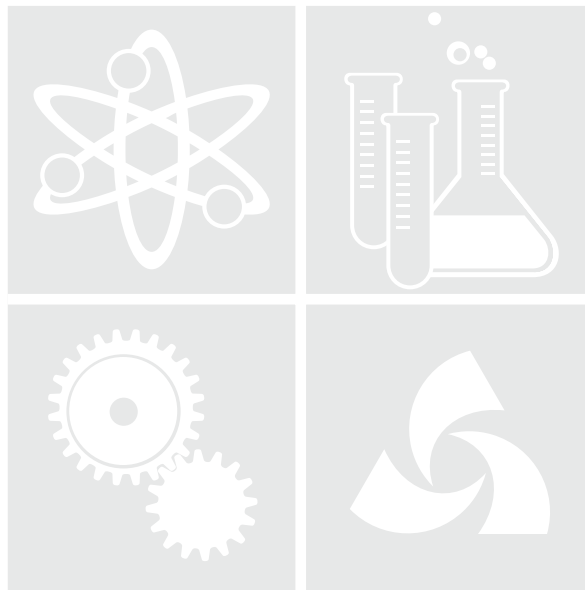
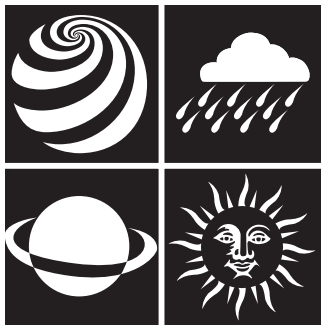


Grade

1

Strategic
Science
Teaching





Title of Lesson:

Air Throughout the Day



Conceptual Statement:

The temperature of air changes throughout the day.



Conceptual Learning Sequence:

This lesson is part of a conceptual unit on weather that addresses the concept that the sun, land, water and air interact to create weather. It is appropriate after students have observed weather patterns over a period of time and have learned some of the properties of air. This lesson explores air's ability to be heated and cooled. Following this lesson, students learn that the sun warms the water and the land which, in turn, heats the air.

Student Outcomes:

- Students learn that air temperature changes throughout the day.
- Student record observations and data during an investigation of air temperature during the day.
- Students experience and practice the “Think Aloud” strategy to link prior knowledge with new information in the reading selection.

Lesson Overview:

In this lesson, students use an outdoor thermometer to record the changes in air temperature throughout the day. They analyze their data to compare temperature changes over time and write a conclusion.



English Language Learning:

English Language Development standards are referenced in the lesson where appropriate. The hand icon appears throughout the lesson when learning strategies and lesson components are identified as pathways for academic success and reflect critical developmental differences for students who are English learners.

Literature in the Science Learning Cycle:



The book *Weather Words and What They Mean* is used in the EXPLAIN stage of the learning cycle and *Air is All Around You* is used in the lesson during the EVALUATE stage.



Learning Strategy: (included at the end of this lesson plan)

Teachers model “Think Aloud” in the EXPLAIN stage by verbalizing their own thought processes while reading orally to students. Students practice “Think Aloud” with a second reading selection to revisit their understanding about air changing temperature. (See Appendix pages 90-91.)

Literature Selections:

Title: *Weather Words and What They Mean*

Author: Gail Gibbons

Publisher: Holiday House, 1992 ISBN: 082340952X

Annotation: Common weather words and other weather related phenomena are explained in *Weather Words and What They Mean*. Air pressure, fog, clouds, moisture, temperature and wind are just a few of the vocabulary words defined in a simple dictionary-like book for young readers.

Genre: Non-fiction



Title: *Air is All Around You*

Author: Franklyn M. Branley

Illustrations: Holly Keller

Publisher: Harper Collins, 1986 ISBN: 0064450481

Annotation: The author makes science concepts understandable in *Air is All Around You*. Young children learn the various properties of air and investigate that air takes up space and that air is dissolved in water in this “Let’s Read and Find Out Science” series (Stage 1).

Genre: Non-fiction



California Science Content Standards:*

Science: Grade 1, Earth Science

3. Weather can be observed, measured, and described. As a basis for understanding this concept:

- Students know how to use simple tools (e.g. thermometer, wind vane) to measure weather conditions and record changes from day to day and over the seasons.
- Students know that the weather changes from day to day, but trends in temperature of rain (or snow) tend to be predictable during a season.
- Students know the sun warms the land, air, and water.



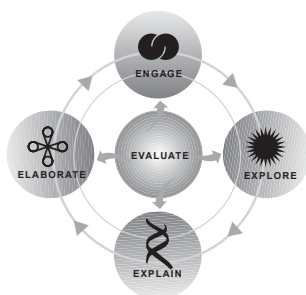
4. Investigation and Experimentation

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- Draw pictures that correctly portray at least some features of the thing being described.
- Record observations and data with pictures, numbers, and/or written statements.
- Record observations on a bar graph.

*Selected standards addressed within this lesson.

Lesson at a Glance



Science Learning Cycle	Objective Science Thinking Process	Suggested Time Entire lesson could be completed in 5 days.
ENGAGE	Students engage in making observations of how the air feels. They compare this data with how the air feels at other times of the day and year. Observing, Comparing, Communicating	20 minutes
EXPLORE	Students discuss their observations from the ENGAGE stage and make predictions about the temperature changes they observe. Students explore ideas about scientific procedures and develop a plan for observation. Students explore changes in air temperature throughout the day. Observing, Comparing, Communicating	Part I: 40 minutes Part II: 15 minutes four times during the day
EXPLAIN	Students use their observations and data to explain what they know about changes in air temperature. Students listen as the teacher models using the “Think Aloud” strategy while reading selection pages in <i>Weather Words and What They Mean</i> . Observing, Comparing, Communicating	30 minutes Part IV: 30 minutes
EVALUATE	With a partner, students use the “Think Aloud” strategy to read selected pages in <i>Air is All Around You</i> . In so doing, students evaluate their prior knowledge and new information they learned. The EVALUATE stage is used here rather than at the end of the lesson to maximize the use of the learning strategy. The Teacher continues to evaluate in other stages of this lesson. Observing, Comparing, Communicating	40 minutes
ELABORATE	Students elaborate on their understanding as they conduct additional investigations of temperature and/or other properties of air from <i>Air is All Around You</i> . Observing, Comparing, Communicating, Applying	45 minutes



Air Throughout the Day

Teacher Background:

The sun is the source of most of the energy that warms Earth. A small amount of energy that warms Earth comes from Earth's interior but this generally has little effect on everyday temperature changes.

Many people think the air temperature is warmest when the sun is directly overhead. However, a temperature log generally shows a rapid temperature increase in the morning, a slow increase in the early afternoon, a slow decrease in the late afternoon, and a fairly steady but rapid decrease during the night. The coolest temperature is just before sunrise. The warmest air temperature is generally about 3 P.M. Of course, a cold wind, cloud cover, rain, and other weather conditions can cause changes in this normal pattern.

What causes this regular air temperature pattern? The air is not heated directly by the sun's energy. Instead, the sun's energy is absorbed directly by the land and water. This energy is then transferred to the air molecules around the land and water, thus warming the air.

Related California Content Standards

Math: Grade 1

Measurement and Geometry

- 1.0 Students use direct comparison and non-standard units to describe the measurement of objects.
- 1.2 tell time to the nearest half hour and relate time to events

Statistics, Data Analysis and Probability

- 1.0 Students organize, represent, and compare data by category on simple graphs and charts:
- 1.2 represent and compare data by using pictures, bar graphs, tally charts and picture graphs.

Language Arts: Grade 1

Reading

- 1.0 Word Analysis, Fluency, and Systematic Vocabulary Development
Students understand the basic features of a reading.

Concepts About Print

- 1.1 match oral words to printed words
- 1.3 identify letters, words and sentences

2.0 Reading Comprehension

Students read and understand grade-level-appropriate material.

Comprehension & Analysis of Grade-Level-Appropriate Text

- 2.4 use context to resolve ambiguities about word and sentence meanings
- 2.6 relate prior knowledge to textual information

Writing

1.0 Writing Strategies

Students write clear and coherent sentences and paragraphs that develop a central idea.

Organization and Focus

- 1.1 select a focus when writing

Penmanship:

- 1.3 print legibly and space letters, words, and sentences appropriately

Written and Oral English Language Conventions

1.0 Written and Oral English Language Conventions

Students write and speak with a command of standard English conventions.

Sentence Structure

- 1.1 write and speak in complete, coherent sentences

Punctuation:

- 1.5 use period, exclamation point, or question mark at the end of sentences.

Capitalization:

- 1.7 correctly capitalize the first word of a sentence

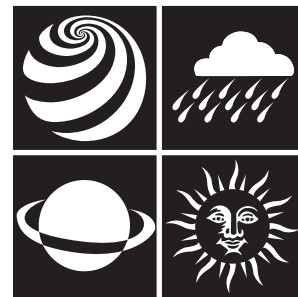
Listening and Speaking

1.0 Listening and Speaking Strategies

Students listen and respond critically to oral communication.

Comprehension

- 1.1 listen attentively
- 1.2 ask questions for clarification and understanding
- 1.3 give, restate, and follow simple two-step directions

**VOCABULARY**

air – a mixture of gases that is all around Earth

energy – the power of certain forces in nature to do work

heat – warmth; a form of energy

sun – the very hot, bright star that is the center of our solar system and creates daylight

temperature – the degree of heat or cold in something

thermometer – a device for measuring temperature

Related California Content Standards**English Language Development: Grade 1**

Listening and Speaking:

Early Intermediate–Ask and answer questions using phrases or simple sentences

Reading Work Analysis:

Intermediate–Understand that printed materials provide information.

Reading Fluency and Systemic Vocabulary Development:

Intermediate–Apply knowledge of content-related vocabulary to discussions and reading.

Advanced–Read simple one-syllable and high-frequency words

Reading Comprehension:

Beginning–Draw pictures from student's own experiences related to a story or topic.

Writing:

Beginning–Write a phrase or simple sentence about an experience generated from a group story.

Grouping: Whole class, partner, individual

For hands-on activities, mix the EL with the native speakers.

Materials:**Per Class**

Air Investigation Class Chart (Teacher Page 1.0)

Four large paper thermometers, each drawn on a separate piece of chart paper

Literature selection *Weather Words and What They Mean* by Gail Gibbons

(Big Book if possible, or one book per group)

Chart paper

Per Group

1 outdoor thermometer

Sign that says, Do Not Disturb–Science Experiment

Per Student

Copies of Student Pages 1.1-1.5

Red crayon

Pencil

Literature selection, *Air is All Around You*, by Franklyn Branley

Advanced Prep:

1. Prepare the Air Investigation Class Chart (Teacher Page 1.0)
2. Prepare four large class thermometers on chart paper, Fahrenheit or Celsius to match the scan on the actual thermometer the class will use.
3. Prepare the “What We Know About Air” chart for recording brainstorming.
4. Duplicate Student Pages 1.0 -1.2, 1.5, and the appropriate thermometer Student Page 1.3 or 1.4 according the thermometers used for the investigation (Celsius, Student Page 1.3 or Fahrenheit, Student Page 1.4)

Teacher Resources:

Kerrod, Robin, *Fantastic Facts about Weather*, Southwater, 2000.

Teacher Tips:

- Teach this lesson on a warm, sunny day.
- Have students place the group's outdoor thermometer in the shade and not in the sun. If the thermometer is in the sun it isn't measuring the air temperature; it is measuring the sun's radiant energy on the thermometer.
- Use either all Celsius or all Fahrenheit thermometers for the investigation.
- Students should have some experience with reading a thermometer before conducting the investigation.
- Duplicate extra worksheets if you want students to make more than four temperature readings.
- If students need more hands-on explorations to learn about the properties of air, conduct the two investigations in the book, *Air is All Around You*, pages 8-17.
- Student summaries should state what is directly in the data, not attempt to explain data.

Common Misconceptions:

Some students might think the sun is warming the air rather than understand that the sun heats the land and water, which in turn heats the air. Further investigations in the unit should help students understand this concept of heat transfer.

Related Student Resources:

Dewitt, L., Carol, C.. *What Will the Weather Be?*, Harper Trophy, 1993.

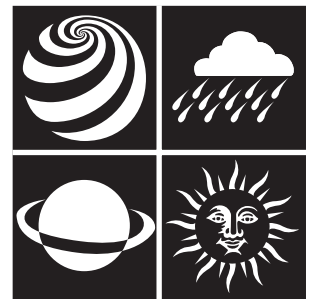
Dorros, Arthur. *Feel the Wind*, Harper Collins, 1989.

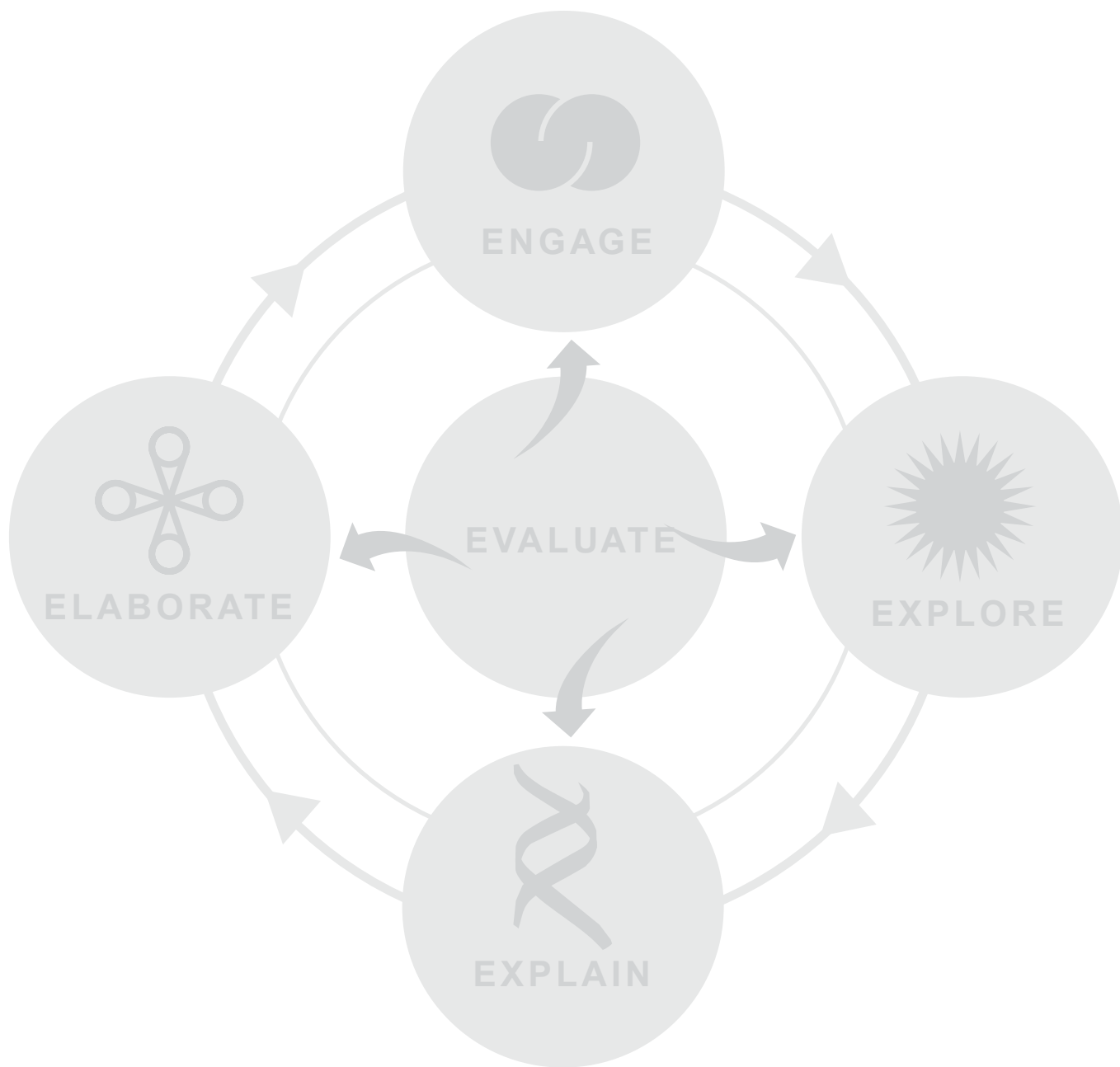
Gibbons, Gail. *The Reason for Seasons*, Holiday House, 1996.

Gibbons, Gail. *Sun Up, Sun Down*, Scholastic, 1983.

Lesson Credits:

This lesson is adapted from *Weather, a Storyline Unit for 1st grade*, developed by the K-12 Alliance (CSIN-SPAN-SS&C), 2000.





The Science Learning Cycle:

Air Throughout the Day



ENGAGE: Day 1

1. Ask students to briefly step outside the classroom and observe the weather. Have students return to the classroom and ask them to share their descriptions. How did the air feel on their skin? Do they think it would feel the same in the afternoon? In the evening? How might it feel at those times? Record the student's ideas on a class chart **What We Know About Air**.
2. Have students tell you other words that help describe how the air feels during other parts of the day or during other seasons.
3. Read the recorded statements/words aloud with the class. Ask students if there are other words or phrases that tell what else they know about air. (For example – air is a gas, air is invisible, wind is moving air)
4. Remind students they already know a lot about the air. Over the next couple of days they will do some additional investigations to learn more about air.



EXPLORE: Part I: Day 2

5. Tell students that, like scientists, they made observations about how the air feels on their skin. Ask students what questions they have about their observations. If necessary prompt with questions such as: "What do you think causes the air to feel differently during the day?" "Do you think the air temperature is the same all day long, or does it change?"
6. Explain to students that if they are going to investigate air temperature they will need to keep a record of their thinking. Show students the **Air Investigation Class Chart** Teacher Page 1.0. Review the different parts of the **Air Investigation Class Chart**. (Teacher Page 1.0)
7. Read the question "Does the air temperature change throughout the day?" on the class chart. Ask students to think about this question for the investigation and predict what will happen as they observe air temperature throughout the day. Have students discuss their predictions with a partner. Write examples of the predictions on the **Air Investigation Class Chart** Teacher Page 1.0 under "Our Predictions."
8. Distribute Student Page 1.0 and ask students to write their name on the top of the page. Explain to students they will also record information (data) about the investigation on air, just like a scientist. Ask students; "Why is it important to record information from the investigation?"
9. Ask students to write their own prediction and complete the sentence frame on Student Page 1.0, "I predict the air temperature will _____."
10. Ask students how they can find out if the air temperature changes during the day. If necessary lead the discussion towards placing thermometers outside and measuring the temperature throughout the day.
11. Help students think about the materials they would need to conduct the investigation. How will they measure the temperature (thermometer); where will they record their data (student sheet); how will they know when to take a measurement? (clock, timepiece). Record the word and a picture of the materials under the Materials section of the **Class Chart** Teacher Page 1.0 and ask students to record it on Student Page 1.0.
12. Ask students what would the first step be if they wanted to find out if the air temperature changed throughout the day. Check to see that the steps include at least four readings at times that students think are best for recording the air temperature. Record procedures on the **Air Investigation Class Chart** Teacher Page 1.0 with times in the data column (include illustrations for visual cues e.g., clock with times, picture of a thermometer, etc.). Have students record the procedures on Student Page 1.0.
An example of a procedure is
 1. Find a safe place outside to set the thermometer in the shade.
 2. Take the temperature of the air at different times 9:00AM, 11:00AM, 12:30PM, 2:00PM
 3. Record the temperatures on the chart.
 4. Use the data to understand the question that we investigated.

The Science Learning Cycle: Air Throughout the Day

13. Ask students to record the four agreed upon times in the data chart under "Time of Day" on Student Page 1.1. Ask students what time of the day do they think the air will be the warmest? Have students use a red crayon to circle the box on the data section with the time of day they think will be the warmest.
14. Explain to students they are now prepared to conduct the investigation. When they return the next day they will complete the investigation.

Part II: Day 3

15. Put students in groups of three or four and assign a number to each group. Have students read and review Student Page 1.0 with a partner. As a class, also review the procedures. Distribute one thermometer to each group. Ask students to take a pencil and their Student Page 1.1 with them. Ask each group to go outside and find a safe place in the shade to set their thermometer for the day. Place a "Do Not Disturb-Science Experiment" sign by the thermometer. Have students record their first temperature reading and location of their thermometer on the data chart on Student Page 1.1.
16. Upon return to the classroom, ask groups to report their data. Record temperatures on the data section of the class **Air Investigation Chart** Teacher Page 1.0 next to the corresponding time for each group.
17. Demonstrate how to color the thermometer on the large classroom thermometer. Distribute Student Page 1.2 or 1.3 and ask students to record their data (the time and temperature) in the appropriate boxes. Ask them to color the thermometer red to show the temperature for the first reading.
18. Repeat step 15-17 for the other three readings.



EXPLAIN: Part III: Day 4

19. Have students look at the data on the **Class Air Investigation Chart** Teacher Page 1.0 and their own recordings on Student Pages 1.0-1.1 and 1.2 or 1.3. Ask the students to discuss the data from their investigations. Did the temperature change or stay the same? How do you know? When was the temperature the warmest? When was the temperature the coolest? How did their prediction compare with the actual data? Record student responses in the "Summary" section of the **Air Investigation Class Chart** Teacher Page 1.0. Ask students to write at least one sentence summarizing what they noticed about the data on Student Page 1.1. (A summary of the data simply states what is in the data, (e.g., At 2:00 it was 83 degrees. It was warmer at 2:00 than at 11:00.)
20. Ask students what they think caused the air to get warmer. Record their ideas on chart paper. Based on student answers, lead a discussion about the sun's role in the temperature differences. What did students learn about air temperature from the investigation? Record responses in the Conclusion section of **Class Air Investigation Chart** Teacher Page 1.0 and ask students to record their understanding on Student Page 1.1. (Example-The air temperature changes from the morning to the afternoon. Air is not the same temperature all day.) Note: A discussion of night time temperature is addressed in the ELABORATE section #29.

Part IV:



21. Distribute the book, *Weather Words and What They Mean* to each group (or use book as a read aloud). Ask students to turn to page 6 and find the word TEMPERATURE in the box at the top.



22. Use the "Think Aloud" strategy for pages 6-7 from *Weather Words and What They Mean*. Take this opportunity to model for students the kinds of strategies a skilled reader uses to construct meaning and cope with comprehension problems.

Example:

Read the two pages aloud, telling students to follow along silently and listen to how you construct meaning and think through trouble spots. (For example "This word must be temp-er-a-ture and not ther-mo-meter because it doesn't begin with a th.")

- Describe any pictures forming in your head while you read. Use examples from the Air Investigation. (For example "It says that the temperature goes up and down. My data chart also showed that the air temperature goes up and down.")

The Science Learning Cycle: Air Throughout the Day

- Show how to link prior knowledge with new information in the reading selection. ("I remember talking about how the air temperature is different at nighttime and in the winter and summer.")
 - Show how you monitor your ongoing comprehension and become aware of problems. ("I wonder what the word 'mild' means?" What does it mean when the sun is 'low in the sky'?)
24. Refer to the **"What We Know About Air"** class chart. Ask students if there is any new information or phrases from the Air Investigation or the two pages they just read that can be added to the chart.



EVALUATE:

25. Distribute the literature selection to each student, *Air is All Around You*. Review the "Think Aloud" strategy modeled in the EXPLAIN section of the lesson. If necessary, model the strategy again for students while reading pages 3-7. If students are ready, pair them and ask partners to read pages 3-7 with each other. After reading, ask students if there are any new words or phrases that can be added to the "What We Know About Air" chart.
26. Depending on student reading level, either have students continue to read pages 18-32 with their partner or read the selection aloud to students while they follow along. (Do not read pages 8-17.) Add new information or phrases to the **"What We Know About Air"** chart.
27. Ask students to think about what they have learned about the temperature of air throughout the day. Distribute Student Page 1.4. Ask students to write and draw at least two new things they learned from the lesson. Tell students they can use the "What We Know About Air" chart, their Student Pages, or the literature books to help them explain their thinking. Note: Student responses should demonstrate understanding that temperature of the air changes throughout the day.
28. Combine the pages into a class book "What We Learned About Air Temperature!" for others to read and enjoy.



ELABORATE:

29. Ask students who have thermometers at home to record the air temperature in the evening and bring the temperature readings to school the next day. Discuss their results: How does the night temperature differ from the daytime temperature? Why? Link this discussion to the changes they noted during the day.
30. Ask students to think about a cloudy or rainy day. How do they think the temperature will change on those days? What is the basis for their thinking? Repeat this activity on a cloudy day or a rainy day and compare results to the student discussion.

Teacher Reflection:

1. How does the student work provide evidence that they learned air temperature changes throughout the day?
2. What instructional strategies used in this lesson promote student understanding? How do you know?
3. How does the literature selection support student understanding of the science concepts?
4. How would you modify instruction to ensure understanding of student outcomes by all students?

Air Temperature Investigation Chart

Question: Does the air temperature change throughout the day?

Our Predictions:

Materials:

Our Procedures:

- 1.
- 2.
- 3.

Our Data: (make as many data charts as you have groups and label, Group 1, Group 2, etc.)

Group # _____

Location _____

Time of Day	Temperature

Summary of Data: (Sentences that state the observations)

Our Conclusions: (Interpretations of why temperature changes.)

Air Temperature Investigation

Question:

Does the air temperature change throughout the day?

My Prediction:

I predict the air temperature
will _____

Materials:

Procedure:

My Data: Group _____

Location: _____

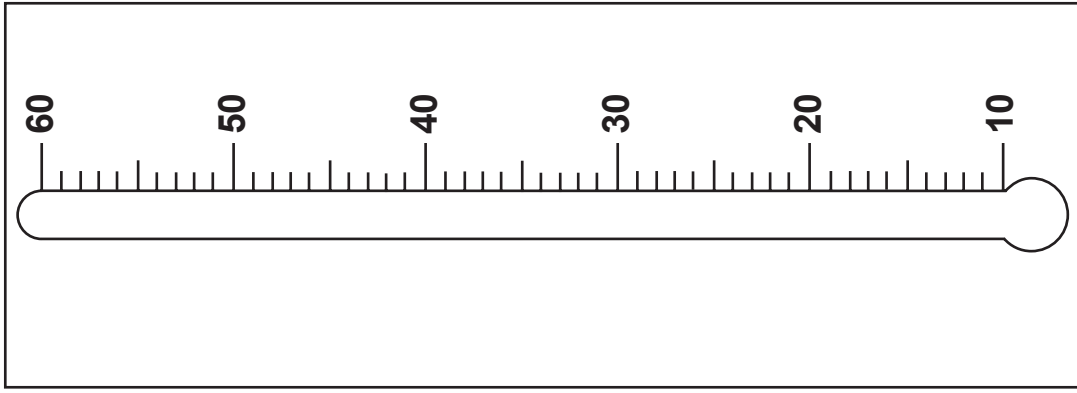
Time of Day	Temperature

Summary:

My Conclusions:

Celsius

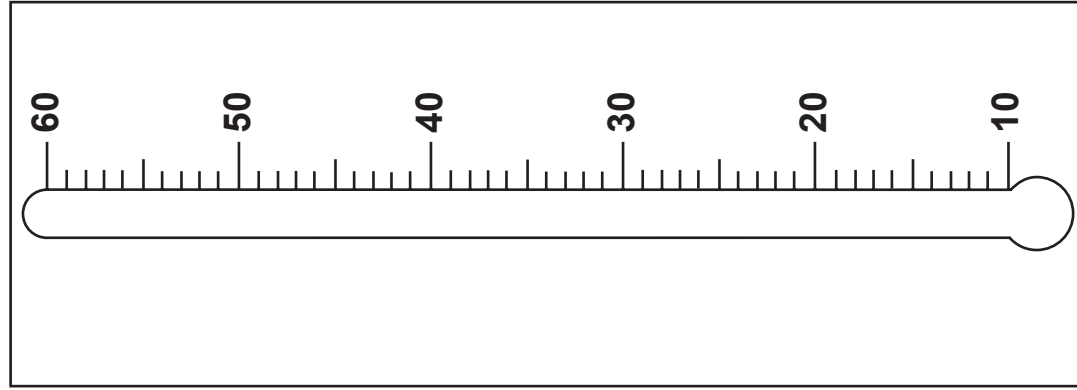
4th Reading



Temperature

Time

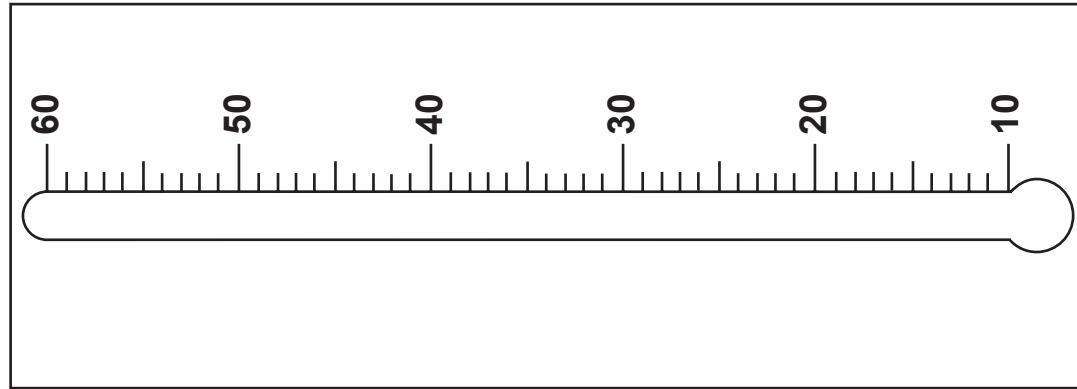
3rd Reading



Temperature

Time

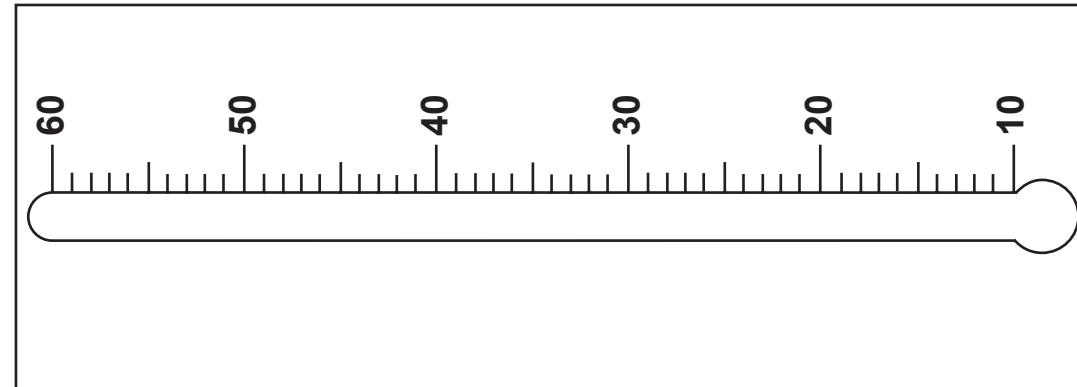
2nd Reading



Temperature

Time

1st Reading

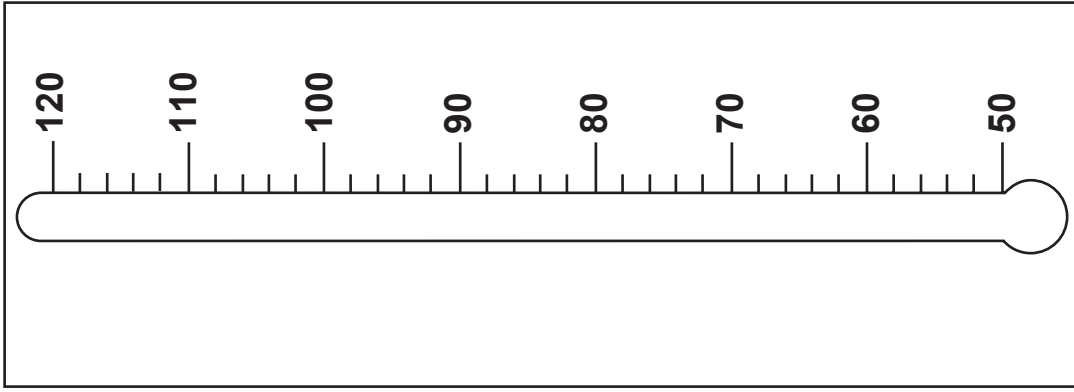


Temperature

Time

Fahrenheit

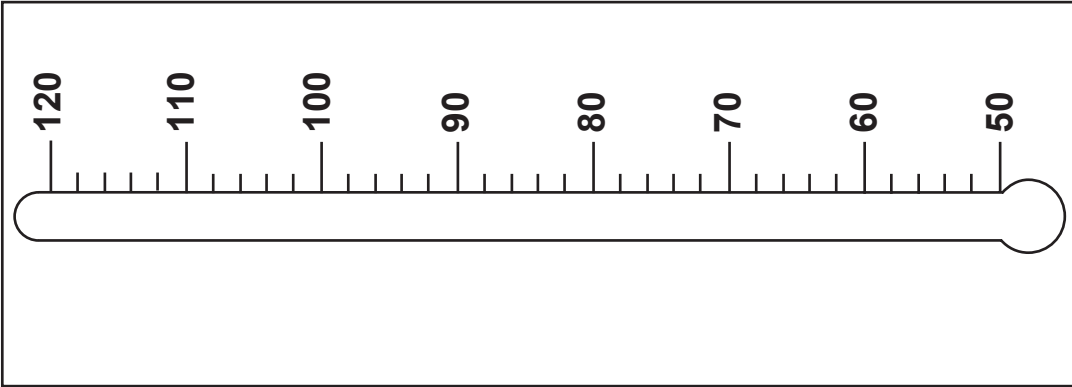
4th Reading



Temperature

Time

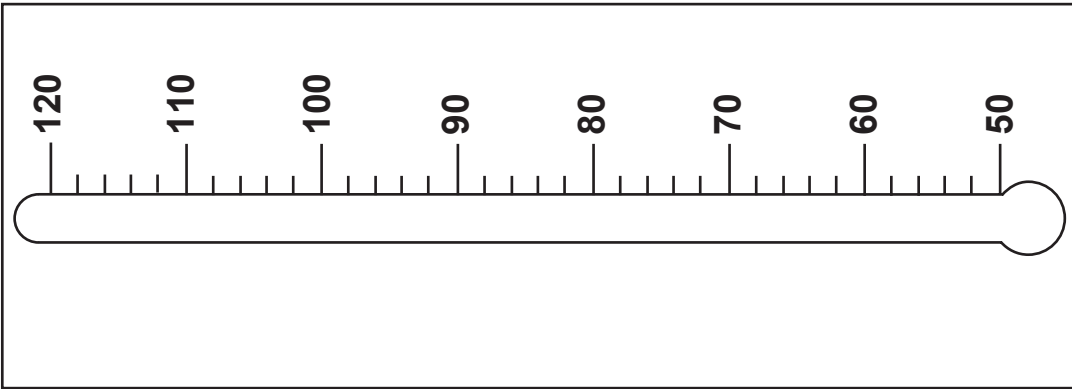
3rd Reading



Temperature

Time

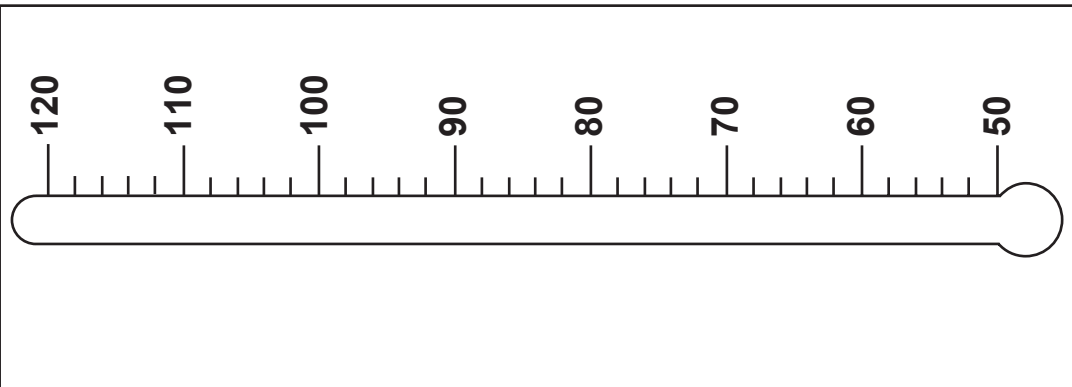
2nd Reading



Temperature

Time

1st Reading



Temperature

Time

Air is All Around

What have you learned about air temperature?

Think Aloud

The think-aloud strategy is an approach in which teachers verbalize their own thought processes while reading orally to students. In this way teachers model for students the cognitive and meta-cognitive¹ processes that good readers use to construct meaning and monitor comprehension.

Goals

1. Give students the opportunity to see the kinds of strategies a skilled reader uses to construct meaning and cope with comprehension problems.
2. Develop students' ability to monitor their reading and take corrective action when needed.
3. Provide an opportunity for students to experience effective reading and problem solving and to transfer these strategies to their independent reading.

Teacher Preparation

1. Select a passage that contains points of difficulty, ambiguities, or unknown words in preparation for oral reading.
2. Preview the passage and imagine that you are reading it for the first time as one of your good readers would.
3. Use a copy of the passage to make note of the comments and questions to model for students.

Instructional Procedures

1. Read the passage aloud, telling students to follow along silently and listen to how you construct meaning and think through trouble spots. The following are examples of the thought processes you might model for your students:
 - Make predictions. (Show how to develop hypotheses.)

¹Metacognition means awareness of one's own processing behaviors.

- Describe any pictures forming in your head while you read. (Show how to develop images during reading.)
 - Share an analogy. (Show how to link prior knowledge with new information in the reading selection.)
 - Verbalize a confusing point. (Show how you monitor your ongoing comprehension and become aware of problems.)
 - Demonstrate fix-up strategies. (Show how you address comprehension problems by using fix-up strategies.)
2. Select a logical stopping point, and have students use some of those strategies during a silent reading of the passage.
 3. Model several experiences, then have students work with partners to practice "think alouds" by taking turns in reading orally and sharing thoughts. For struggling readers, move from carefully developed materials with obvious problems to school materials of various types and lengths.

Relevant English–Language Arts Content Standards

Grades Two Through Four: Reading Comprehension

- 2.0 Students read and understand grade-level-appropriate material. They draw upon a variety of comprehension strategies as needed, including generating and responding to essential questions, making predictions, and comparing information from several sources.

Grade Four: Reading Comprehension

- 2.2 [Students] use appropriate strategies when reading for different purposes (e.g., full comprehension, locating information, personal enjoyment).

Further Resources

Davey, B. "Think Aloud—Modeling the Cognitive Process of Reading Comprehension," *Journal of Reading* (October 1983), 44–47.

STRATEGY INDEX	
Student Audience	
Beginning readers	
Below grade level	
At or above grade level	
Text Type	
Literary	
Informational	
Special Features	
Automaticity with print	
Prior knowledge and interest	
Discussion about texts	
Collaborative learning	
Writing emphasis	
Graphic representation	
Student control of reading process	
Student ownership of strategy	

Example of Think Aloud

The following material is an example of a passage and the thoughts that a teacher might express aloud during the oral reading:

Passage

Salaam frantically searched for the address listed on his clipboard; he had six more packages to deliver before his shift ended. The building he had entered had eight floors, and he hoped that number 456 Lakeside was an apartment on the fourth floor of this old, dilapidated building.

Teacher Thinking Aloud

I predict that Salaam, who is a delivery man for a shipping company, will not find the address because the author described the building as being run-down.

I see the building as being one of many apartment buildings on a busy street in a big city. I imagine that there could be paint peeling off the walls and bars on the windows.

I can compare this situation to the time I was in my hometown, and I had driven into an area that looked like what the author is describing. I was afraid and wanted to leave.

Passage Continued

Salaam climbed the stairs to the fourth floor. As he walked from door to door checking numbers, he felt the floor vibrate. He felt invisible hands push him from side to side. The whole building started to rumble. Hanging on to the package, Salaam reached for the bannister on the stairwell as it gave way.

Teacher Thinking Aloud

I don't understand how invisible hands could be pushing him. I'm not sure what is happening to Salaam and where the story is going.

I'm going to keep reading and hope my level of understanding will increase. If it doesn't, then I will reread the passage or ask someone.