

## Kindergarten Science, Unit 1

# Weather

### Overview

#### Unit abstract

In this unit of study, students are expected to develop an understanding of patterns and variations in local weather and the use of weather forecasting to prepare for and respond to severe weather. The crosscutting concepts of patterns; cause and effect; interdependence of science, engineering, and technology; and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for the disciplinary core ideas. In the kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, analyzing and interpreting data, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

#### Essential question(s)

- What is the weather like today and how is it different from yesterday?

## Written Curriculum

### Next Generation Science Standards<sup>1</sup>

<b>K. Weather and Climate</b>		
Students who demonstrate understanding can:		
<p><b>K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.</b>            [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>		
The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i> :		
<p style="text-align: center;"><b>Science and Engineering Practices</b></p> <p><b>Analyzing and Interpreting Data</b>            Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</p> <ul style="list-style-type: none"> <li>Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)</li> </ul> <p style="text-align: center;">-----</p> <p style="text-align: center;"><b>Connections to Nature of Science</b></p> <p><b>Science Knowledge is Based on Empirical Evidence</b></p> <ul style="list-style-type: none"> <li>Scientists look for patterns and order when making observations about the world. (K-ESS2-1)</li> </ul>	<p style="text-align: center;"><b>Disciplinary Core Ideas</b></p> <p><b>ESS2.D: Weather and Climate</b></p> <ul style="list-style-type: none"> <li>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. (K-ESS2-1)</li> </ul>	<p style="text-align: center;"><b>Crosscutting Concepts</b></p> <p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)</li> </ul>
<i>Connections to other DCIs in kindergarten:</i> N/A		
<i>Articulation of DCIs across grade-levels:</i> <b>2.ESS2.A</b> (K-ESS2-1); <b>3.ESS2.D</b> (K-ESS2-1)		
<i>Common Core State Standards Connections:</i>		
<i>ELA/Literacy –</i>		
<b>W.K.7</b> Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)		
<i>Mathematics –</i>		
<b>MP.2</b> Reason abstractly and quantitatively. (K-ESS2-1)		
<b>MP.4</b> Model with mathematics. (K-ESS2-1)		
<b>K.CC.A</b> Know number names and the count sequence. (K-ESS2-1)		
<b>K.MD.A.1</b> Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)		
<b>K.MD.B.3</b> Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)		

<sup>1</sup> Next Generation Science Standards is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards was involved in the production of, and does not endorse, this product.

<b>K. Weather and Climate</b>		
Students who demonstrate understanding can: <b>K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*</b> [Clarification Statement: Emphasis is on local forms of severe weather.]		
The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i> :		
<p style="text-align: center;"><b>Science and Engineering Practices</b></p> <p><b>Asking Questions and Defining Problems</b>                  Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.</p> <ul style="list-style-type: none"> <li>Ask questions based on observations to find more information about the designed world. (K-ESS3-2)</li> </ul> <p><b>Obtaining, Evaluating, and Communicating Information</b>                  Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.</p> <ul style="list-style-type: none"> <li>Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)</li> </ul>	<p style="text-align: center;"><b>Disciplinary Core Ideas</b></p> <p><b>ESS3.B: Natural Hazards</b></p> <ul style="list-style-type: none"> <li>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. (K-ESS3-2)</li> </ul> <p><b>ETS1.A: Defining and Delimiting an Engineering Problem</b></p> <ul style="list-style-type: none"> <li>Asking questions, making observations, and gathering information are helpful in thinking about problems. (<i>secondary to K-ESS3-2</i>)</li> </ul>	<p style="text-align: center;"><b>Crosscutting Concepts</b></p> <p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>Events have causes that generate observable patterns. (K-ESS3-2)</li> </ul> <p style="text-align: center;">-----</p> <p style="text-align: center;"><b>Connections to Engineering, Technology, and Applications of Science</b></p> <p><b>Interdependence of Science, Engineering, and Technology</b></p> <ul style="list-style-type: none"> <li>People encounter questions about the natural world every day. (K-ESS3-2)</li> </ul> <p><b>Influence of Engineering, Technology, and Science on Society and the Natural World</b></p> <ul style="list-style-type: none"> <li>People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)</li> </ul>
Connections to other DCIs in kindergarten: <b>K.ETS1.A</b> (K-ESS3-2)		
Articulation of DCIs across grade-levels: <b>2.ESS1.C</b> (K-ESS3-2); <b>3.ESS3.B</b> (K-ESS3-2); <b>4.ESS3.B</b> (K-ESS3-2)		
Common Core State Standards Connections:		
ELA/Literacy –		
<b>RI.K.1</b> With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2)		
<b>SL.K.3</b> Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2)		
Mathematics –		
<b>MP.4</b> Model with mathematics. (K-ESS3-2)		
<b>K.CC</b> Counting and Cardinality (K-ESS3-2)		

<b>K-2.Engineering Design</b>		
Students who demonstrate understanding can: <b>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.</b>		
The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i> :		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<b>Asking Questions and Defining Problems</b> Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions. <ul style="list-style-type: none"> <li>▪ Ask questions based on observations to find more information about the natural and/or designed world. (K-2-ETS1-1)</li> <li>▪ Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)</li> </ul>	<b>ETS1.A: Defining and Delimiting Engineering Problems</b> <ul style="list-style-type: none"> <li>▪ A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)</li> <li>▪ Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)</li> <li>▪ Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)</li> </ul>	N/A
<i>Connections to K-2-ETS1.A: Defining and Delimiting Engineering Problems include:</i> <b>Kindergarten:</b> K-PS2-2, K-ESS3-2 <i>Connections to K-2-ETS1.B: Developing Possible Solutions to Problems include:</i> <b>Kindergarten:</b> K-ESS3-3, <b>First Grade:</b> 1-PS4-4, <b>Second Grade:</b> 2-LS2-2 <i>Connections to K-2-ETS1.C: Optimizing the Design Solution include:</i> <b>Second Grade:</b> 2-ESS2-1		
<i>Articulation of DCIs across grade-bands: <b>3-5.ETS1.A</b> (K-2-ETS1-1); <b>3-5.ETS1.C</b> (K-2-ETS1-1)</i>		
<i>Common Core State Standards Connections:</i> <b>ELA/Literacy –</b> <b>RI.2.1</b> Ask and answer such questions as <i>who, what, where, when, why,</i> and <i>how</i> to demonstrate understanding of key details in a text. (K-2-ETS1-1) <b>W.2.6</b> With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1) <b>W.2.8</b> Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1) <b>Mathematics –</b> <b>MP.2</b> Reason abstractly and quantitatively. (K-2-ETS1-1) <b>MP.4</b> Model with mathematics. (K-2-ETS1-1) <b>MP.5</b> Use appropriate tools strategically. (K-2-ETS1-1) <b>2.MD.D.10</b> Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1)		

## Clarifying the standards

### *Prior learning*

There are no disciplinary core ideas that are considered prior learning for the concepts in this unit of study.

### *Progression of current learning*

#### **Driving question 1**

What types of patterns can be observed in local weather conditions?

##### Concepts

- Scientists look for patterns and order when making observations about the world.
- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.
- 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.

##### Practices

- Observe and use patterns in the natural world as evidence and to describe phenomena.
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.
- Use and share observations of local weather conditions to describe patterns over time. (Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.)
  - 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.

**Driving question 2**

How does weather forecasting help us to prepare for and respond to severe weather?

**Concepts**

- Events have causes that generate observable patterns.
- People encounter questions about the natural world every day.
- Some kinds of severe weather are more likely than others in a given region.
- Weather scientists forecast severe weather so that communities can prepare for and respond to these events.
- People depend on various technologies in their lives; human life would be very different without technology.
- Before beginning to design a solution, it is important to clearly understand the problem.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- A situation that people want to change or create can be approached as a problem to be solved through engineering.

**Practices**

- Observe patterns in events generated by cause-and-effect relationships.
- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world.
- Ask questions based on observations to find more information about the designed world.
- Ask questions to obtain information about the purpose of weather forecasting to prepare for and respond to severe weather. (Emphasis is on local forms of severe weather.)
- Define a simple problem that can be solved through the development of a new or improved object or tool.
- Ask questions, make observations, and gather information about a situation people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool.

**Integration of content, practices, and crosscutting concepts**

In this unit of study, students are expected to develop an understanding of patterns and variations in local weather and the use of weather forecasting to prepare for and respond to severe weather. Throughout the unit, students will look for patterns and cause-and-effect relationships as they observe and record weather events. Students will have opportunities to ask scientific questions, analyze and interpret data, and communicate their findings to others.

In this unit's progression of learning, students first develop an understanding that patterns in the natural world can be observed and documented, and that, like scientists, they can use these patterns as evidence to describe phenomena and make predictions. In order to observe patterns in weather, kindergartners will learn that weather is the combination of sunlight, wind, precipitation, and temperature in a particular region at a particular time. By observing and recording daily weather events—such as sunny, cloudy, rainy, and windy—students can analyze both qualitative and quantitative data. Recording and analyzing data over time will reveal recognizable weather patterns that can be used to make predictions. Examples of weather patterns may include

- Snow and colder temperatures generally occur in the winter.
- Clouds may bring rain or snow.

- Rain occurs more often in the spring.
- Warmer/hotter temperatures occur in the summer.
- It is generally cooler in the morning and warmer in the afternoon.

At this grade level, it is developmentally appropriate to describe temperature in relative terms; therefore, vocabulary words such as *hot*, *warm*, *cool*, *cold*, and *warmer/cooler* should be used to describe temperature, rather than accurately measuring and describing temperature in degrees Celsius.

Students also learn that weather events have causes that generate observable patterns over time, and that these patterns help weather scientists predict severe weather. Kindergartners need opportunities to learn about severe weather, especially those types that tend to occur in the local region in which they live. By using a variety of media and technology, such as computers, radio, and television, and by reading grade-appropriate texts about weather and weather events, students can learn about types of severe weather that are common to their region. In addition, they come to understand that people depend on technology to help us predict and solve problems, and without it, our lives would be very different.

In order to apply their learning, students need opportunities to ask questions about weather forecasting and how it can help us prepare for and respond to different types of severe weather. When kindergartners ask questions, make observations, gather weather information, and look for patterns of change in the weather, it prepares them to think about how to best prepare for and respond to local severe weather. As part of this unit of study, students are challenged to investigate how people prepare for and solve problems caused by severe weather. With adult guidance, students should define weather problems by asking questions, making observations, and gathering information about severe weather situations. Some questions students might want to consider include the following:

- What kinds of severe weather events tend to occur where we live (e.g., thunderstorms, hurricanes, flooding, snow storms)?
- What do people do in response to these types of severe weather events?
- What kinds of tools can people use to solve problems caused by severe weather conditions (e.g., umbrellas, sandbags, salt, gravel, shovels, snow blowers)?
- What other solutions might people use for problems caused by severe weather (e.g., closing schools and businesses; sending out emergency workers to restore utilities; sending out early warnings; stockpiling food, water, and other supplies; having a portable generator)?
- What kinds of problems would we face if we had a lot of rain in a short period of time?
- What problems might we have if our community experienced flooding?
- What kinds of problems might occur if strong winds caused damage (e.g., knocked over trees, damaged power lines, damaged homes and businesses)?
- What kinds of precautions do people take during a hurricane? A tornado? A Nor'easter? Why?

### Integration of engineering

In this unit of study, students learn that problem situations can be solved through engineering, and that in order to design a solution, we must first define the problem. As described in the narrative above, students define problems caused by severe weather events by asking specific questions, making observations, and gathering information that will help them understand the types of problems they might face when severe weather conditions exist in and around their homes, schools, and communities.

### Integration of DCI from other units within this grade level

The following connections to disciplinary core ideas in Engineering, Technology, and Applications of Science occur in Unit 4, The Human Factor; Unit 5, Pushes and Pulls; and Unit 6, Effects of the Sun.

- 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.
- 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.
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

### Integration English language arts and of mathematics

#### *English language arts*

Kindergarteners will make connections to the CCSS-ELA by using trade books (read-alouds, big books) to learn about and discuss severe weather. Strategies, such as Think-Pair-Share, can be used to encourage students to think about information from books and to use that information to ask and answer questions about key details. With guidance, students use online media resources to view examples of severe weather. They can ask questions in order to understand how severe weather affects people and communities and to determine how communities prepare for and respond to severe weather.

#### *Mathematics*

Throughout this unit of study, students make connections to the CCSSM by measuring and recording various types of weather (e.g., rainfall or snow amounts, relative temperature at different times of the day and over a period of time). They mathematically represent real-world information by organizing their data into simple weather charts and graphs. Kindergarteners attend to the meaning of various quantities using a variety of units of measure and use counting to analyzing data and determine patterns in charts and graphs. By using media resources, students explore how weather scientists represent real-world weather data with picture representations, charts, and graphs. They can use this information to think about how weather scientists use tools to collect and record weather data in order to determine patterns of change. Students will attend to the meaning of various quantities used in simple weather charts and graphs, both from classroom observations and from media sources, by counting and comparing severe weather data with daily weather data (e.g., relative amounts of rainfall, snowfall). By analyzing data from weather graphs and charts, young students begin to understand how severe weather affects people and communities and that weather scientists play an important role in predicting severe weather conditions.

#### ***Future Learning***

The following disciplinary core ideas are future learning related to the concepts in this unit of study.

In Grade 2, students will know that:

- Some events happen very quickly, while others occur very slowly, over a time period much longer than one can observe.
- Wind and water can change the shape of the land.

Bristol–Warren, Central Falls, Cranston, Tiverton, and Woonsocket, with process support from The Charles A. Dana Center at the University of Texas at Austin

In Grade 3, students will know that:

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.
- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

In Grade 4, students will know that:

- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate these hazards but can take steps to reduce their impacts.

In Grades 3-5, students will know that:

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

## Number of Instructional Days

*Recommended number of instructional days: 20 (1 day = approximately 20–30 minutes)*

**Note**—The recommended number of days is an estimate based on the information available at this time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.

