

Kindergarten Thematic Model-Bundle 2

Local Weather

This is the second bundle of the Kindergarten Thematic Model. Each bundle has connections to the other bundles in the course, as shown in the [Course Flowchart](#)

Bundle 2 Question: This bundle is assembled to address the question of “What can we observe about weather over the course of the year?”

Summary

The bundle organizes performance expectations around *observations of weather patterns over the course of the year*. 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

Sunlight warms Earth’s surface. (PS3.B as in K-PS3-1 and K-PS3-2). This concept of sunlight warming Earth’s surface connects to the idea that weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time (ESS2.D as in K-ESS2-1).

The concepts of weather and patterns of weather (ESS2.D as in K-ESS2-1) connect to the idea that some kinds of severe weather are more likely than others in a given region. (ESS3.B as in K-ESS3-2).

The concept that asking questions, making observations, and gathering information are helpful in thinking about problems (ETS1.A as in K-ESS3-2 and K-2-ETS1-1) could connect to multiple concepts such as sunlight warms Earth’s surface (PS3.B as in K-PS3-1 and K-PS3-2) as well as that weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time (ESS2.D as in K-ESS2-1) and some kinds of severe weather are more likely than others in a given region (ESS3.B as in K-ESS3-2). These connections could be made by having students engage in the process of asking questions, making observations, and gathering information about sunlight’s effect on Earth’s surface in order to define a problem and then reflecting on this process. Alternatively, students can ask questions, make observations, and gather information to think about problems caused by both typical local weather and severe local weather.

And the concept that designs can be conveyed through sketches, drawings, or physical models (ETS1.B as in K-2-ETS1-2) could connect to multiple concepts such as sunlight warms Earth’s surface (PS3.B as in K-PS3-1 and K-PS3-2) and that weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time (ESS2.D as in K-ESS2-1). These connections could be made through a task in which students must use a representation to convey their design of a structure that will provide a cool place for the students of their school to use when they are outside on a warm day. Students could also engage in a task in which they need to convey the design of an object that would protect them from any negative effects of wind and then reflect on the usefulness of conveying their ideas through representations.

Bundle Science and Engineering Practices

Instruction leading to this bundle of PEs will help students build toward proficiency in elements of the practices of asking questions and defining problems (K-ESS3-2 and K-2-ETS1-1); developing models (K-2-ETS1-2); planning and carrying out investigations (K-PS3-1); analyzing and interpreting data (K-ESS2-1); designing solutions (K-PS3-2); and obtaining information (K-ESS3-2). Many other practice elements can be used in instruction.

<p>Bundle Crosscutting Concepts</p> <p>Instruction leading to this bundle of PEs will help students build toward proficiency in elements of the crosscutting concepts of Patterns (K-ESS2-1); Cause and Effect (K-PS3-1, K-PS3-2, and K-ESS3-2); and Structure and Function (K-2-ETS1-2). Many other crosscutting concepts elements can be used in instruction.</p> <p><i>All instruction should be three-dimensional.</i></p>	
<p>Performance Expectations</p> <p>K-2-ETS1-1 is partially assessable</p>	<p>K-PS3-1. Make observations to determine the effect of sunlight on Earth’s surface. [Clarification Statement: Examples of Earth’s surface could include sand, soil, rocks, and water.] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]</p> <p>K-PS3-2. Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth’s surface.* [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]</p> <p>K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time. [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]</p> <p>K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [Clarification Statement: Emphasis is on local forms of severe weather.]</p> <p>K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.</p> <p>K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.</p>
<p>Example Phenomena</p>	<p>The temperature changes throughout a day and across days, weeks, months and the year.</p> <p>Sometimes people know ahead of time that a storm is coming.</p>
<p>Additional Practices Building to the PEs</p>	<p>Asking Questions and Defining Problems</p> <ul style="list-style-type: none"> ● Ask and/or identify questions that can be answered by an investigation. <p>Students could <i>ask questions</i> [about] <i>the effect of sunlight on Earth’s surface</i> that can be answered by an investigation. K-PS3-2</p> <p>Developing and Using Models</p> <ul style="list-style-type: none"> ● Compare models to identify common features and differences. <p>Students could <i>compare models</i> [of] <i>structures that reduce the effect of sunlight heating the Earth’s surfaces</i> to identify the common features and differences. K-PS3-2</p>

**Additional Practices
Building to the PEs
(Continued)**

Planning and Carrying out Investigations

● Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question. Students could *evaluate different ways of observing and/or measuring the phenomena that sunlight warms Earth's surface and [that] structures [can] reduce the warming effects of sunlight on Earth's surface to determine which way can answer a question.* K-PS3-1 and K-PS3-2

Analyzing and Interpreting Data

● Use and share pictures, drawings, and/or writings of observations. Students could *use and share pictures, drawings and/or writings of observations [of] local weather including severe weather.* K-ESS2-1 and K-ESS3-2

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 use numbers to identify and describe patterns [of] local weather over time.* K-ESS2-1

Constructing Explanations and Designing Solutions

● Generate and/or compare multiple solutions to a problem. Students can *generate and compare multiple solutions to a given problem to illustrate how the shape of the object helps it function as needed to solve the problem.* K-2-ETS1-2

Engaging in Argument from Evidence

● Distinguish between opinions and evidence in one's own explanations. Students could *distinguish between opinions and evidence in [their] explanations [of the] effect of sunlight on Earth's surface, [how] structures [can] reduce the warming effect of sunlight on Earth's surface, and local weather patterns over time.* K-PS3-1, K-PS3-2, and K-ESS2-1

Obtaining, Evaluating, and Communicating Information

● Obtain information using various texts, text features (e.g. headings, table of contents, glossaries, electronic menus, icons) and other media that will be useful in answering a scientific question and/or supporting a scientific claim. Students could *obtain information using various texts, text features, and other media that will be useful in answering scientific questions [about] the effect of sunlight on Earth's surface, [how] structures [can] reduce the warming effect of sunlight on Earth's surface, and local weather patterns over time.* K-PS3-1, K-PS3-2, and K-ESS2-1

<p>Suggested Crosscutting Concepts Leading to PE</p>	<p>Scale, Proportion, and Quantity</p> <ul style="list-style-type: none"> Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower). <p>Students could describe how <i>relative scales allow them to compare and describe their observations of local weather conditions and to notice patterns over time</i>. K-ESS2-1</p> <p>Structure and Function</p> <ul style="list-style-type: none"> The shape and stability of structures of natural and designed objects are related to their function(s). <p>Students could describe how <i>the shape [of] a structure [designed to] reduce the warming effect of sunlight on Earth's surface [is] related to its function</i>. K-PS3-2</p> <p>Stability and Change</p> <ul style="list-style-type: none"> Things may change slowly or rapidly. <p>Students could describe that <i>things like local weather conditions, including severe weather, may change slowly or rapidly</i>. K-ESS2-1 and K-ESS3-2</p>
<p>Connections to Nature of Science</p>	<p>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</p> <ul style="list-style-type: none"> Scientists use drawings, sketches, and models as a way to communicate ideas. <p>Students could describe why <i>scientists [might] use drawings, sketches, and models as a way to communicate ideas [just] like they, as students [can] develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem and use drawings, sketches, and models to communicate their ideas [about] the effect of sunlight on Earth's surface, their design for a structure to reduce the warming effect of sunlight on Earth's surface, and local weather patterns</i>. K-2-ETS1-2, K-PS3-1, K-PS3-2, and K-ESS2-1</p> <p>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</p> <ul style="list-style-type: none"> Many events are repeated. <p>Students could describe and reflect on the idea <i>that many events [such as] sunny, cloudy, rainy, and warm days are repeated</i>. K-ESS2-1</p>

K-PS3-1 Energy

Students who demonstrate understanding can:

- K-PS3-1. Make observations to determine the effect of sunlight on Earth’s surface.** [Clarification Statement: Examples of Earth’s surface could include sand, soil, rocks, and water.] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]

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	Disciplinary Core Ideas	Crosscutting Concepts
<p>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.</p> <ul style="list-style-type: none"> Make observations (firsthand or from media) to collect data that can be used to make comparisons. <p>-----</p> <p style="text-align: center;">Connections to Nature of Science</p> <p>Scientific Investigations Use a Variety of Methods</p> <ul style="list-style-type: none"> Scientists use different ways to study the world. 	<p>PS3.B: Conservation of Energy and Energy Transfer</p> <ul style="list-style-type: none"> Sunlight warms Earth’s surface. 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Events have causes that generate observable patterns.

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.

K-PS3-2 Energy

Students who demonstrate understanding can:

- K-PS3-2. Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth’s surface.*** [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]

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	Disciplinary Core Ideas	Crosscutting Concepts
<p>Constructing Explanations and Designing Solutions</p> <p>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.</p> <ul style="list-style-type: none"> Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. 	<p>PS3.B: Conservation of Energy and Energy Transfer</p> <ul style="list-style-type: none"> Sunlight warms Earth’s surface. 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Events have causes that generate observable patterns.

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).

K-ESS2-1 Earth's Systems

Students who demonstrate understanding can:

- K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.** [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]

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

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.

Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas

ESS2.D: Weather and Climate

- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.

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	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:
		<ul style="list-style-type: none"> 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:
		<ul style="list-style-type: none"> 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:
		<ul style="list-style-type: none"> 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.

K-ESS3-2 Earth and Human Activity

Students who demonstrate understanding can:

- K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*** [Clarification Statement: Emphasis is on local forms of severe weather.]

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

Asking Questions and Defining Problems

Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

- Ask questions based on observations to find more information about the designed world.

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world.

Disciplinary Core Ideas

ESS3.B: Natural Hazards

- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events.

ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (*secondary*)

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns.

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- People encounter questions about the natural world every day.

Influence of Engineering, Technology, and Science on Society and the Natural World

- People depend on various technologies in their lives; human life would be very different without technology.

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: <table border="1" style="margin-left: 20px;"> <tr> <td>i.</td> <td>There are patterns related to local severe weather that can be observed (e.g., certain types of severe weather happen more in certain places).</td> </tr> <tr> <td>ii.</td> <td>Weather patterns (e.g., some events are more likely in certain regions) help scientists predict severe weather before it happens.</td> </tr> <tr> <td>iii.</td> <td>Severe weather warnings are used to communicate predictions about severe weather.</td> </tr> <tr> <td>iv.</td> <td>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).</td> </tr> </table>	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).
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).								

K-2-ETS1-1 Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

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

Asking Questions and Defining Problems

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Define a simple problem that can be solved through the development of a new or improved object or tool.

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problem.

Crosscutting Concepts

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.

K-2-ETS1-2 Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

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

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool.

Disciplinary Core Ideas

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

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 it is 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.	