1st Grade - Topic Model - Bundle 1
Light and Solar Patterns

This is the first bundle of the 1st Grade Topic Model. Each bundle has connections to the other bundles in the course, as shown in the Course Flowchart

Bundle 1 Question: This bundle is assembled to address the question "why are we able to see objects?"

Summary

The bundle organizes performance expectations around the theme of *seeing objects.* Instruction developed from this bundle should always maintain the three-dimensional nature of the standards, but recognize that instruction is not limited to the practices and concepts directly linked with any of the bundle performance expectations.

Connections between bundle DCIs

The concept that seasonal patterns of sunrise and sunset can be observed, described, and predicted (ESS1.B as in 1-ESS1-2) connects to the idea that objects can be seen if they give off their own light or if there is light to illuminate them (PS4.B as in 1-PS4-2). This idea in turn connects to the idea that some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach (PS4.B as in 1-PS4-3).

Bundle Science and Engineering Practices

Instruction leading to this bundle of PEs will help students build toward proficiency in elements of the practices of planning and carrying out investigations (1-ESS1-2 and 1-PS4-3) and constructing explanations and designing solutions (1-PS4-2). Many other practice elements can be used in instruction.

Bundle Crosscutting Concepts

Instruction leading to this bundle of PEs will help students build toward proficiency in elements of the crosscutting concepts of Patterns (1-ESS1-2) and Cause and Effect (1-PS4-2 and 1-PS4-3). Many other crosscutting concepts elements can be used in instruction.

All instruction should be three-dimensional.

Performance Expectations 1-PS4-2 and 1-ESS1-2 are partially assessable	1-PS4-2 **Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** **[Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]** 1-PS4-3 **Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.** **[Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [*Assessment Boundary: Assessment does not include the speed of light.*]** 1-ESS1-2 **Make observations at different times of year to relate the amount of daylight to the time of year.** **[Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [*Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.*].**
Example Phenomena	We can see more during the daytime than at night. I can make shadow puppets.
Additional Practices Building to the PEs	**Asking Questions and Defining Problems** • Ask and/or identify questions that can be answered by an investigation. Students could *identify questions* [related to whether] ***objects need light to illuminate them*** [in order to] ***be seen*** *that can be answered by an investigation*. 1-PS4-2

Additional Practices Building to the PEs (Continued)	**Developing and Using Models** • Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). Students could *develop a model to represent* [the] *relationship* [between] **materials** [and whether they] **allow light to pass through them**. 1-PS4-3 **Planning and Carrying Out Investigations** • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. Students could *plan an investigation collaboratively to produce data to answer a question* [about whether] ***objects can be seen if light is*** [not] ***available to illuminate them***. 1-PS4-2 **Analyzing and Interpreting Data** • Record information (observations, thoughts, and ideas). Student could *record information* [to identify] ***seasonal patterns of sunrise and sunset***. 1-ESS1-2 **Using Mathematical and Computational Thinking** • Use counting and numbers to identify and describe patterns in the natural and designed world(s). Students could use *counting and numbers to describe* ***seasonal patterns of sunrise and sunset*** *in the natural world*. 1-ESS1-2 **Constructing Explanations and Designing Solutions** • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. Students could *make observations (firsthand or from media) to construct an evidence-based account for* [why] ***some materials allow light to pass through them***. 1-PS4-3 **Engaging in Argument from Evidence** • Make a claim about the effectiveness of an object, tool, or solutions that is supported by relevant evidence. Students could *make a claim about the effectiveness of objects, tool, or solutions* [intended to] ***allow light to pass through them*** *that is supported by relevant evidence*. 1-PS4-3 **Obtaining, Evaluating, and Communicating Information** • Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, numbers that provide detail about scientific ideas, practices, and/or design ideas. Students could *communicate information with others in oral forms using numbers that provide detail about scientific ideas* [related to] ***seasonal patterns of sunrise and sunset***. 1-ESS1-2
Additional Crosscutting Concepts Building to the PEs	**Patterns** • Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. Students could describe that *patterns in the world* – [for example, patterns related to which types of] ***materials allow light to pass through them,*** [which] ***allow only some light through and*** [which] ***block all the light*** – *can be observed, used to describe phenomena, and used as evidence.*1-PS4-3

Additional Crosscutting Concepts Building to the PEs (Continued)	**Scale, Proportion, and Quantity** • Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower). Students could describe how using *relative scales (e.g., more and less) allowed* [them] *to compare events* [such as] ***materials*** [and whether they] ***allow light to pass through them***. 1-PS4-3 **Stability and Change** • Some things stay the same while other things change. Students could identify *some things stay the same* [and] *other things* [that] *change* [such as] ***seasonal*** [changes] ***of sunrise and sunset***. 1-ESS1-2
Additional Connections to Nature of Science	**Scientific Investigations Use a Variety of Methods** • Scientists use different ways to study the world. Students could describe how they *used different ways to study* [that] ***objects can be seen if light is available to illuminate them or if they give off their own light*** [just as] *scientists use different ways to study the world*. 1-PS4-2 **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Many events are repeated. Students could describe that *many events*, [including those related to] ***seasonal patterns of sunrise and sunset****, are repeated.* 1-ESS1-2

1-PS4-2 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

1-PS4-2. **Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** [Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.

Disciplinary Core Ideas

PS4.B: Electromagnetic Radiation

- Objects can be seen if light is available to illuminate them or if they give off their own light.

Crosscutting Concepts

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

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.

1-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

1-PS4-3. **Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.** [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [*Assessment Boundary: Assessment does not include the speed of light.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct investigations collaboratively to produce evidence to answer a question.

Disciplinary Core Ideas

PS4.B: Electromagnetic Radiation

- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.)

Crosscutting Concepts

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

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 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.

1-ESS1-2 Earth's Place in the Universe

Students who demonstrate understanding can:

1-ESS1-2. **Make observations at different times of year to relate the amount of daylight to the time of year.** [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [*Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons.

Disciplinary Core Ideas

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted.

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

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 the following idea: the relationship between the amount of daylight and the time of year.
2	Identifying evidence to address the purpose of the investigation	
	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).
3	Planning the investigation	
	a	Based on the given investigation plan, students describe* (with support):
		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).