biological Evolution: Unity and Diversity

Observable features of the student performance by the end of the grade:		
	Supported claims	
1	a	Students make a claim about the merit of a given solution to a problem that is caused when the environment changes, which results in changes in the types of plants and animals that live there.
	Identifying scientific evidence	
2	a	Students describe* the given evidence about how the solution meets the given criteria and constraints. This evidence includes:
		i. A system of plants, animals, and a given environment within which they live before the given environmental change occurs.
		ii. A given change in the environment.
		iii. How the change in the given environment causes a problem for the existing plants and animals living within that area.
		iv. The effect of the solution on the plants and animals within the environment.
		v. The resulting changes to plants and animals living within that changed environment, after the solution has been implemented.
	Evaluating and critiquing evidence	
3	a	Students evaluate the solution to the problem to determine the merit of the solution. Students describe* how well the proposed solution meets the given criteria and constraints to reduce the impact of the problem created by the environmental change in the system, including:
		i. How well the proposed solution meets the given criteria and constraints to reduce the impact of the problem created by the environmental change in the system, including:
		1. How the solution makes changes to one part (e.g., a feature of the environment) of the system, affecting the other parts of the system (e.g., plants and animals).
		2. How the solution affects plants and animals.
	b	Students evaluate the evidence to determine whether it is relevant to and supports the claim.
	c	Students describe* whether the given evidence is sufficient to support the claim, and whether additional evidence is needed.

Content Resource: 3rd Grade Physical Science PS2-1 Motion and Stability: Forces & Interactions

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon under investigation
	a	Students identify and describe* the phenomenon under investigation, which includes the effects of different forces on an object's motion (e.g., starting, stopping, or changing direction).
	b	Students describe* the purpose of the investigation, which includes producing data to serve as the basis for evidence for how balanced and unbalanced forces determine an object's motion.
2		Identifying the evidence to address the purpose of the investigation
	a	Students collaboratively develop an investigation plan. In the investigation plan, students describe* the data to be collected, including:
		i. The change in motion of an object at rest after:
		1. Different strengths and directions of balanced forces (forces that sum to zero) are applied to the object.
		2. Different strengths and directions of unbalanced forces (forces that do not sum to zero) are applied to the object (e.g., strong force on the right, weak force or the left).
		ii. What causes the forces on the object.
	b	Students individually describe* how the evidence to be collected will be relevant to determining the effects of balanced and unbalanced forces on an object's motion.
3		Planning the investigation
	a	In the collaboratively developed investigation plan, students describe* how the motion of the object will be observed and recorded, including defining the following features:
		i. The object whose motion will be investigated.
		ii. The objects in contact that exert forces on each other.
	a	iii. Changing one variable at a time (e.g., control strength and vary the direction, or control direction and vary the strength).
		iv. The number of trials that will be conducted in the investigation to produce sufficient data.
	b	Students individually describe* how their investigation plan will allow them to address the purpose of the investigation.
4		Collecting the data
	a	Students collaboratively collect and record data according to the investigation plan they developed, including data from observations and/or measurements of:
		i. An object at rest and the identification of the forces acting on the object.
		ii. An object in motion and the identification of the forces acting on the object.

Content Resource: 3rd Grade Physical Science PS2-2 Motion and Stability: Forces & Interactions

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon under investigation
	a	From the given investigation plan, students identify and describe* the phenomenon under investigation, which includes observable patterns in the motion of an object.
	b	Students identify and describe* the purpose of the investigation, which includes providing evidence for an explanation of the phenomenon that includes the idea that patterns of motion can be used to predict future motion of an object.
2		Identifying the evidence to address the purpose of the investigation
	a	Based on a given investigation plan, students identify and describe* the data to be collected through observations and/or measurements, including data on the motion of the object as it repeats a pattern over time (e.g., a pendulum swinging, a ball moving on a curved track, a magnet repelling another magnet).
	b	Students describe* how the data will serve as evidence of a pattern in the motion of an object and how that pattern can be used to predict future motion.
3		Planning the investigation
	a	From the given investigation plan, students identify and describe* how the data will be collected, including how:
		i. The motion of the object will be observed and measured.
		ii. Evidence of a pattern in the motion of the object will be identified from the data on the motion of the object.
		iii. The pattern in the motion of the object can be used to predict future motion.
4		Collecting the data
	a	Students make observations and/or measurements of the motion of the object, according to the given investigation plan, to identify a pattern that can be used to predict future motion.

Content Resource: 3rd Grade Physical Science PS2-3 Motion and Stability: Forces & Interactions

Observable features of the student performance by the end of the grade:		
1		Addressing phenomena of the natural world
	a	Students ask questions that arise from observations of two objects not in contact with each other interacting through electric or magnetic forces, the answers to which would clarify the cause-and- effect relationships between:
		i. The sizes of the forces on the two interacting objects due to the distance between the two objects.
		ii. The relative orientation of two magnets and whether the force between the magnets is attractive or repulsive.
		iii. The presence of a magnet and the force the magnet exerts on other objects.
		iv. Electrically charged objects and an electric force.
2		Identifying the scientific nature of the question
	a	Students' questions can be investigated within the scope of the classroom.

Content Resource: 3rd Grade Physical Science PS2-4 Motion and Stability: Forces & Interactions

Observable features of the student performance by the end of the grade:		
1		Identifying the problem to be solved
	a	Students identify and describe* a simple design problem that can be solved by applying a scientific understanding of the forces between interacting magnets.
	b	Students identify and describe* the scientific ideas necessary for solving the problem, including:
		i. Force between objects do not require that those objects be in contact with each other
		ii. The size of the force depends on the properties of objects, distance between the objects, and orientation of magnetic objects relative to one another.
2		Defining the criteria and constraints
	a	Students identify and describe* the criteria (desirable features) for a successful solution to the problem.
	b	Students identify and describe* the constraints (limits) such as:
		i. Time.
		ii. Cost.
		iii. Materials.

Content Resource: 3rd Grade Physical Science PS2-5 Motion & Stability: Forces and Interaction

Observable features of the student performance by the end of the grade:		
1		Supported claims
	a	Students identify a given claim to be supported about a phenomenon. The claim includes the idea that the gravitational force exerted by Earth on objects is directed down toward the center of Earth.
2.		Identifying scientific evidence
	a	Students identify and describe* the given evidence, data, and/or models that support the claim, including:
		i. 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).
		ii. That objects dropped appear to fall straight down.
		iii. That people live all around the spherical Earth, and they all observe that objects appear to fall straight down.
3		Evaluating and critiquing evidence
	a	Students evaluate the evidence to determine whether it is sufficient and relevant to supporting the claim.
	b	Students describe* whether any additional evidence is needed to support the claim.
4		Reasoning and synthesis
	a.	Students use reasoning to connect the relevant and appropriate evidence to support the claim with argumentation. Students describe* a chain of reasoning that includes:
		i. If Earth is spherical, and all observers see objects near them falling directly "down" to the Earth's surface, then all observers would agree that objects fall toward the Earth's center.
		ii. Since an object that is initially stationary when held moves downward when it is released, there must be a force (gravity) acting on the object that pulls the object toward the center of Earth.

Content Resource: 4rd Grade Earth Science ESS1-1 Earth's Place in the Universe.

Observable features of the student performance by the end of the grade:		
1		Articulating the explanation of phenomena
	a	From a given model, students identify and describe* the relevant components for testing interactions concerning the functioning of a given natural system, including:
		Students identify the given explanation for a phenomenon, which includes a statement about the idea that landscapes change over time.
1	b	From the given explanation, students identify the specific aspects of the explanation they are supporting with evidence.
2		Evidence
	a	Students identify the evidence relevant to supporting the explanation, including local and regional patterns in the following:
		i. Different rock layers found in an area (e.g., rock layers taken from the same location show marine fossils in some layers and land fossils in other layers).
		ii. Ordering of rock layers (e.g., layer with marine fossils is found below layer with land fossils).
		iii. Presence of particular fossils (e.g., shells, land plants) in specific rock layers.
		iv. The occurrence of events (e.g., earthquakes) due to Earth forces.
3		Reasoning
	a	Students use reasoning to connect the evidence to support particular points of the explanation, including the identification of a specific pattern of rock layers and fossils (e.g., a rock layer containing shells and fish below a rock layer containing fossils of land animals and plants is a pattern indicating that, at one point, the landscape had been covered by water and later it was dry land). Students describe* reasoning for how the evidence supports particular points of the explanation, including:
		i. Specific rock layers in the same location show specific fossil patterns (e.g., some lower rock layers have marine fossils, while some higher rock layers have fossils of land plants).
		ii. Since lower layers were formed first then covered by upper layers, this pattern indicates that the landscape of the area was transformed into the landscape indicated by the upper layer (e.g., lower marine fossils indicate that, at one point, the landscape was covered by water, and upper land fossils indicate that later the landscape was dry land).
		iii. Irregularities in the patterns of rock layers indicate disruptions due to Earth forces (e.g., a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock).

Content Resource: 4rd Grade Earth Science ESS2-2 Earth's Systems

Observable features of the student performance by the end of the grade:		
	Organizing data	
1	a	Students organize data using graphical displays (e.g., table, chart, graph) from maps of Earth's features (e.g., locations of mountains, continental boundaries, volcanoes, earthquakes, deep ocean trenches, ocean floor structures).
	Identifying relationships	
2	a	Students identify patterns in the location of Earth features, including the locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes. These relationships include:
		i. Volcanoes and earthquakes occur in bands that are often along the boundaries between continents and oceans.
		ii. Major mountain chains form inside continents or near their edges.
	Interpreting data	
3	a	Students use logical reasoning based on the organized data to make sense of and describe* a phenomenon. In their description*, students include that Earth features occur in patterns that reflect information about how they are formed or occur (e.g., mountain ranges tend to occur on the edges of continents or inside them, the Pacific Ocean is surrounded by a ring of volcanoes, all continents are surrounded by water [assume Europe and Asia are identified as Eurasia]).

Content Resource: 4rd Grade Earth Science ESS3-1 Earth and Human Activity

Observable features of the student performance by the end of the grade:		
	Obtaining information	
1	a	Students gather information from books and other reliable media about energy resources and fossil fuels (e.g., fossil fuels, solar, wind, water, nuclear), including:
		i. How they are derived from natural sources (e.g., which natural resource they are derived from) [note: mechanisms should be limited to grade appropriate descriptions*, such as comparing the different ways energy resources are each derived from a natural resource).
		ii. How they address human energy needs.
		iii. The positive and negative environmental effects of using each energy resource.
	Evaluating information	
2	a	Students combine the obtained information to provide evidence about:
		i. The effects on the environment of using a given energy resource.
		ii. Whether the energy resource is renewable.
		iii. The role of technology, including new and improved technology, in improving or mediating the environmental effects of using a given resource.
	Communicating information	
3	a	Students use the information they obtained and combined to describe* the causal relationships between:
		ii. Energy resources and the environmental effects of using that energy source. \
		ii. The role of technology in extracting and using an energy resource.

Content Resource: 4rd Grade Earth Science ESS3-2 Earth and Human Activity

Observable features of the student performance by the end of the grade:		
1		Using scientific knowledge to generate design solutions
	a	Given a natural Earth process that can have a negative effect on humans (e.g., an earthquake, volcano, flood, landslide), students use scientific information about that Earth process and its effects to design at least two solutions that reduce its effect on humans.
	b	In their design solutions, students describe* and use cause and effect relationships between the Earth process and its observed effect.
2		Describing* criteria and constraints, including quantification when appropriate
	a	Students describe* the given criteria for the design solutions, including using scientific information about the Earth process to describe* how well the design must alleviate the effect of the Earth process on humans.
	b	Students describe* the given constraints of the solution (e.g., cost, materials, time, relevant scientific information), including performance under a range of likely conditions.
3		Evaluating potential solutions
	a	Students evaluate each design solution based on whether and how well it meets the each of the given criteria and constraints.
	b	Students compare the design solutions to each other based on how well each meets the given criteria and constraints.
	c	Students describe* the design solutions in terms of how each alters the effect of the Earth process on humans.

Content Resource: 4th Grade 3-5-ETS1-1. Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Identifying the problem to be solved
	a	Students use given scientific information and information about a situation or phenomenon to define a simple design problem that includes responding to a need or want.
	b	The problem students define is one that can be solved with the development of a new or improved object, tool, process, or system.
	c	Students describe* that people's needs and wants change over time.
2		Defining the boundaries of the system
	a	Students define the limits within which the problem will be addressed, which includes addressing something people want and need at the current time.
3		Defining the criteria and constraints
	a	Based on the situation people want to change, students specify criteria (required features) of a successful solution.
	b	Students describe* the constraints or limitations on their design, which may include:
		i. Cost.
		ii. Materials.
		iii. Time.

Content Resource: 4th Grade 3-5-ETS1-2. Engineering & Technology

Observable features of the student performance by the end of the grade:		
1	Using scientific knowledge to generate design solutions	
	a	Students use grade-appropriate information from research about a given problem, including the causes and effects of the problem and relevant scientific information.
	b	Students generate at least two possible solutions to the problem based on scientific information and understanding of the problem.
	c	Students specify how each design solution solves the problem.
	d	Students share ideas and findings with others about design solutions to generate a variety of possible solutions.
	e	Students describe* the necessary steps for designing a solution to a problem, including conducting research and communicating with others throughout the design process to improve the design [note: emphasis is on what is necessary for designing solutions, not on a step-wise process].
2	Describing* criteria and constraints, including quantification when appropriate	
	a	Students describe*:
		i. The given criteria (required features) and constraints (limits) for the solutions, including increasing benefits, decreasing risks/costs, and meeting societal demands as appropriate.
		ii. How the criteria and constraints will be used to generate and test the design solutions.
3	Evaluating potential solutions	
	a	Students test each solution under a range of likely conditions and gather data to determine how well the solutions meet the criteria and constraints of the problem.
	b	Students use the collected data to compare solutions based on how well each solution meets the criteria and constraints of the problem.

Content Resource: 4th Grade 3-5-ETS1-3. Engineering & Technology

Observable features of the student performance by the end of the grade:		
	Identifying the purpose of the investigation	
1	a	Students describe* the purpose of the investigation, which includes finding possible failure points or difficulties to identify aspects of a model or prototype that can be improved.
	Identifying the evidence to be address the purpose of the investigation	
2	a	Students describe* the evidence to be collected, including:
		i. How well the model/prototype performs against the given criteria and constraints.
		ii. Specific aspects of the prototype or model that do not meet one or more of the criteria or constraints (i.e., failure points or difficulties).
		iii. Aspects of the model/prototype that can be improved to better meet the criteria and constraints.
	b	Students describe* how the evidence is relevant to the purpose of the investigation.
	Planning the investigation	
3	a	Students create a plan for the investigation that describes* different tests for each aspect of the criteria and constraints. For each aspect, students describe*:
		i. The specific criterion or constraint to be used.
		ii. What is to be changed in each trial (the independent variable).
		iii. The outcome (dependent variable) that will be measured to determine success.
		iv. What tools and methods are to be used for collecting data.
		v. What is to be kept the same from trial to trial to ensure a fair test.
4	Collecting the data	
	a	Students carry out the investigation, collecting and recording data according to the developed plan.

Content Resource: 4rd Grade Life Science 4-LS1-1. From Molecules to Organisms: Structures & Processes

Observable features of the student performance by the end of the grade:		
1		Supported claims
	a	Students make a claim to be supported about a phenomenon. In the claim, students include the idea that plants and animals have internal and external structures that function together as part of a system to support survival, growth, behavior, and reproduction.
2		Identifying scientific evidence
	a	Students describe* the given evidence, including:
		i. The internal and external structures of selected plants and animals.
		ii. The primary functions of those structures
3		Evaluating and critiquing evidence
	a	Students determine the strengths and weaknesses of the evidence, including whether the evidence is relevant and sufficient to support a claim about the role of internal and external structures of plants and animals in supporting survival, growth, behavior, and/or reproduction.
4		Reasoning and synthesis
	a	Students use reasoning to connect the relevant and appropriate evidence and construct an argument that includes the idea that plants and animals have structures that, together, support survival, growth, behavior, and/or reproduction. Students describe* a chain of reasoning that includes:
		i. Internal and external structures serve specific functions within plants and animals (e.g., the heart pumps blood to the body, thorns discourage predators).
		ii. The functions of internal and external structures can support survival, growth, behavior, and/or reproduction in plants and animals (e.g., the heart pumps blood throughout the body, which allows the entire body access to oxygen and nutrients; thorns prevent predation, which allows the plant to grow and reproduce).
		iii. Different structures work together as part of a system to support survival, growth, behavior, and/or reproduction (e.g., the heart works with the lungs to carry oxygenated blood throughout the system; thorns protect the plant, allowing reproduction via stamens and pollen to occur).

Content Resource: 4rd Grade Life Science LS1-2 From Molecules to Organisms: Structures & Processes

Observable features of the student performance by the end of the grade:		
		Components of the model
1	a	From a given model, students identify and describe* the relevant components for testing interactions concerning the functioning of a given natural system, including:
		i. Different types of information about the surroundings (e.g., sound, light, odor, temperature).
		ii. Sense receptors able to detect different types of information from the environment.
		iii. Brain.
		iv. Animals' actions.
		Relationships
2	a	Students describe* the relationships between components in the model, including:
		i. Different types of sense receptors detect specific types of information within the environment.
		ii. Sense receptors send information about the surroundings to the brain.
		iii. Information that is transmitted to the brain by sense receptors can be processed immediately as perception of the environment and/or stored as memories.
		iv. Immediate perceptions or memories processed by the brain influence an animal's action or responses to features in the environment.
		Connections
3	a	Students use the model to describe* that:
		i. Information in the environment interacts with animal behavioral output via interactions mediated by the brain.
		ii. Different types of sensory information are relayed to the brain via different sensory receptors, allowing experiences to be perceived, stored as memories, and influence behavior (e.g., an animal sees a brown, rotten fruit and smells a bad odor — this sensory information allows the animal to use information about other fruits that appear to be rotting to make decisions about what to eat; an animal sees a red fruit and a green fruit — after eating them both, the animal learns that the red fruit is sweet and the green fruit is bitter and then uses this sensory information, perceived and stored as memories, to guide fruit selection next time).
		iii. Sensory input, the brain, and behavioral output are all parts of a system that allow animals to engage in appropriate behaviors.
	b	Students use the model to test interactions involving sensory perception and its influence on animal behavior within a natural system, including interactions between:
		i. Information in the environment.
		ii. Different types of sense receptors.
		iii. Perception and memory of sensory information.
		iv. Animal behavior.

Content Resource: 4rd Grade Physical Science PS3-1 Energy

Observable features of the student performance by the end of the grade:		
		Articulating the explanation of phenomena
1	a	Students articulate a statement that relates the given phenomenon to a scientific idea, including that the speed of a given object is related to the energy of the object (e.g., the faster an object is moving, the more energy it possesses).
	b	Students use the evidence and reasoning to construct an explanation for the phenomenon.
		Evidence
2	a	Students identify and describe* the relevant given evidence for the explanation, including:
		i The relative speed of the object (e.g., faster vs. slower objects).
		ii. Qualitative indicators of the amount of energy of the object, as determined by a transfer of energy from that object (e.g., more or less sound produced in a collision, more or less heat produced when objects rub together, relative speed of a ball that was stationary following a collision with a moving object, more or less distance a stationary object is moved).
		Reasoning
3	a	Students use reasoning to connect the evidence to support an explanation for the phenomenon. In the explanation, students describe* a chain of reasoning that includes:
		i. Motion can indicate the energy of an object.
		ii. The faster a given object is moving, the more observable impact it can have on another object (e.g., a fast-moving ball striking something (a gong, a wall) makes more noise than does the same ball moving slowly and striking the same thing).
		iii. The observable impact of a moving object interacting with its surroundings reflects how much energy was able to be transferred between objects and therefore relates to the energy of the moving object.
		iv. Because faster objects have a larger impact on their surroundings than objects moving more slowly, they have more energy due to motion (e.g., a fast-moving ball striking a gong makes more noise than a slow-moving ball doing the same thing because it has more energy that can be transferred to the gong, producing more sound). [Note: This refers only to relative bulk motion energy, not potential energy.)
		v. Therefore, the speed of an object is related to the energy of the object.

Content Resource: 4rd Grade Physical Science PS3-2 Energy

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon under investigation
	a	From the given investigation plan, students describe* the phenomenon under investigation, which includes the following ideas:
		i. The transfer of energy, including:
		1. Collisions between objects.
		2. Light traveling from one place to another.
		3. Electric currents producing motion, sound, heat, or light.
		4. Sound traveling from one place to another.
		5. Heat passing from one object to another.
		6. Motion, sound, heat, and light causing a different type of energy to be observed after an interaction (e.g., in a collision between two objects, one object may slow down or stop, the other object may speed up, and the objects and surrounding air may be heated; a specific sound may cause the movement of an object; the energy associated with the motion of an object, via an electrical current, may be used to turn on a light).
	b	Students describe* the purpose of the investigation, which includes providing evidence for an explanation of the phenomenon, including the idea that energy can be transferred from place to place by:
		i. Moving objects.
		ii. Sound.
		iii. Light.
		iv. Heat.
		v. Electric currents.
2		Identifying the evidence to address the purpose of the investigation
	a	From the given investigation plan, students describe* the data to be collected that will serve as the basis for evidence, including:
		i. The motion and collision of objects before and after an interaction (e.g., when a given object is moving fast, it can move another object farther than when the same object is moving more slowly).
		ii. The relative presence of sound, light, or heat (including in the surrounding air) before and after an interaction (e.g. shining a light on an object can increase the temperature of the object; a sound can move an object).
		iii. The presence of electric currents flowing through wires causally linking one form of energy output (e.g., a moving object) to another form of energy output (e.g., another moving object; turning on a light bulb).
	b	Students describe* how their observations will address the purpose of the investigation, including how the observations will provide evidence that energy, in the form of light, sound, heat, and motion, can be transferred from place to place by sound, light, heat, or electric currents (e.g., in a system in which the motion of an object generates an observable electrical current to turn on a light, energy (from the motion of an object) must be transferred to another place (energy in the form of the light bulb) via the electrical current, because the motion doesn't cause the light bulb to light up if the wire is not completing a circuit between them; when a light is directed at an object, energy (in the form of light) must be transferred from the source of the light to its destination and can be observed in the form of heat, because if the light is blocked, the object isn't warmed.
3		Planning the investigation
	a	From the given investigation plan, students identify and describe* how the data will be observed and recorded, including the tools and methods for collecting data on:
		i. The motion and collision of objects, including any sound or heat producing the motion/collision, or produced by the motion/collision.
		ii. The presence of energy in the form of sound, light, or heat in one place as a result of sound, light, or heat in a different place.
		iii. The presence of electric currents in wires and the presence of energy (in the form of sound, light, heat, or motion resulting from the flow of electric currents through a device).

	b	Students describe* the number of trials, controlled variables, and experimental set up.
4	Collecting the data	
	a	Students make and record observations according to the given investigation plan to provide evidence that:
		i. Energy is present whenever there are moving objects, sound, light, or heat.
		ii. That energy has been transferred from place to place (e.g., a bulb in a circuit is not lit until a switch is closed and it lights, indicating that energy is transferred through electric current in a wire to light the bulb; a stationary ball is struck by a moving ball, causing the stationary ball to move and the moving ball to slow down, indicating that energy has been transferred from the moving ball to the stationary one).

Content Resource: 4rd Grade Physical Science PS3-3 Energy

Observable features of the student performance by the end of the grade:		
1	Addressing phenomena of the natural world	
	a	Students ask questions about the changes in energy that occur when objects collide, the answers to which would clarify:
		i. A qualitative measure of energy (e.g., relative motion, relative speed, relative brightness) of the object before the collision.
		1. The transfer of energy by contact forces between colliding objects that results in a change in the motion of the objects.
		2. The transfer of energy to the surrounding air when objects collide resulting in sound and heat. .
	b	ii. Students predict reasonable outcomes about the changes in energy that occur after objects collide, based on patterns linking object collision and energy transfer between objects and the surrounding air.
2	Identifying the scientific nature of the question	
	a	Students ask questions that can be investigated within the scope of the classroom or an outdoor environment. .

Content Resource: 4rd Grade Physical Science PS3-4 Energy

Observable features of the student performance by the end of the grade:		
1		Using scientific knowledge to generate design solutions
	a	Given a problem to solve, students collaboratively design a solution that converts energy from one form to another. In the design, students:
		i. Specify the initial and final forms of energy (e.g., electrical energy, motion, light).
		ii. Identify the device by which the energy will be transformed (e.g., a light bulb to convert electrical energy into light energy, a motor to convert electrical energy into energy of motion).
2		Describing* criteria and constraints, including quantification when appropriate
	a	a Students describe* the given criteria and constraints of the design, which include:
		ii. Criteria:
		1. The initial and final forms of energy.
		2. Description* of how the solution functions to transfer energy from one form to another.
		ii. Constraints:
		1.The materials available for the construction of the device.
		2. Safety considerations.
3		Evaluating potential solutions
	a	Students evaluate the proposed solution according to how well it meets the specified criteria and constraints of the problem.
4		Modify the design solution
	a	Students test the device and use the results of the test to address problems in the design or improve its functioning.

Content Resource: 4rd Grade Physical Science PS4-1 Waves and Their Applications in Technologies for Information Transfer

Observable features of the student performance by the end of the grade:		
1	Components of the model	
	a	Students develop a model (e.g., diagrams, analogies, examples, abstract representations, physical models) to make sense of a phenomenon that involves wave behavior. In the model, students identify the relevant components, including:
		i. Waves.
		ii. Wave amplitude.
		iii. Wavelength.
		iv. Motion of objects.
2	Relationships	
	a	Students identify and describe* the relevant relationships between components of the model, including:
		i. Waves can be described* in terms of patterns of repeating amplitude and wavelength (e.g., in a water wave there is a repeating pattern of water being higher and then lower than the baseline level of the water).
		ii. Waves can cause an object to move.
		iii. The motion of objects varies with the amplitude and wavelength of the wave carrying it.
3	Connections	
	a	Students use the model to describe*:
		i. The patterns in the relationships between a wave passing, the net motion of the wave, and the motion of an object caused by the wave as it passes.
		ii. How waves may be initiated (e.g., by disturbing surface water or shaking a rope or spring).
		iii. The repeating pattern produced as a wave is propagated.
	b	Students use the model to describe* that waves of the same type can vary in terms of amplitude and wavelength and describe* how this might affect the motion, caused by a wave, of an object.
	c	Students identify similarities and differences in patterns underlying waves and use these patterns to describe* simple relationships involving wave amplitude, wavelength, and the motion of an object (e.g., when the amplitude increases, the object moves more).

Content Resource: 4rd Grade Physical Science PS4-2 Waves and Their Applications in Technologies for Information Transfer

Observable features of the student performance by the end of the grade:		
	Components of the model	
1	a	Students develop a model to make sense of a phenomenon involving the relationship between light reflection and visibility of objects. In the model, students identify the relevant components, including:
		i. Light (including the light source).
		ii. Objects.
		iii. The path that light follows.
		iv. The eye.
	Relationships	
2	a	Students identify and describe* causal relationships between the components, including:
		i. Light enters the eye, allowing objects to be seen.
		ii. Light reflects off of objects, and then can travel and enter the eye.
		iii. Objects can be seen only if light follows a path between a light source, the object, and the eye.
	Connections	
3	a	Students use the model to describe* that in order to see objects that do not produce their own light, light must reflect off the object and into the eye.
	b	Students use the model to describe* the effects of the following on seeing an object:
		i. Removing, blocking, or changing the light source (e.g., a dimmer light).
		ii. Closing the eye.
		iii. Changing the path of the light (e.g., using mirrors to direct the path of light to allow the visualization of a previously unseen object or to change the position in which the object can be seen, using an opaque or translucent barrier between 1) the light source and the object or 2) the object and the eye to change the path light follows and the visualization of the object).

Content Resource: 4rd Grade Physical Science PS4-3 Waves and Their Applications in Technologies for Information Transfer

Observable features of the student performance by the end of the grade:		
1		Using scientific knowledge to generate design solutions
	a	Students generate at least two design solutions, for a given problem, that use patterns to transmit a given piece of information (e.g., picture, message). Students describe* how the design solution is based on:
		i. Knowledge of digitized information transfer (e.g., information can be converted from a sound wave into a digital signal such as patterns of 1s and 0s and vice versa; visual or verbal messages can be encoded in patterns of flashes of light to be decoded by someone else across the room).
		ii. Ways that high-tech devices convert and transmit information (e.g., cell phones convert sound waves into digital signals, so they can be transmitted long distances, and then converted back into sound waves; a picture or message can be encoded using light signals to transmit the information over a long distance).
2		Describing* criteria and constraints, including quantification when appropriate
	a	Students describe* the given criteria for the design solutions, including the accuracy of the final transmitted information and that digitized information (patterns) transfer is used.
	b	Students describe* the given constraints of the design solutions, including:
		i. The distance over which information is transmitted.
		ii. Safety considerations.
		iii. Materials available.
3		Evaluating potential solutions
	a	Students compare the proposed solutions based on how well each meets the criteria and constraints.
	b	Students identify similarities and differences in the types of patterns used in the solutions to determine whether some ways of transmitting information are more effective than others at addressing the problem.

Content Resource: 5th Grade Earth Science ESS1-1 Earth's Place in the Universe

Observable features of the student performance by the end of the grade:		
1	Supported claims	
	a	Students identify a given claim to be supported about a phenomenon. The claim includes the idea that the apparent brightness of the sun and stars is due to their relative distances from Earth.
2.	Identifying scientific evidence	
	a	Students identify and describe* the given evidence, data, and/or models that support the claim, including:
		i. The sun and other stars are natural bodies in the sky that give off their own light.
		ii. The apparent brightness of a variety of stars, including the sun.
		iii. A luminous object close to a person appears much brighter and larger than a similar object that is very far away from a person (e.g., nearby streetlights appear bigger and brighter than distant streetlights).
		iv. The relative distance of the sun and stars from Earth (e.g., although the sun and other stars are all far from the Earth, the stars are very much farther away; the sun is much closer to Earth than other stars).
3	Evaluating and critiquing evidence	
	a	Students evaluate the evidence to determine whether it is relevant to supporting the claim, and sufficient to describe* the relationship between apparent size and apparent brightness of the sun and other stars and their relative distances from Earth.
	b	Students determine whether additional evidence is needed to support the claim.
4		Reasoning and synthesis
	a	Students use reasoning to connect the relevant and appropriate evidence to the claim with argumentation. Students describe* a chain of reasoning that includes:
		i. Because stars are defined as natural bodies that give off their own light, the sun is a star.
		ii. The sun is many times larger than Earth but appears small because it is very far away.
		iii. Even though the sun is very far from Earth, it is much closer than other stars.
		iv. Because the sun is closer to Earth than any other star, it appears much larger and brighter than any other star in the sky.
		v. Because objects appear smaller and dimmer the farther they are from the viewer, other stars, although immensely large compared to the Earth, seem much smaller and dimmer because they are so far away.
		vi. Although stars are immensely large compared to Earth, they appear small and dim because they are so far away.
		vii. Similar stars vary in apparent brightness, indicating that they vary in distance from Earth.

Content Resource: 5th Grade Earth Science ESS1-2 Earth's Place in the Universe

Observable features of the student performance by the end of the grade:		
1		Organizing data
	a	Using graphical displays (e.g., bar graphs, pictographs), students organize data pertaining to daily and seasonal changes caused by the Earth's rotation and orbit around the sun. Students organize data that include:
		i. The length and direction of shadows observed several times during one day.
		ii. The duration of daylight throughout the year, as determined by sunrise and sunset times.
		iii. Presence or absence of selected stars and/or groups of stars that are visible in the night sky at different times of the year.
2		Identifying relationships
	a	Students use the organized data to find and describe* relationships within the datasets, including:
	a	i. The apparent motion of the sun from east to west results in patterns of changes in length and direction of shadows throughout a day as Earth rotates on its axis.
	a	ii. The length of the day gradually changes throughout the year as Earth orbits the sun, with longer days in the summer and shorter days in the winter
	a	iii. Some stars and/or groups of stars (i.e., constellations) can be seen in the sky all year, while others appear only at certain times of the year.
	b	Students use the organized data to find and describe* relationships among the datasets, including:
	b	i. Similarities and differences in the timing of observable changes in shadows, daylight, and the appearance of stars show that events occur at different rates (e.g., Earth rotates on its axis once a day, while its orbit around the sun takes a full year).

Content Resource: 5th Grade Earth Science ESS2-1 Earth's Systems

Observable features of the student performance by the end of the grade:		
1		Components of the model
	a	Students develop a model, using a specific given example of a phenomenon, to describe* ways that the geosphere, biosphere, hydrosphere, and/or atmosphere interact. In their model, students identify the relevant components of their example, including features of two of the following systems that are relevant for the given example:
	a	i. Geosphere (i.e., solid and molten rock, soil, sediment, continents, mountains).
		ii. Hydrosphere (i.e., water and ice in the form of rivers, lakes, glaciers).
		iii. Atmosphere (i.e., wind, oxygen).
		iv. Biosphere (i.e., plants, animals [including humans]).
2		Relationships
	a	Students identify and describe* relationships (interactions) within and between the parts of the Earth systems identified in the model that are relevant to the example (e.g., the atmosphere and the hydrosphere interact by exchanging water through evaporation and precipitation; the hydrosphere and atmosphere interact through air temperature changes, which lead to the formation or melting of ice).
3		Connections
	a	Students use the model to describe* a variety of ways in which the parts of two major Earth systems in the specific given example interact to affect the Earth's surface materials and processes in that context. Students use the model to describe* how parts of an individual Earth system:
	a	i. Work together to affect the functioning of that Earth system.
		ii. Contribute to the functioning of the other relevant Earth system.

Content Resource: 5th Grade Earth Science ESS2-2 Earth's Systems

Observable features of the student performance by the end of the grade:		
		Representation
1	a	Students graph the given data (using standard units) about the amount of salt water and the amount of fresh water in each of the following reservoirs, as well as in all the reservoirs combined, to address a scientific question:
		i. Oceans.
		ii. Lakes.
		iii. Rivers.
		iv. Glaciers.
		v. Ground water.
		vi. Polar ice caps.
		Mathematical/computational analysis
2	a	Students use the graphs of the relative amounts of total salt water and total fresh water in each of the reservoirs to describe* that:
		i. The majority of water on Earth is found in the oceans.
		ii. Most of the Earth's fresh water is stored in glaciers or underground.
		iii. A small fraction of fresh water is found in lakes, rivers, wetlands, and the atmosphere.

Content Resource: 5th Grade Earth Science ESS3-1 Earth and Human Activity

Observable features of the student performance by the end of the grade:		
		Obtaining information
1	a	Students obtain information from books and other reliable media about:
		i. How a given human activity (e.g., in agriculture, industry, everyday life) affects the Earth's resources and environments.
		ii. How a given community uses scientific ideas to protect a given natural resource and the environment in which the resource is found.
		Evaluating information
2	a	Students combine information from two or more sources to provide and describe* evidence about:
		i. The positive and negative effects on the environment as a result of human activities.
		ii. How individual communities can use scientific ideas and a scientific understanding of interactions between components of environmental systems to protect a natural resource and the environment in which the resource is found.

Content Resource: 5th Grade 3-5 ETS1-1 Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Identifying the problem to be solved
	a	Students use given scientific information and information about a situation or phenomenon to define a simple design problem that includes responding to a need or want.
	b	The problem students define is one that can be solved with the development of a new or improved object, tool, process, or system.
	c	Students describe* that people's needs and wants change over time.
2		Defining the boundaries of the system
	a	Students define the limits within which the problem will be addressed, which includes addressing something people want and need at the current time.
3		Defining the criteria and constraints
	a	Based on the situation people want to change, students specify criteria (required features) of a successful solution.
	b	Students describe* the constraints or limitations on their design, which may include:
		i. Cost.
		ii. Materials.
		iii. Time.

Content Resource: 5th Grade 3-5 ETS1-2 Engineering & Technology

Observable features of the student performance by the end of the grade:		
1		Using scientific knowledge to generate design solutions
	a	Students use grade-appropriate information from research about a given problem, including the causes and effects of the problem and relevant scientific information.
	b	Students generate at least two possible solutions to the problem based on scientific information and understanding of the problem.
	c	Students specify how each design solution solves the problem.
	d	Students share ideas and findings with others about design solutions to generate a variety of possible solutions.
	e	Students describe* the necessary steps for designing a solution to a problem, including conducting research and communicating with others throughout the design process to improve the design [note: emphasis is on what is necessary for designing solutions, not on a step-wise process].
2		Describing* criteria and constraints, including quantification when appropriate
	a	Students describe*:
		i. The given criteria (required features) and constraints (limits) for the solutions, including increasing benefits, decreasing risks/costs, and meeting societal demands as appropriate.
		ii. How the criteria and constraints will be used to generate and test the design solutions.
3		Evaluating potential solutions
	a	Students test each solution under a range of likely conditions and gather data to determine how well the solutions meet the criteria and constraints of the problem.
	b	Students use the collected data to compare solutions based on how well each solution meets the criteria and constraints of the problem.

Content Resource: 5th Grade 3-5 ETS1-3 Engineering & Technology

Observable features of the student performance by the end of the grade:		
	Identifying the purpose of the investigation	
1	a	Students describe* the purpose of the investigation, which includes finding possible failure points or difficulties to identify aspects of a model or prototype that can be improved.
	Identifying the evidence to be address the purpose of the investigation	
2	a	Students describe* the evidence to be collected, including:
		i. How well the model/prototype performs against the given criteria and constraints.
		ii. Specific aspects of the prototype or model that do not meet one or more of the criteria or constraints (i.e., failure points or difficulties).
		iii. Aspects of the model/prototype that can be improved to better meet the criteria and constraints.
	b	Students describe* how the evidence is relevant to the purpose of the investigation.
	Planning the investigation	
3	a	Students create a plan for the investigation that describes* different tests for each aspect of the criteria and constraints. For each aspect, students describe*:
		i. The specific criterion or constraint to be used.
		ii. What is to be changed in each trial (the independent variable).
		iii. The outcome (dependent variable) that will be measured to determine success.
		iv. What tools and methods are to be used for collecting data.
		v. What is to be kept the same from trial to trial to ensure a fair test.
4	Collecting the data	
	a	Students carry out the investigation, collecting and recording data according to the developed plan.

Content Resource: 5th Grade Life Science LS1-1 From Molecules to Organisms: Structures & Processes

Observable features of the student performance by the end of the grade:		
1	Supported claims	
	a	Students identify a given claim to be supported about a given phenomenon. The claim includes the idea that plants acquire the materials they need for growth chiefly from air and water.
2	Identifying scientific evidence	
	a	Students describe* the given evidence, data, and/or models that support the claim, including evidence of:
		i. Plant growth over time.
		ii. Changes in the weight of soil and water within a closed system with a plant, indicating:
		1. Soil does not provide most of the material for plant growth (e.g., changes in weight of soil and a plant in a pot over time, hydroponic growth of plants).
		2. Plants' inability to grow without water.
		iii. Plants' inability to grow without air.
		iv. Air is matter (e.g., empty object vs. air filled object).
3	Evaluating and critiquing evidence	
	a	Students determine whether the evidence supports the claim, including:
		i. Whether a particular material (e.g. air, soil) is required for growth of plants
		ii. Whether a particular material (e.g. air, soil) may provide sufficient matter to account for an observed increase in weight of a plant during growth.
4	Reasoning and synthesis	
	a	Students use reasoning to connect the evidence to support the claim with argumentation. Students describe* a chain of reasoning that includes:
	a	i. During plant growth in soil, the weight of the soil changes very little over time, whereas the weight of the plant changes a lot. Additionally, some plants can be grown without soil at all.
	a	ii. Because some plants don't need soil to grow, and others show increases in plant matter (as measured by weight) but not accompanying decreases in soil matter, the material from soil must not enter the plant in sufficient quantities to be the chief contributor to plant growth.
	a	*iii.* Therefore, plants do not acquire most of the material for growth from soil.
		iv. A plant cannot grow without water or air. Because both air and water are matter and are transported into the plant system, they can provide the materials plants need for growth.
		v. Since soil cannot account for the change in weight as a plant grows and since plants take in water and air, both of which could contribute to the increase in weight during plant growth, plant growth must come chiefly from water and air.

Content Resource: 5th Grade Life Science LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Observable features of the student performance by the end of the grade:		
		Components of the model
1	a	Students develop a model to describe* a phenomenon that includes the movement of matter within an ecosystem. In the model, students identify the relevant components, including:
		i. Matter.
		ii. Plants.
		iii. Animals.
		iv. Decomposers, such as fungi and bacteria.
		v. Environment.
		Relationships
2	a	Students describe* the relationships among components that are relevant for describing* the phenomenon, including:
		i. The relationships in the system between organisms that consume other organisms, including:
		1. Animals that consume other animals.
		2. Animals that consume plants.
		3. Organisms that consume dead plants and animals.
		4. The movement of matter between organisms during consumption.
		ii. The relationship between organisms and the exchange of matter from and back into the environment (e.g., organisms obtain matter from their environments for life processes and release waste back into the environment, decomposers break down plant and animal remains to recycle some materials back into the soil).
		Connections
3	a	Students use the model to describe*:
		i. The cycling of matter in the system between plants, animals, decomposers, and the environment.
		ii. How interactions in the system of plants, animals, decomposers, and the environment allow multiple species to meet their needs.
		iii. That newly introduced species can affect the balance of interactions in a system (e.g., a new animal that has no predators consumes much of another organism's food within the ecosystem).
		iv. That changing an aspect (e.g., organisms or environment) of the ecosystem will affect other aspects of the ecosystem.

Content Resource: 5th Grade Physical Science PS1-1 Matter & Its Interactions

Observable features of the student performance by the end of the grade:		
1		Components of the model
	a	Students develop a model to describe* a phenomenon that includes the idea that matter is made of particles too small to be seen. In the model, students identify the relevant components for the phenomenon, including:
		i. Bulk matter (macroscopic observable matter; e.g., as sugar, air, water).
		ii. Particles of matter that are too small to be seen.
2		Relationships
	a	In the model, students identify and describe* relevant relationships between components, including the relationships between:
		i. Bulk matter and tiny particles that cannot be seen (e.g., tiny particles of matter that cannot be seen make up bulk matter).
		ii. The behavior of a collection of many tiny particles of matter and observable phenomena involving bulk matter (e.g., an expanding balloon, evaporating liquids, substances that dissolve in a solvent, effects of wind).
3		Connections
	a	Students use the model to describe* how matter composed of tiny particles too small to be seen can account for observable phenomena (e.g., air inflating a basketball, ice melting into water).

Content Resource: 5th Grade Physical Science PS1-2 Matter and Its Interactions

Observable features of the student performance by the end of the grade:		
1		Representation
	a	Students measure and graph the given quantities using standard units, including:
		i. The weight of substances before they are heated, cooled, or mixed.
		ii. The weight of substances, including any new substances produced by a reaction, after they are heated, cooled, or mixed.
2		Mathematical/computational analysis
	a	Students measure and/or calculate the difference between the total weight of the substances (using standard units) before and after they are heated, cooled, and/or mixed.
	b	Students describe* the changes in properties they observe during and/or after heating, cooling, or mixing substances.
	c	Students use their measurements and calculations to describe* that the total weights of the substances did not change, regardless of the reaction or changes in properties that were observed.
	d	Students use measurements and descriptions* of weight, as well as the assumption of consistent patterns in natural systems, to describe* evidence to address scientific questions about the conservation of the amount of matter, including the idea that the total weight of matter is conserved after heating, cooling, or mixing substances.

Content Resource: 5th Grade Physical Science PS1-3 Matter & Its Interactions

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon under investigation
	a	From the given investigation plan, students identify the phenomenon under investigation, which includes the observable and measurable properties of materials.
	b	Students identify the purpose of the investigation, which includes collecting data to serve as the basis for evidence for an explanation about the idea that materials can be identified based on their observable and measurable properties.
2		Identifying the evidence to address the purpose of the investigation
	a	From the given investigation plan, students describe* the evidence from data (e.g., qualitative observations and measurements) that will be collected, including:
		i. Properties of materials that can be used to identify those materials (e.g., color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility).
	b	Students describe* how the observations and measurements will provide the data necessary to address the purpose of the investigation.
3		Planning the investigation
	a	From the given investigation plan, students describe* how the data will be collected, including how:
		i. Quantitative measures of properties, in standard units (e.g., grams, liters).
		ii. Observations of properties such as color, conductivity, and reflectivity.
		iii. Determination of conductors vs. nonconductors and magnetic vs. nonmagnetic materials.
	b	Students describe* how the observations and measurements they make will allow them to identify materials based on their properties.
4		Collecting the data
	a	Students collect and record data, according to the given investigation plan.

Content Resource: 5th Grade Physical Science PS1-4 Matter & Its Interactions

Observable features of the student performance by the end of the grade:		
1		Identifying the phenomenon under investigation
	a	From the given investigation plan, students identify the phenomenon under investigation, which includes the mixing of two or more substances.
	b	Students identify the purpose of the investigation, which includes providing evidence for whether new substances are formed by mixing two or more substances, based on the properties of the resulting substance.
2		Identifying the evidence to address the purpose of the investigation
	a	From the given investigation plan, students describe* the evidence from data (e.g., qualitative observations and measurements) that will be collected, including:
		i. Quantitative (e.g., weight) and qualitative properties (e.g., state of matter, color, texture, odor) of the substances to be mixed.
		ii. Quantitative and qualitative properties of the resulting substances.
	b	Students describe* how the collected data can serve as evidence for whether the mixing of the two or more tested substances results in one or more new substances.
3		Planning the investigation
	a	From the given investigation plan, students describe* how the data will be collected, including how:
		i. How quantitative and qualitative properties of the two or more substances to be mixed will be determined and measured.
		ii. How quantitative and qualitative properties of the substances that resulted from the mixture of the two or more substances will be determined and measured.
		iii. Number of trials for the investigation.
		iv. How variables will be controlled to ensure a fair test (e.g., the temperature at which the substances are mixed, the number of substances mixed together in each trial).
4		Collecting the data
	a	According to the investigation plan, students collaboratively collect and record data, including data about the substances before and after mixing.

Content Resource: 5th Grade Physical Science PS3-1 Energy

Observable features of the student performance by the end of the grade:		
1	Components of the model	
	a	Stu Students use models to describe* a phenomenon that includes the idea that energy in animals' food was once energy from the sun. Students identify and describe* the components of the model that are relevant for describing* the phenomenon, including:
	a	i. Energy.
	a	ii. The sun.
	a	iii. Animals, including their bodily functions (e.g., body repair, growth, motion, body warmth maintenance).
	a	iv. Plants.
2	Relationships	
	a	Students identify and describe* the relevant relationships between components, including:
		i. The relationship between plants and the energy they get from sunlight to produce food.
		ii. The relationship between food and the energy and materials that animals require for bodily functions (e.g., body repair, growth, motion, body warmth maintenance).
		iii. The relationship between animals and the food they eat, which is either other animals or plants (or both), to obtain energy for bodily functions and materials for growth and repair.
3	Connections	
	a	Students use the models to describe* causal accounts of the relationships between energy from the sun and animals' needs for energy, including that:
		i. Since all food can eventually be traced back to plants, all of the energy that animals use for body repair, growth, motion, and body warmth maintenance is energy that once came from the sun.
		ii. Energy from the sun is transferred to animals through a chain of events that begins with plants producing food then being eaten by animals.