K | *Earth and Space Science*

Weather for Kindergarten

Weather and Climate

BOCES 4 Science

Teacher's Guide

Published by BOCES 4 Science
Genesee Valley Educational Partnership
Monroe 1 BOCES
Monroe 2–Orleans BOCES
Wayne Finger Lakes BOCES

Written by teachers and administrators from public school districts within the borders of the NYS Midwest Joint Management Team in conjunction with the BOCES 4 Science Educators

Principal Writer 2016-17: Kathy A. Arminio

12/17

Foreward

BOCES 4 Science is a collaboration between four New York State BOCES (Board of Cooperative Educational Services) with in the Midwest Region. This collaborative of science educators came together to respond to the need for instructional resources based on the New York State pK-12 Science Learning Standards (NYSSLS). The research behind the Next Generation Science Standards (NGSS) and the National Research Council (NRC) publication, A Framework for K-12 Science Education is the basis for the NYSSLS and the BOCES 4 science units.

We believe that the future health and well-being of our world depends on scientifically literate people making informed decisions. The development of scientific literacy begins at the earliest grades. Elementary children must have concrete experiences upon which to hook their understanding and new vocabulary – this is especially true in the discipline of science. We embrace the notion that students should experience phenomena and solve real problems to learn about the world. We strive to present lessons and materials that will make high quality science instruction available for all students through cost-effective resources for teachers.

Table of Contents

About this Unit

Overview

This Weather Unit is designed for Kindergarten. The main topics included in this unit are, learning about the local weather, seasons, weather forecasting, and how to prepare for certain kinds of inclement weather.

Scheduling

This unit is scheduled to be in the classroom for 17 weeks. There are approximately 16 science instructional sessions in this unit, based on 30-40 minutes each. Adjust your schedule accordingly. Please return the unit promptly. To request an extension if needed, call 585-352-1140.

Materials to Obtain Locally

Some lessons require materials that are NOT supplied in the kit. These materials can be easily obtained by the teacher or the students. Materials that will need to be provided are indicated with an* asterisk in the lesson materials list and are also listed below:

- Box of misc. seasonal clothing items and props
- Chart paper
- Classroom calendar and manipulatives
- Crayons or markers
- Hard boiled eggs (plastic substitutes are included for students with egg allergies)
- Hole punch
- Misc. art materials (paint, fabric)
- Pencils
- Safety scissors
- Small plastic houses or Lego bricks
- Sticks/stones
- Whiteboard or interactive presentation board

Three Dimensions

Each of the BOCES 4 Science lessons includes at least one element from each of the three dimensions identified in the NYSSLS. The lesson page identifies the specific elements targeted; the NYSSLS topic page is included at the back of the Teacher's Guide.

Science and Engineering Practices (SEP) – these are the major practices that scientists employ as they investigate and build models of their understanding of the world. They also include key practices used by engineers as they design and build systems.

Disciplinary Core Ideas (DCI) – selected to represent four major domains: the physical sciences; the life sciences; the earth and space sciences: and engineering technology, and the applications of sciences.

Crosscutting Concepts (CCC) – these big ideas have application across all domains of science and provide one way of linking across the domains of the DCI's. In addition, they link to ideas that are parts of other elementary subjects.

NYSSLS Shifts in Instruction

It is the intention of BOCES 4 Science that this unit provides lessons that demonstrate the following shifts in instruction:

- **Explaining Phenomena or Designing Solutions to Problems:** The unit focuses on supporting students to make sense of a phenomenon or design solutions to a problem.
- **Three Dimensions:** The unit helps students develop and use multiple grade-appropriate elements of the SEPs, CCCs, and DCIs which are deliberately selected to make sense of phenomena or design a solution to a problem.
- **Integrating the Three Dimensions for Instruction and Assessment:** The unit will elicit student artifacts that show direct, observable evidence of three dimensional learning.
- **Relevance and Authenticity:** By taking advantage of student questions and experiences in the context of their homes, neighborhood and community, the lessons in this unit will motivate student sense-making or problem-solving.
- **Student Ideas:** This unit provides opportunities for students to express clarify, justify, interpret or represent their ideas and to respond to peer and teacher feedback.
- **Building on Students' Prior Knowledge:** Since student understanding grows over time, this unit identifies and builds on students' prior learning in three dimensions in such a way as it is explicit to both students and teachers.

Assessment:

Providing opportunities for assessment of learning and feedback to students is an important step in the educational process. This unit includes formative assessments and summative assessments. The teacher is encouraged to use a variety of informal or anecdotal assessment strategies.

Additional Features of this Unit

The Interdependent Relationships in The Weather for Kindergarten unit also includes a Student Science Journal. A digital version of the Student Science Journal is available online at the BOCES 4 Science website. (A web address and password are located on a color insert in the Teacher's Guide.)

Additional resources for the teacher, such as the specific assessments, ELA and/or ELL supports, direct links to videos or websites mentioned in the teacher's guide, etc. can also be found on the BOCES 4 Science website.

Features that Support 3-D Learning

Look for these special features in the Teacher's Guide:

Performance Expectations:

NYS pK-12 – Science Learning Standards within each lesson provide the teacher with specific information about the Performance Expectation and the 3-Dimensions that are targeted by the instruction in this lesson.

Science and Engineering Practices

Developing and Using Models

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

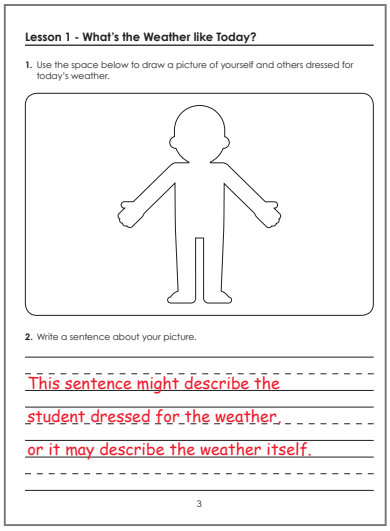
- The shape and stability of structures of natural and designed objects are related to their function(s).

ELA/Math

ELA: 2R1

Math: NY-2.MD

Throughout the Teacher's Guide, the 3-Dimensional Domains are color coded within the text so that teachers know to emphasize or explicitly point out to students this connection to either the **Science and Engineering Practices (SEPs)** and the **Crosscutting Concepts (CCCs)**. In addition, small boxes on the right hand side of the Procedure pages (see box in the blue column to the right) serve as a visual reminder as well.


Lesson 1 - What's the Weather like Today?

1. Use the space below to draw a picture of yourself and others dressed for today's weather.

2. Write a sentence about your picture.

This sentence might describe the student dressed for the weather, or it may describe the weather itself.

3

In addition, a small picture of the page(s) of the Student Science Journal (with answers) that students are using for each lesson has been included on the appropriate pages in the Teacher's Guide (see box to the right). This keeps the teacher from needing to go back and forth between various documents pertaining to a particular lesson.

CCC: Crosscutting Concept(s):

Cause and Effect:

Events have causes that generate observable patterns.

New York State P-12 Science Learning Standards

K. Weather and Climate

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

K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [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.]

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.]

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

The performance expectations above were 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. (K-ESS3-2)

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. (K-PS3-1)

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. (K-ESS2-1)

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.

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface.

(K-PS3-1), (K-PS3-2)

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. (K-ESS2-1

Cause and Effect

- Events have causes that generate observable patterns. (K-PS3-1),(K-PS32),(K-ESS3-2)

New York State P-12 Science Learning Standards

- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS32)

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. (K-ESS3-2)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Scientists use different ways to study the world. (K-PS3-1)

Science Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (K-ESS2-1)

(K-ESS2-1) 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.

(K-ESS3-2) ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- People encounter questions about the natural world every day. (K-ESS3-2)

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. (K-ESS32)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **1.PS4.B** (K-PS3-1),(K-PS3-2); **2.ESS1.C** (K-ESS3-2); **2.ESS2.A** (K-ESS2-1); **2.ETS1.B** (K-PS3-2); **3.ESS2.D** (K-PS3-1),(K-ESS2-1); **3.ESS3.B** (K-ESS3-2); **4.ESS2.A** (K-ESS2-1); **4.ESS3.B** (K-ESS3-2); **4.ETS1.A** (K-PS3-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2)

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS3-1),(K-PS3-2),(K-ESS21)

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. (K-ESS2-1)

MP.4 Model with mathematics. (K-ESS2-1),(K-ESS3-2)

K.CC Counting and Cardinality (K-ESS3-2)

K.CC.A Know number names and the count sequence. (K-ESS2-1) K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS3-1),(KPS3-2)

K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea. The text in the "Disciplinary Core Ideas" section is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas unless it is preceded by (NYSED).

Lesson 2

Let's Take a Temperature Walk (Sunny)

Focus Question:
How does the sunlight affect our playground?

Vocabulary:
cold
cool
hot
temperature
thermometer
warm

Lesson Synopsis

Learning Target:
I can make observations about how the surface of something will feel depending on what it is made of, and where it is located on our playground.

Lesson Description:
In lesson 1, the students were introduced to different kinds of weather though a guessing game. In lesson 2, the students will explore the schoolyard, particularly the playground, to discover how the sun interacts with different surfaces, including their skin. Students will make predictions about the relative temperature of things. **This is a long lesson that can be broken into two parts, with the temperature walk on one day, and the class discussion and activity page in the Student Science Journal on the second day.**

Safety:
Teacher should visit the playground ahead of time to determine what surfaces are safe for the students to touch.

Management

Materials

For each group of 3-4 students:
A sample Temperature Walk handout with pictures or photos is located online in the Teacher Resource section. A processing page is also included in the Student Science Journal.

For each student:
Glue sticks
Student Science Journal - Activity 2, My Temperature Walk
Safety scissors*

For each teacher:
2 pieces of black construction paper
Demonstration thermometer
Laminated weather cards
Classroom calendar, weather card symbols for graph•
Whiteboard•
*provided by teacher/student

Preparation:

1. Be sure to select a sunny day for this lesson or you may not observe the variations in temperature necessary for the students to fully grasp the concepts in the lesson.
2. Make sure you have located specific surfaces and areas that you want the students to observe and touch. You can use the photographs to create a recording sheet for the students, or use the sample in your kit. **See sample in Teacher Resource Section online or at the back of this guide.**
3. Have the classroom calendar and manipulative weather symbols ready for use.

Teacher Background:

This lesson focuses on **temperature**, and the students will come to understand that the sun warms different surfaces differently. This lesson will provide students with some background information they will need to draw on in order to complete an engineering task as a summative assessment for the unit. Temperature at this grade level will only be looked at comparatively. For example, asking the students to determine if a surface feels **warmer** or **cooler** in comparison to another surface. A classroom **thermometer** may be used to demonstrate that the red liquid in a thermometer moves higher when the temperature gets hotter. However, the students are not expected to actually read a thermometer.

Standards

Performance Expectations:

K-PS3-1 – Make observations to determine the effect of sunlight on Earth's surface.

Science and Engineering Practices

Asking Questions and Defining Problems

Ask questions based on observations to find more information about the natural and/or designed world.

Analyzing and Interpreting Data

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

Disciplinary Core Ideas

Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface.

Crosscutting Concepts

Patterns

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

Cause and Effect

- Events have causes that generate observable patterns.

ELA/Math:

ELA: RI.K.1, SL.K.3

Vocabulary:
- **cold** - a low temperature
- **cool** - a temperature less than warm, but not cold
- **hot** - a high temperature
- **temperature** - how hot or cold something is
- **thermometer** - tool for measuring the temperature
- **warm** - a moderate temperature

Misconceptions:
Sunlight affects all surfaces the same.

Procedure

Part 1:

Phenomenon:
The students will see first-hand that sunlight warms different surfaces differently.

Tell students that you have not been able to find that TV channel again- the one with that crazy meteorologist. Ask the students what the meteorologist could have done to get the weather report correct. The students will probably say things like:

- He/she could have checked to see if their weather tools they were using were working properly.
- He/she could have watched another weather report on TV first
- He/she could have just gone outside!

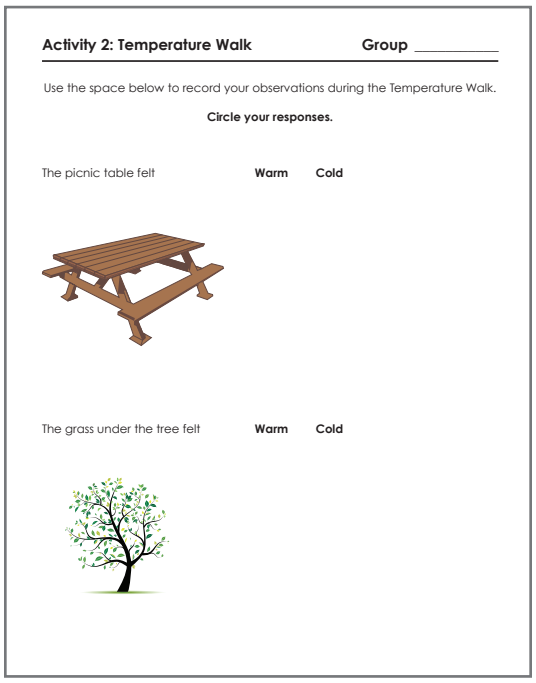
1. Activate student's prior knowledge by reading a trade book about the weather on a sunny day. (consult reference section online and at back of teacher's guide)
2. Remind students of the guessing game that was played in the last lesson.
3. On your whiteboard or on chart paper, create a quick **bar graph** of the student's favorite or least favorite kind of weather. Use the weather symbols from your calendar, and there are some additional laminated weather cards in your kit.
4. Ask the students what the weather is like today and record the symbol on the classroom calendar.
5. Tell the students that because today is such a sunny day, you are all going on a temperature walk.
6. Students will be working in small groups to record some observations about **temperature**.
7. Ask what they think the word temperature means. Accept all responses that refer to variations of **warm** or **cold**.

SEP: Science and Engineering Practice(s):

Analyzing and Interpreting Data:
Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.

8. Ask how temperature is measured and show them the demonstration thermometer. It is not necessary at this point to explain how the thermometer works. Tell them that this is a tool for measuring the temperature inside or outside.

   Show the students the recording sheets, and divide them into groups of 3-4



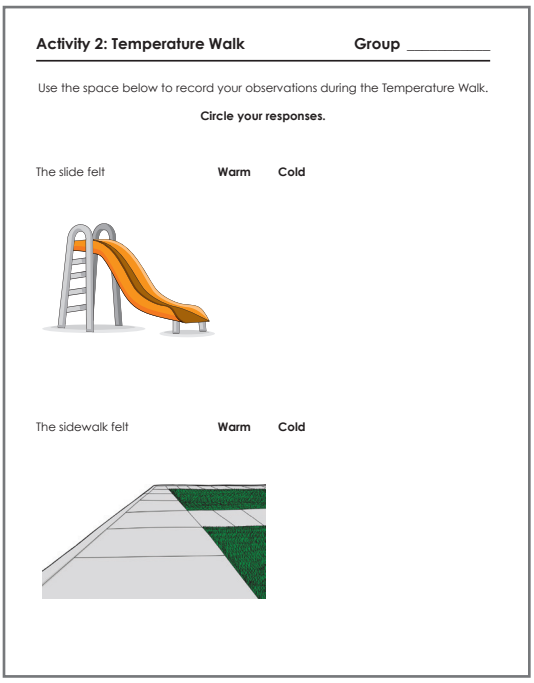
Activity 2: Temperature Walk **Group** _____

Use the space below to record your observations during the Temperature Walk.

Circle your responses.

The picnic table felt **Warm** **Cold**

The grass under the tree felt **Warm** **Cold**



Activity 2: Temperature Walk **Group** _____

Use the space below to record your observations during the Temperature Walk.

Circle your responses.

The slide felt **Warm** **Cold**

The sidewalk felt **Warm** **Cold**

9. Each group only needs 1 recording sheet. Assign each group a number to write on their sheet. Quickly make note of who is in which group.

   NOTE: This recording sheet is not included in the Student Science Journals.

10. Before taking the class outside, review all the safety rules about going outside as a class. For example, stay with your group members. Do not run. Do not touch any surface unless you are instructed to by the teacher.
11. Choose a specific spot where you will both begin and end the class with the students.
12. Keep the groups of students together on the way to the playground so that you can ask some children to touch a surface and report if it is warm or cool. Choose some surfaces in both the shade and in the sun.
13. While you are having students touching some surfaces in the shade and in the sun, place a piece of black construction paper in both locations. Put a small stone or something on the paper to keep it from blowing away. Tell the students that you will be checking back on the paper on your way back into the building.
14. Direct the students to their recording sheets and instruct them to find the things or surfaces you have photographed. Choosing eight items for the sheets will insure that teams of 4 each get a chance to be recorder twice.

CCC: Crosscutting Concept(s):

Cause and Effect:
Events have causes that generate observable patterns.

Closing the Lesson

- Signal for the students to return to the spot you where you started the lesson outside, and ask them to sit down with their group members.
- Once they are seated, discuss responses to some of these questions.
  1. How does sunlight **affect** our playground? (possible responses might include the sun makes our playground very warm.)
  2. How does sunlight **affect** what we wear? (we dress for warmer or colder temperatures)
  3. How does your skin feel on a sunny day? (my skin feels warm)
  4. **Does it feel the same** on a sunny day in winter as it does on a sunny day in summer? This may be a difficult question for the students. You could also ask them would they take off their coat in winter just because it was sunny outside. (No because the air is still cold)
  5. Does the temperature feel the same in the evening as in the morning? (no, it is generally cooler in the evening once the sun has gone down) Ask if any of the students have experienced needing to wear a sweater or jacket at night when it was nice and warm during the day?
- The students may have **additional questions** that can be addressed when you return to the classroom.
- Return to the place where you left the two pieces of black paper in the sun and in the shade. Without removing the papers, have the students touch each of the papers and decide which one is warmer. (the one in the sun, because the **sun makes things warm or hot.**)
- Collect the **recording sheets** from the children. Make sure that a group number is written on each sheet. Return to your classroom.

This is a possible ending point for Part 1

SEP: Science and Engineering Practice(s):

Asking Questions and Defining Problems:

Ask questions based on observations to find more information about the natural and/or designed world.

CCC: Crosscutting Concept(s):

Cause and Effect:

Events have causes that generate observable patterns.

SEP: Science and Engineering Practice(s):

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.

SEP: Science and Engineering Practice(s):

Analyzing and Interpreting Data:

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

Lesson 2 Let's Take a Temperature Walk (Sunny) *cont.*

SEP: Science and Engineering Practice(s):

Asking Questions and Defining Problems:
Ask questions based on observations to find more information about the natural and/or 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.

Analyzing and Interpreting Data:
Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.

CCC: Crosscutting Concept(s):

Cause and Effect:
Events have causes that generate observable patterns.

Part 2:

- Allow the students to sit with the members of their group from the Temperature Walk, and **discuss** their **findings** with other members of the group. Ask student(s) to **explain** why some of the surfaces on the playground felt warm and others cool. (because some of the surfaces were more in the sun than others)
- Remind the students what they discovered about the two identical pieces of black paper.
- Be certain that the students understand it is the **sun that warm's** the Earth's surfaces.
- Teach students the **Weather song** that is sung to the tune of B-I-N-G-O

We have weather every day.
Today is sunny weather.
S-U-N-N-Y, S-U-N-N-Y, S-U-N-N-Y
Today it's sunny weather!

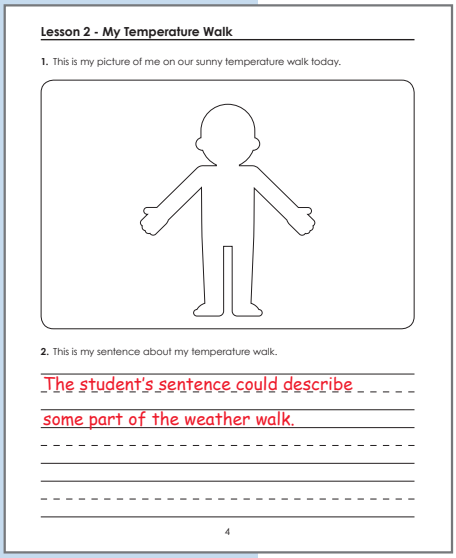
This same song can be sung for rainy, snowy, windy, cloudy weather.

Assessment

Distribute the Student Science Journals and have students complete Activity 2. Both this assessment sheet and the team recording sheets may serve as formative assessments. **Look for the drawings to contain the sun and students dressed in appropriate clothing for the season of your temperature walk.** The students may also write or dictate a sentence about their picture to the teacher. They would write the sentence under the picture.

You may instruct the students to cut out the pictures from page 5 in the Student Science Journal, and paste them in the correct column on page 4.

If you have an Interactive White Board in your classroom, this activity is also available as a Smart Notebook file located in Teachers Resources on the website.

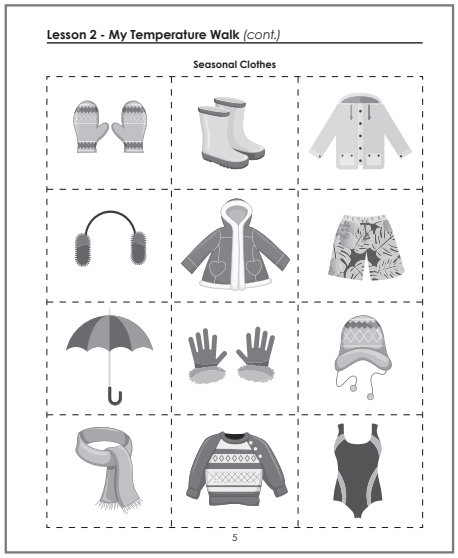

Lesson 2 - My Temperature Walk

1. This is my picture of me on our sunny temperature walk today.

2. This is my sentence about my temperature walk.

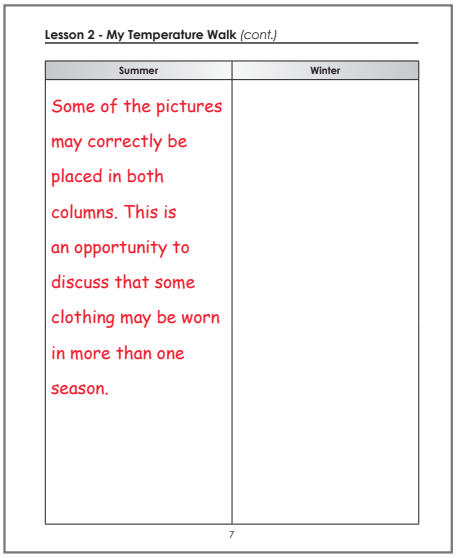
The student's sentence could describe some part of the weather walk.

4


Lesson 2 - My Temperature Walk *(cont.)*

Seasonal Clothes

5


Lesson 2 - My Temperature Walk *(cont.)*

Summer	Winter
Some of the pictures may correctly be placed in both columns. This is an opportunity to discuss that some clothing may be worn in more than one season.	

7

Connections

Differentiation:

ELL: may need additional support completing the recording sheets outside. It would be helpful to have some key vocabulary reviewed in their native language prior to going outside. You might provide pictorial choices instead of asking students to draw.

Special Education: Request assistance from an aide when taking the students outside. They may also need assistance completing the recording sheet. Provide one on one assistance or extra time as necessary. Allow them to work in a smaller group. A suggestion might be to select one specific tree or shrub and observe it at various times during the year. Document any changes with photographs. The students could write about the changes. This will give students a concrete experience on which to hook their learning.

Cross-Discipline: A discussion from this lesson might be useful in Social Studies when students are learning more about the climate of an area of the world.

This lesson should be repeated numerous times during the year and titled Windy Walk, Rainy Walk, Snowy Walk etc. The SUNNY Weather Song can be sung again substituting new words. These walks will provide a multitude of opportunities for students to practice mathematics skills such as measuring, counting and classifying.

Next Lesson Preparation

The next lesson will include some informal graphing with the students. Gather enough card stock and create cards with images of different types of clothing for different kinds of weather. You can also make cards with seasons on them.