10 EASY STEPS TO TEACH WEATHER

The step-by-step teacher's guide

Based on NSE Standards

Includes 56 ready-to-use flashcards
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Step 1
USING THIS BOOK

This Book Was Designed for You —
a talented, yet busy teacher. We know that you want to provide students with the most interesting and comprehensive units of study possible. We also know how much time it takes to fully prepare to teach a topic. That’s why we developed the 10 Easy Steps series. We’ve covered all the bases. From planning to implementation — it’s all here.

1. Using This Book
This section contains background information on this book and a peek into what you’ll be teaching during the 10 lessons.

2. Gather Great Resources
In this section you’ll find a list of books to use when teaching yourself and others about weather, a list of web sites that help explain the weather topics you’ll be teaching, and a list of field trip and guest speaker ideas. There’s even a letter for parents to help you find a great speaker!

3. Speak the Lingo
This is where you’ll find all the vocabulary words and definitions specific to the topics covered in this book as well as worksheets and pocket chart ideas designed to reinforce the vocabulary.

4. Set the Scene
It’s important to set the tone for the unit of study. This means transforming your classroom environment to reflect the concepts being taught. In this section you’ll find great ideas for interactive learning areas and classroom decoration.

5. Plan a Project
In this section you’ll find plans for an on-going project students will be working on throughout the unit of study. It’s a great way to apply what they’re learning each day.

6. Teach Ten Terrific Lessons
Ten complete lessons can be found within this section. Each lesson includes essential concept information, experiments, hands-on activities to reinforce the concepts, journal prompts, homework ideas, and teaching notes on each experiment.

7. Cross the Curriculum
Take one great concept, teach it in multiple curriculum areas, and you’re sure to reinforce learning. In this section you’ll find ways to extend the learning across all areas of the curriculum, including social studies, reading, writing, math, and art.

8. Tie in Technology
In this section we provide you with ideas and project planning pages for a multimedia presentation and web site creation.

9. Assess Learning
This section provides a variety of assessment options. But don’t wait until the end of the unit to evaluate your students. This book is filled with journal and homework ideas to assess your students from the start.

10. Celebrate!
Once you’ve completed a unit study as compelling as this, you’ll want to celebrate. In this section we’ve provided an idea for a great end-of-unit celebration.

A Note About the Internet
The Internet is a constantly changing environment. The sites listed as additional references were current at the time this book went to press.
INTRODUCTION TO WEATHER

Weather is so much more than simply charting sunny and rainy days or listening to the five-minute weather segment on your local news. Weather is a science that involves a multitude of interactions.

In this unit of study, students will learn what causes weather conditions. But we couldn’t stop there, so we’ve included lessons on what happens as a result of the weather, what tools can help predict or measure weather elements, and how a meteorologist combines weather readings, past actions, and current conditions to create a weather forecast.

Each of the following lessons in Step 6 features a quick informative mini-lesson, fascinating facts, easy-to-accomplish experiments and activities, a journal prompt, and a homework idea.

1. Air and Air Pressure
   Objective: To learn about air pressure and how it affects weather.

2. Water Vapor & Humidity
   Objective: To understand how humidity levels affect weather.

3. The Water Cycle
   Objective: To see the water cycle in action, including condensation, evaporation, and precipitation.

4. Clouds
   Objective: To learn how clouds form and how they are classified.

5. Thunder & Lightning
   Objective: To find out what causes thunder and lightning.

6. Wind
   Objective: To investigate wind patterns and the affects they have on a climate.

7. Tornadoes
   Objective: To find out how tornadoes form, where most occur, and how to stay safe when a tornado strikes.

8. Hurricanes
   Objective: To discover how and where hurricanes form, how one is ranked, and how to stay safe when a hurricane occurs.

9. Weather Instruments
   Objective: To recognize the kinds of tools meteorologists use to predict the weather.

10. Weather Forecasting
    Objective: To understand the science behind weather forecasting and learn to read a weather map.

In addition to the lessons and experiments, this book contains many other tools to help you make your unit on weather more complete, including:

- A list of books and web sites for you and your students. (Step 2)
- A vocabulary list of weather words and definitions along with vocabulary worksheets, puzzles, and pocket chart activities. The back of the book contains a pocket chart card for each vocabulary word. You can use the pocket on the inside back cover to store the cards once they’re torn out from the book. (Step 3)
- Learning center ideas filled with information to help you set up a classroom weather reporting center and an area for students to learn more about weather folklore and legends. (Step 4)
- An ongoing project for students to chart daily weather information and tape-record or film the report. (Step 5)
- Cross-curricular learning ideas to carry the study of weather into other areas of your curriculum. This includes calculating the distance of a storm, listing adjectives that describe the weather, and studying weather patterns in other countries. (Step 7)
- Integration into technology with a tornado web page project and a multimedia presentation on weather instruments. (Step 8)
- Assessment tools including rubrics, journals, and tests for alternative or traditional assessment of student learning. (Step 9)
- Celebrating with a game that allows the students to “show what they know” while reinforcing the content covered. (Step 10)
GATHER GREAT RESOURCES

Great Resources for You

It’s impossible to be an expert on every subject you teach, yet that’s exactly how your students see you. Before you begin teaching this weather unit, spend a few nights reviewing the following web sites and books and you’ll be up to speed in no time!

Web Sites

USA Today – Weather
http://www.usatoday.com/weather/wfront.htm
Click the Weather Basics link on this page for a great overview of the major weather topics you’ll be teaching.

Weather Channel – Education Index
http://www.weather.com
This is a very comprehensive site for up-to-the-minute weather conditions.

National Science Teachers Association
http://www.nsta.org/
This organization’s site has super resources to give your ideas a boost. Includes a publications area for journals, books, and kits in addition to a wonderful listing of science and mathematics links.

Learning Resources
http://www.learningresources.com
Seek out this site for a list of 10 Steps-recommended web sites or great products for your classroom. You’ll want to head to Activities & Resources for the list.

Books That Help Prepare

With much information about weather, this book is too good to pass up. The photos will amaze you as they tell the story and help explain weather concepts.

Like all the “Dummy” titles, this book is a light and easy read that covers difficult concepts well. Even though it’s written for adults, you’ll want to share the experiments and cool facts with your students.

This book provides a thorough explanation of basic weather information including instruments that measure the weather, with superb coverage on clouds and precipitation. It’s a great reference book to keep around during this entire unit of study.

Written by USA Today’s “weather guy,” this book features the same great graphics as the paper. It’s an easy read that covers everything there is to know about weather. It also features great information on weather forecasting and computerized meteorology.
GATHER GREAT RESOURCES

Great Resources for Your Students

Surrounding your students with great resources is a sure way to stimulate learning. The first step is to encourage your students to take a look at a few of the great web sites and books listed on this page and page 7. The field trip ideas will also inspire your students to get in gear for weather. You’ll have a captive audience before you even begin teaching!

Web Sites

The Weather Channel
http://www.weather.com
This site is full of up-to-the minute data and weather information. It’s one of the most comprehensive sites online.

Dan’s Wild Weather Watch Page
http://wildwildweather.com/
This is a complete weather stop for all grade levels with learning centers for each area of weather, from clouds to radar.

USA Today: Weather
http://www.usatoday.com/weather/wfront.htm
This site focuses on current weather events as well as historical information. It also offers support materials for the study of weather.

Online Guide to Meteorology
http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/home.rxml
Although text-heavy, this site includes great information on all elements of weather.

Web Weather for Kids
http://www.ucar.edu/40th/webweather/index.html
You’ll find easy-to-understand explanations along with great graphics at this site. They’ve even included a few neat experiments.

World Weather
www.worldweather.com
Find the current weather conditions for any region or city in the world. Older students can find information on natural disasters, climate changes, and global warming.

Weather Cams
http://yang.sprl.umich.edu/wxnet/
Current weather conditions in many cities are just a click away!

Climatologist’s Toolbox
http://whyfiles.org/021climate/index.html
This site covers all the different instruments used to measure the weather and how that information is put to use.
**GATHER GREAT RESOURCES**

**Great Resources for Your Students**

### Books

  The questions in this book are answered in a way that makes information easy for students to understand. The drawings do a good job of showing the answers to questions commonly asked about the storms.

  This book provides easy-to-understand and informative details about how thunderclouds form, what causes lightning, and how sound travels. It includes a section on storm safety.

  Check out the anecdotes and strange but true weather information found within this book. You’ll also find information on clouds, rain, snow, thunder, lightning, tornadoes, hurricanes, and weather instruments.

  Ms. Frizzle is up to her old tricks! This time her field trip takes students right into the eye of the storm — a hurricane that is. As with all the other "Magic School Bus" titles, this one tells all the facts with a generous dose of humor.

  All DK books feature great photography and illustrations, and this one is no exception. Get answers to all your weather questions along with a serving or two of trivia.

  This book has it all for general weather information, from facts, lists, and trivia, to really great illustrations!

  Your students may just seek out this book on their own. It’s easy-to-read as it provides a straightforward explanation for all the weather concepts you’ll be covering in this unit of study.

  The information on tornadoes and hurricanes is compelling and the illustrations thrill.

- Relf, Patricia. *The Magic School Bus Wet All Over: A Book about the Water Cycle*  
  New York: Scholastic Trade, 1996.  
  Experience evaporation, condensation, and rain while riding through the atmosphere in Ms. Frizzle’s Magic School Bus! Excitement, learning, and a good bit of laughter are mixed within the pages of this book.

### Guest Speaker Ideas

1. Local meteorologist from a television or radio station.
2. Someone who has experienced a hurricane, tornado, blizzard, or other severe weather. You may want to use the letter on the next page to help you find that person.
3. A travel agent to explain how weather can impact travel plans and climates in various regions of the world.
4. Someone who has lived in a climate that’s very different from yours.
5. A farmer for an explanation of the types of weather conditions that can hurt crops and the kinds of conditions that are most welcome.
6. Someone from a disaster-relief program in your community.

### Field Trip Ideas

1. Visit a television or radio station to see a meteorologist at work.
2. Go through the tornado and/or hurricane safety procedures that have been created by your school.
Dear Parents,

Over the next few weeks our class will be studying weather. Our topics of interest will include:

1. Air & Air Pressure
2. Water Vapor & Humidity
3. The Water Cycle
4. Clouds
5. Thunder & Lightning
6. Wind
7. Tornadoes
8. Hurricanes
9. Weather Instruments
10. Weather Forecasting

If you have personal stories or insights to share on any of the above listed topics, we would love to have you come in and talk to the class. We would also appreciate any materials (books, videos, and posters) that you’d be willing to share for the next few weeks.

Reinforcing learning at home will help your child retain the information learned in school. Try to find time to discuss the topics, ask questions, and stay involved with homework and projects. If possible, explore the following web sites with your child.

Dan’s Wild Weather Watch Page
http://wildwildweather.com/

USA Today: Weather
http://www.usatoday.com/wfront.htm

Web Weather for Kids
http://www.ucar.edu/40th/webweather/index.html

Thank you for all your help and support.
Weather Vocabulary

Understanding the meanings of key words before delving into the topic will help students grasp the concepts later on. The pages in Step 3 provide the practice to help students retain the words and their definitions. The worksheets are based on the following list of vocabulary words, which are from the lessons in Step 6. Each word is also printed on the pocket chart cards located at the end of this book.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>air pressure</td>
<td>weight of the air as it presses down</td>
</tr>
<tr>
<td></td>
<td>barometer</td>
<td>instrument used to measure air pressure</td>
</tr>
<tr>
<td>2</td>
<td>dew point</td>
<td>temperature at which the relative humidity reaches 100%</td>
</tr>
<tr>
<td></td>
<td>humidity</td>
<td>water vapor or moisture in the air</td>
</tr>
<tr>
<td>3</td>
<td>absorption</td>
<td>process of soaking up liquid, heat, or light</td>
</tr>
<tr>
<td></td>
<td>condensation</td>
<td>act of compressing something (e.g., water vapor condenses to form a cloud)</td>
</tr>
<tr>
<td></td>
<td>precipitation</td>
<td>falling of water from the sky in the form of rain, sleet, hail, or snow</td>
</tr>
<tr>
<td></td>
<td>water cycle</td>
<td>constant movement of Earth's water, including evaporation, condensation, and precipitation</td>
</tr>
<tr>
<td>4</td>
<td>cirrus</td>
<td>type of wispy curly cloud</td>
</tr>
<tr>
<td></td>
<td>cloud</td>
<td>mass of water drops or ice crystals suspended in the air</td>
</tr>
<tr>
<td></td>
<td>condensation</td>
<td>act of compressing something (e.g., water vapor condenses to form a cloud)</td>
</tr>
<tr>
<td></td>
<td>cumulonimbus</td>
<td>heaps of clouds that look like fluffy mounds of cotton</td>
</tr>
<tr>
<td></td>
<td>nimbus</td>
<td>large, dark rain clouds</td>
</tr>
<tr>
<td></td>
<td>stratus</td>
<td>low clouds that are spread out</td>
</tr>
<tr>
<td>5</td>
<td>lightning</td>
<td>flash of light in the sky caused by a path of electricity that travels through the air</td>
</tr>
<tr>
<td></td>
<td>thunder</td>
<td>sound that's caused by the sudden expansion of the air after lightning</td>
</tr>
<tr>
<td></td>
<td>anemometer</td>
<td>instrument used to measure wind speed</td>
</tr>
<tr>
<td></td>
<td>barometer</td>
<td>instrument used to measure air pressure</td>
</tr>
<tr>
<td></td>
<td>meteorologist</td>
<td>person who studies the weather</td>
</tr>
<tr>
<td></td>
<td>thermometer</td>
<td>instrument used to measure temperature</td>
</tr>
<tr>
<td></td>
<td>temperature</td>
<td>degree of heat or cold</td>
</tr>
<tr>
<td>6</td>
<td>eye</td>
<td>center of a hurricane or tornado with light winds or complete calm and no rain</td>
</tr>
<tr>
<td>7</td>
<td>eye</td>
<td>center of a hurricane or tornado with light winds or complete calm and no rain</td>
</tr>
<tr>
<td>8</td>
<td>climate</td>
<td>usual weather in a place</td>
</tr>
<tr>
<td></td>
<td>eye</td>
<td>center of a hurricane or tornado with light winds or complete calm and no rain</td>
</tr>
<tr>
<td></td>
<td>hurricane</td>
<td>large storm with rotating winds that forms over the warm waters of the ocean</td>
</tr>
<tr>
<td>9</td>
<td>anemometer</td>
<td>instrument used to measure wind speed</td>
</tr>
<tr>
<td></td>
<td>barometer</td>
<td>instrument used to measure air pressure</td>
</tr>
<tr>
<td></td>
<td>meteorologist</td>
<td>person who studies the weather</td>
</tr>
<tr>
<td></td>
<td>thermometer</td>
<td>instrument used to measure temperature</td>
</tr>
<tr>
<td></td>
<td>temperature</td>
<td>degree of heat or cold</td>
</tr>
<tr>
<td>10</td>
<td>eye</td>
<td>center of a hurricane or tornado with light winds or complete calm and no rain</td>
</tr>
<tr>
<td></td>
<td>meteorologist</td>
<td>person who studies the weather</td>
</tr>
<tr>
<td></td>
<td>weather</td>
<td>current atmospheric conditions</td>
</tr>
</tbody>
</table>
Teaching Notes on Pocket Chart Vocabulary

Using your pocket chart cards and a pocket chart, try a few of the activities listed below to introduce and develop weather vocabulary words.

Begin Each Lesson
Begin each lesson by showing the new vocabulary words that apply for that lesson. At the end of each lesson, review the words with your students together.

Weather Olympics
Play “Weather Olympics.” Divide the class into teams. Pull one vocabulary card, and give its definition without showing the face of the card. The first team to “buzz in” with the correct word receives a point. Continue until all the cards have been revealed. A much more involved form of the idea is included in Step 10: Celebrate!

Weather Instrument Naming
Use the weather instrument picture cards to play a matching game. Show children the picture of the instrument and challenge them to name that tool.

Definition, Please
Play “What’s the Definition, Please.” Place cards in the pocket chart. Divide the students into four teams. Teams take turns sending a player up to the chart to retrieve a card to take back to their group. The group then has 30 seconds to come up with a definition for the word they choose to receive a point. If they don’t come up with the definition, the other teams have the opportunity to answer. Play resumes with the next team going up to draw a card. Continue until all the words have been defined.

Forecast Vocabulary
As a fellow classmate reads a weather map aloud or gives a forecast, have another student pull the weather map symbol cards or vocabulary word cards that correlate with the forecast being read.

Symbol and Word Matching
Have students match weather symbol cards with the correct vocabulary word they represent.

SPEAK THE LINGO
lightning weather tornado
temperature
condensation
rainguage
nimbus
Fill in the blank with the correct word from your weather vocabulary word sheet.

1. An __________________________ is used to measure wind speed.
2. ____________________________ is water vapor or moisture in the air.
3. A ____________________________ is a large storm that forms over the ocean.
4. ____________________________ follows lightning and is caused by a sudden expansion of air.
5. A ____________________________ cloud is wispy and curly.
6. The __________________________ of a hurricane is usually calm with little or no rain.
7. ____________________________ is the process of soaking up liquid, light, or heat.
8. The weight of the air pressing down on you is called __________________________.
9. The usual weather in a place is called the __________________________.
10. Dark rain clouds are called __________________________ clouds.
11. Evaporation, condensation, and precipitation are all steps in the __________________________.
12. Moving air can also be called __________________________.
13. A ____________________________ is an instrument used to measure the temperature.
14. A ____________________________ is used to measure air pressure.
Wild Vocabulary Crossword

Fill in the crossword puzzle using these clues.

Across
1. the act of condensing something
2. moving air
3. person who studies the weather
4. center of a tornado
5. the degree of heat or cold
6. instrument used to measure the temperature

Down
1. the usual weather in a place
7. instrument used to measure wind speed
8. temperature at which the relative humidity reaches 100%
9. water vapor or moisture in the air
Classroom Learning Centers

Just as the backdrops and costumes are important to a play, a welcoming classroom environment is important to foster learning. The room should be fun, inviting, and interactive. With that in mind, this section features learning center activities and bulletin board ideas to help you set the room for weather.

1. Weather Folklore and Fables Learning Center

Provide copies of the books listed below and encourage students to create their own weather fables or provide scientific reasons why the stories aren’t true.

January Fog Will Freeze A Hog
By Hubert Davis

Tales of a Shimmering Sky: Ten Global Folktales with Activities
By Susan Milord

A Book of Weather Clues
By Diane Kaiser

2. Record a Forecast Learning Center

Encourage students to listen to radio weather forecasters during the week and take note of how the weather conditions and predictions are being presented. Then, have them try their hand at giving a weather report into a tape recorder. Here are a few materials you’ll want to keep at this center:

- tape recorder
- microphone
- blank audio cassette tapes
- newspaper weather page
- pencil and paper for notes

3. Weather Prediction Learning Center

Allow students to use the instruments to take readings of current weather conditions and then use those readings to make an actual weather prediction for that evening or the next day. Keep track of the correct predictions the students make on a bulletin board. Your students can go back to this center later on as you go over each of the following instruments:

- barometer
- anemometer
- thermometer
- rain gauge
- wind vane
- psychrometer

4. Experiment Learning Center

This center will help you organize all of the experiments in this book for your students. Be sure to have the following materials at this station:

- supplies for the experiments in Step 6
- experiment pages from each lesson
- experiment Science Logs

You may also want to include directions for other experiments you’ve come across during your research at this center.
# SET THE SCENE

## Learning Centers Checklist: Teachers

Use this checklist to record which students have completed each center activity. Record a grade or symbol to reflect the level of completion to the left of each learning center. You can use the wider column beneath each learning center to jot a note about the student’s performance and the date completed.

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</table>
Learning Centers Checklist: Students

Photocopy this page for each student and cut it in half. Have your students use this sheet to get sign-off by you each time they successfully complete a center. Remind students that completing more than one center a day or repeating a center during the week is permitted.

<table>
<thead>
<tr>
<th>Centers</th>
<th>Week</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Weather Folklore</td>
<td>_____ – _____</td>
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</tr>
<tr>
<td>2. Record a Forecast</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>3. Weather Prediction</td>
<td></td>
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<tr>
<td>4. Weather Experiments</td>
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</tbody>
</table>

Name ___________________________________________________________   Date

<table>
<thead>
<tr>
<th>Centers</th>
<th>Week</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Weather Folklore</td>
<td>_____ – _____</td>
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<tr>
<td>2. Record a Forecast</td>
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<tr>
<td>3. Weather Prediction</td>
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<tr>
<td>4. Weather Experiments</td>
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</tbody>
</table>
Classroom Bulletin Board

The bulletin board ideas will help you and your students set up the room. Aside from these bulletin board ideas, you will find that posting maps of the world and a poster of the water cycle are quite useful, especially when answering questions that come up.

It’s All Precipitation! Bulletin Board

Divide this board into four sections: hail, snow, sleet, and rain. Then, encourage students to find pictures of as many examples of precipitation as possible from photos, magazines, and the Internet and then post their images in the correct section. They may even want to use their own drawings. Challenge students to fill the board with images before you’ve finished teaching the unit.

Weather Station Bulletin Board

This is an interactive learning bulletin board that changes with the weather! The board serves two purposes: 1.) a posting area for all the data gathered in Step 5’s ongoing project, and 2.) the backdrop for daily weather reports students record in Step 5. Be sure to post a laminated poster of a U.S. map, include wipe and erase pens, and have a chart for students to record today’s conditions. Finally, include space to feature a picture or a name card stating who will be the weather forecaster for the day. Encourage that person to give the weather forecast while standing in front of the bulletin board. Videotape the forecast each day, and play it back for the class. The board will look like the actual background used on television for weather forecasters — maybe even include a pointer for the student to use as they discuss conditions! Page 76 in Step 7 includes some other activities your students can do to make the board their own.
Plan a Project

Weekly Weather Roundup

Requiring students to put their knowledge and skills to work is ideal to help in long-term retention of content. In Step 5: Plan a Project, students have an opportunity to gather information over a long period of time and share their data. The end product is a videotaped “Weekly Weather Roundup” in which the student gives an informative report on the local weather based on actual data gathered.

This project can be done individually, but would also work well if students had a partner to help measure and record data. Be sure to follow these steps in order with your students.

1. Create a Weather Center
   Make arrangements with school personnel to allow your students to have a “weather data gathering area” outside the school building. Also be sure to have a segment of the classroom designated to the Weather Center. Consider having it close to the Weather Station Bulletin Board so students can easily go to and from the board for information. This center should include all the necessary weather measurement instruments, a map of the world, and a map of the United States.

2. Chart the Weather
   Decide if the students will be working individually on this project or in pairs, and make a copy of the Daily Weather Record Chart on page 19 for each student or pair. Discuss the need for accurate measurements and recording. If necessary, show students how to use the weather instruments. Have students record data for one full week.

3. Compile the Data
   Allow students time to review their data. Remind them to search for trends in actual weather conditions and think about how those trends relate to the instrument readings.

4. Write a Script & Rehearse
   Have your students use the script handout included on page 20 as a starting point for the actual report. Decide on a location and background scenery for taping. You may want to recommend having students use the Weather Station Bulletin Board explained in Step 4 so they can use the map of the United States as a backdrop. Allow time for rehearsal.

5. Record a Forecast
   Use a video camera or tape player to record your students’ weather reports. Remind students to preview their final product and make corrections if necessary before turning it in for a grade.

6. Time for a Show!
   Set aside a day for viewing the student’s presentations. Encourage peer review and assessment.

© Learning Resources, Inc.
Collecting daily weather data is only the beginning for this project. You’ll want to make plans for your video, spend time interpreting the weather data, create cue cards, and practice using the camera or tape recorder before you record your report. Use this chart to plan your activities and set goals.

<table>
<thead>
<tr>
<th>Project Tasks &amp; Goals for the week of ______ – ______</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collecting Data</td>
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<td></td>
</tr>
<tr>
<td>Interpreting Data</td>
<td></td>
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<tr>
<td>Creating Cue Cards</td>
<td></td>
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<tr>
<td>Preparing the Video</td>
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<tr>
<td>Practicing the Report</td>
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<tr>
<td>Other:______________________</td>
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</tbody>
</table>
Use this table to record your daily weather data.

<table>
<thead>
<tr>
<th>Week</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
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<th>Saturday</th>
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<tr>
<td>_____ – _____</td>
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<td>Time of Reading</td>
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<tr>
<td>Temperature</td>
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<tr>
<td>Wind Speed (mph)</td>
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<tr>
<td>Wind Direction</td>
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<tr>
<td>Cloud Cover</td>
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<tr>
<td>Cloud Type(s)</td>
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<td>Precipitation (inches)</td>
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<tr>
<td>Barometric Pressure</td>
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<tr>
<td>Relative Humidity</td>
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<tr>
<td>Dew Point</td>
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<tr>
<td>Air Pollution Index</td>
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</tr>
<tr>
<td>UV Index</td>
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</tbody>
</table>
PLAN A PROJECT

Weather Roundup Tips & Scripts

Use the data recorded during the week to compile a weekly weather report for your class. Work with a friend to create a video or audiotape of your report. The tips below will help you when writing and giving your weather report.

Script

Hi! I’m ________________ with your weekly weather roundup. It’s been a busy weather week here at ________________ School. Let’s get started with the highlights:

_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________
_______________________________________________________________________________

Tips:

As you write your script, include your classmates in your report by tying in classroom events or friends. (For example, We were all upset when the torrential rain cancelled our kickball tournament.) Also:

• Consider adding sound effects like rain, thunder, and wind in the background. This can be done on an audiotape or your partner can make the sounds during the report.

• Practice reading your script aloud before recording.

• Practice your script in front of a mirror so you can watch yourself.

• Consider having your partner hold up cue cards to keep you from constantly looking down at your script.

• Use the Weather Center Bulletin Board as a realistic backdrop for a video.

• Use a yardstick as a pointer to show viewers areas of importance on the map.
Introduction

The ten lessons presented on the pages that follow provide a comprehensive study of weather. Work through the steps in order or pick and choose the activities that will enhance what you’re already teaching — the choice is yours!

Each lesson contains 3 parts:

1. Teacher Note Page(s)
   Provides a general overview of the lesson’s topic. These pages include:
   - They’ll Need to Know ... for a general overview of the lesson’s topic
   - Prove It! for points to bring up as students are working through the experiments
   - Journal Prompt to assess student learning and to give students the opportunity to put the science concept into their own words and/or expand their thinking beyond the topic
   - Homework Idea to follow up on the concept at home

2. Experiments and Activities
   Provides hands-on experiences designed to reinforce the day’s lesson. The teaching notes page provides background information for each experiment.

3. Science Log
   Provides a space for students to record the concepts learned and their observations from the experiments.
# TEACH TEN TERRIFIC LESSONS

## Overview

The following explains the objective of each lesson as well as the experiments, activities, and supplies needed in each lesson. Be sure to collect these supplies in advance.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Air &amp; Air Pressure</strong>&lt;br&gt;Students will learn about air pressure and how it affects our weather.</td>
<td>Experiment 1: Crush the Can hot plate, empty soda can, tongs, tablespoon, water, shallow pan&lt;br&gt;Experiment 2: Balloon Blow-Up balloon, 2-liter plastic bottle, sink with a faucet&lt;br&gt;Activity 1: Make a Barometer Activity 2-liter plastic bottle, clear jar that the bottle will fit into neck first, water, food coloring, ruler, permanent marker</td>
</tr>
<tr>
<td><strong>2. Water Vapor &amp; Humidity</strong>&lt;br&gt;Students will learn about humidity and how humidity levels affect our weather.</td>
<td>Experiment 1: Feel the Humidity water, plastic bag, tape&lt;br&gt;Activity 1: Make a Psychrometer 2 Centigrade thermometers, table, tape, gauze, rubber bands, fan, relative humidity table on page 33</td>
</tr>
<tr>
<td><strong>3. The Water Cycle</strong>&lt;br&gt;Students will learn about the water cycle, including condensation, evaporation, and precipitation.</td>
<td>Experiment 1: Terrific Terrarium 2-liter plastic bottle, scissors, small plants in a flower pot, water&lt;br&gt;Experiment 2: Make it Rain 2 cooking pots, ice, water, hot plate, oven mitt&lt;br&gt;Activity 1: Illustrate the Water Cycle page 39</td>
</tr>
<tr>
<td><strong>4. Clouds</strong>&lt;br&gt;Students learn how clouds form and how they are classified.</td>
<td>Experiment 1: A Dusty Cloud? 2 identical large glass jars, 2 large balloons, warm water, scissors, chalk dust, large rubber bands, permanent marker, refrigerator&lt;br&gt;Experiment 2: Cloud in a Bottle Experiment 2-liter bottle, ice cube, water&lt;br&gt;Activity 1: Show What You Know About Clouds page 46</td>
</tr>
<tr>
<td><strong>5. Thunder &amp; Lightning</strong>&lt;br&gt;Students learn about the electrical energy and rapid air movement that cause thunder and lightning.</td>
<td>Experiment 1: Making Lightning, Take 1 two balloons&lt;br&gt;Experiment 2: Making Lightning, Take 2 plastic comb, wool fabric (small piece), metal doorknob&lt;br&gt;Experiment 3: Taking a Bite of Lightning LifeSavers® Candy (wintergreen and peppermint)&lt;br&gt;Activity 1: Make Your Own Thunder brown paper lunch bag</td>
</tr>
</tbody>
</table>
## Lesson 6. Wind
Students learn what causes wind and the affects that it can have on our weather.

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1: Warm and Cold Air Masses 2 baby food jars, red and blue food coloring, water, cardboard, newspapers</td>
<td>Activity 1: Make an Anemometer Ping-Pong ball, protractor, string, tape, compass</td>
</tr>
</tbody>
</table>

## Lesson 7. Tornadoes
Students learn how and where tornadoes form and how to stay safe when a tornado occurs.

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1: Make a Tornado 2-Liter bottles, water, silver glitter, duct tape, flashlight</td>
<td>Activity 1: Where is Tornado Alley page 60</td>
</tr>
</tbody>
</table>

## Lesson 8. Hurricanes
Students learn how and where hurricanes form, how one is ranked, why they are so dangerous, and how to stay safe if one strikes.

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity 1: Storm Safety Poster poster board, paint or markers, reference materials</td>
<td>Activity 2: Track a Hurricane page 63 Activity 3: Show What You Know, Hurricanes page 64</td>
</tr>
</tbody>
</table>

## Lesson 9. Weather Instruments
Students learn about the tools meteorologists use to predict weather.

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity 1: Make a Rain Gauge plastic ruler, clear tape, clear jar</td>
<td>Activity 2: Make a Wind Vane drinking straw, index card, pushpin or thumbtack, pencil, scissors, compass, stapler Activity 3: Know Your Weather Instruments page 68</td>
</tr>
</tbody>
</table>

## Lesson 10. Weather Forecasting & Maps
Students learn the science behind weather forecasting and how to read a weather map.

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity 1: Weather Watcher Activity local or national newspapers (1 paper for every 2-3 students), page 71</td>
<td>Activity 2: Create a Weather Map local or national newspaper (1 paper for every 2-3 students), page 72</td>
</tr>
</tbody>
</table>
Lesson 1: Air & Air Pressure

Use this page when you introduce Air & Air Pressure to your students. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

We all know that air is a vital life force. It surrounds us at all times. But did you know that air has weight? Even though you can’t see it, air takes up space and exerts pressure. Air pressure is the weight of the air as it presses down upon us. As the air pressure around us changes, the weather, including the temperature, changes.

When air is compressed, it is said to be “under high pressure.” As cold air contracts, it takes up less space and falls because it’s heavier. A high pressure reading usually means clear skies.

Air that’s not compressed is said to be “low pressure.” As warm air expands, it takes up more space and rises because it becomes lighter. A low-pressure reading usually means you’re in for a rainy day.

Prove It!

Discuss the air pressure experiments outlined on the next few pages. You may want to make photocopies available for each student or simply post one at an experiment station. Then, distribute the Science Log to each student, discuss the experiments, and divide students into small groups to complete each.

This experiment shows what happens when high pressure mixes with low pressure. In the first part of the experiment, the air pressure decreased as the water vapor inside the can condensed. In the second part of the experiment, the can collapsed and crushed because the pressure in the can was higher than the pressure outside the can.

Experiment 2: Balloon Blow-Up Teaching Notes

When hot water is splashed on the bottle, the air inside the bottle becomes warm. Since warm air expands to take up more room, it exerted more pressure to fill the balloon. When the students placed the bottle in the cold water, the pressure took up less space and the balloon collapsed.

Journal Prompt

Use the knowledge you gained during today’s lesson to explain how a hot air balloon works. Why does it go up? What enables the balloon to land?

Homework Idea

Challenge the students to create the barometer on page 29 and begin recording their barometric pressure readings. Will their at-home readings correlate with those of a professional meteorologist?

• At just about anytime during the day, there are about 15 pounds of air pressure pushing down on you in every direction! You don’t actually feel it because your body pushes out the same amount and that equalizes the effect.

• When your ears pop, it’s because your body is adjusting to the changes in air pressure.
AIR & AIR PRESSURE

Experiment 1: Crush the Can

Try This!

Work in small groups to complete the experiment listed below. Record your findings on the Crush the Can Science Log. **DO NOT** touch the hot plate, because you can burn yourself.

Procedure

1. Pour one tablespoon of water into the can.

2. Use the tongs to place the can on the warm hot plate so the open side is on top. Observe what happens as the water temperature inside the can rises.

3. Using the tongs, remove the can from the heat and place it open-side down in the pan filled with cool water. Record your observations.

What Happened?

What happened to the can? How did air pressure play a part in this experiment?
AIR & AIR PRESSURE

Experiment 2: Balloon Blow-Up

Try This!
Work in small groups to complete the experiment listed below. Record your findings on the Balloon Blow-Up Science Log.

Procedure
1. Place the mouth of the balloon over the opening of the bottle.
2. Place the bottle in the sink, and splash hot water all over the bottle.
3. Turn the faucet to cold water, and splash it on the balloon.

What Happened?
What happened to the air inside the bottle when you splashed hot water on the balloon? What happened when you splashed cold water on the balloon? Why did the balloon blow up? What kind of air pressure was in the bottle when the balloon collapsed?

MATERIALS NEEDED
• small round balloon
• 2-liter plastic bottle
• sink with a faucet
Science Log

Use this log sheet to record the findings from the Crush the Can experiment.

Question: How do cold air and warm air react?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What I did:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What happened:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Why it happened:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Name ______________________________
Science Log

Use this log sheet to record the findings from the Balloon Blow-Up experiment.

Question: How did the balloon react?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What I did:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What happened:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Why it happened:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Can you think of other examples of warm and cold air reactions? (Hint: Think about how mountains crumble.)
1. _________________________________________________________________
2. _________________________________________________________________
3. _________________________________________________________________
Activity 1: Make a Barometer

A barometer is useful for weather prediction because it measures air pressure. Follow the instructions listed below to create your own barometer. The activity should be completed on a rainy day.

Procedure

1. Pour 3 inches (7.6 cm) of water in the jar.

2. Add a drop of food coloring to the water.

3. Place the bottle, neck first, into the jar on a rainy day. A little water should rise into the neck of your bottle.

4. Let the barometer sit for 15 minutes.

5. Check the water level of the barometer, and use a permanent marker to mark the level on the outside of the jar. This is your low-pressure mark.

6. Measure and mark three additional places on the jar, each at half-inch (1.3 cm) intervals above the previous mark.

7. Check your barometer each morning. If it’s a clear day, the water level should rise toward one of the high-pressure marks, telling you it’s going to be a nice day. When the water level drops close to your low-pressure mark, there’s sure to be rain on the way!

MATERIALS NEEDED

• 2-liter plastic bottle
• clear jar that the bottle will fit into neck first
• food coloring
• ruler
• permanent marker
• water
Lesson 2: Water Vapor & Humidity

Use this page when you introduce Water Vapor and Humidity to your students. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

All air has water. Water in our atmosphere exists in three states:

1. Liquid (rain)
2. Solid (snow, ice, or hail)
3. Gas (water vapor)

Water vapor is a gas, and it is an important part of our weather. It is often referred to as moisture or humidity. Warm air can hold more moisture than cool air. Meteorologists have several different ways to express the amount of moisture or humidity in the air:

1. Relative Humidity is a measure of how much water is in the air compared to how much the air can actually hold. A psychrometer is a tool that measures relative humidity.
2. Heat Index is a measure of the temperature compared to the relative humidity.
3. Dew Point is the temperature at which the relative humidity reaches 100%.

Prove It!

In a whole group setting, review the steps in Experiment 1: Feel the Humidity. Divide students into pairs or small groups to complete the experiment. Ask students to report their findings in the Science Log.

As each group finishes, distribute the instructions and materials needed to create a psychrometer on page 33. Allow time for students to create the tool and take a reading.

Experiment 1: Feel the Humidity Teaching Notes
This is a good experiment on relative humidity. A human body is sensitive to changes in relative humidity. Students can see how an increase in relative humidity feels by slipping one hand in a sandwich bag. The bag increases the rate of perspiration and won’t allow the evaporation process. Therefore, the hand in the bag will feel warmer. The wet hand wasn’t constrained by plastic, which is why the water was able to evaporate and that hand felt cooler.

Journal Prompt
Write about the times when you’ve noticed humidity the most. What time of year was it? What was the weather like? What were you doing?

Homework Idea
Challenge students to learn more about heat index on the Web. Ask them if they think they can use their psychrometers to find the heat index for the day.

• Most of the water vapor in the atmosphere is in the first 10,000 feet (3,050 m) above Earth’s surface.

• Water is one of the only materials on Earth that naturally exists in all three states: solid, liquid, and gas.
Experiment 1: Feel the Humidity

Try This!

Complete the experiment listed below. Record your findings on the Feel the Humidity Science Log.

Procedure

1. Place one hand in the plastic sandwich bag, and seal the bag around your wrist with tape. Wait a few minutes.

2. Using room-temperature water from the sink, wet the hand that’s not in the bag.

3. Observe the difference in comfort between the wet hand and the hand inside the plastic bag.

What Happened?

How did your hand feel inside the bag? How did the wet hand feel? Were you surprised by the results?
Science Log

Use this log sheet to record the findings from the Feel the Humidity experiment.

Question: Can you feel humidity?

What I did:

What happened:

Why it happened:
Activity 1: Make a Psychrometer

A psychrometer measures the relative humidity. Follow the instructions listed below to create your own psychrometer.

**Materials Needed**
- 2 Centigrade thermometers
- table
- tape
- gauze
- rubber bands
- fan
- relative humidity table

**Procedure**

1. Tape the thermometers to a tabletop. The numbers must be facing up, and the end of the thermometer containing the liquid should be hanging at least 1 inch (2.5 cm) off the table.

2. Wet a small piece of gauze, and use the rubber band to secure the gauze around the liquid-filled end of one thermometer.

3. Blow the fan on the thermometers until the temperature stops falling.

4. Subtract the temperature of the gauze wrapped thermometer from the temperature of the dry thermometer.

5. Use the table below. On the left-hand side, find the temperature of the dry thermometer. Look across the top of the chart to find the number that represents the difference between the temperatures of the two thermometers. The cell where the row and column intersect is the percentage of relative humidity.

<table>
<thead>
<tr>
<th>°C</th>
<th>1°</th>
<th>2°</th>
<th>3°</th>
<th>4°</th>
<th>5°</th>
<th>6°</th>
<th>7°</th>
<th>8°</th>
<th>9°</th>
<th>10°</th>
</tr>
</thead>
<tbody>
<tr>
<td>10°</td>
<td>88%</td>
<td>77%</td>
<td>66%</td>
<td>55%</td>
<td>44%</td>
<td>34%</td>
<td>23%</td>
<td>15%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>11°</td>
<td>89%</td>
<td>78%</td>
<td>67%</td>
<td>56%</td>
<td>46%</td>
<td>36%</td>
<td>27%</td>
<td>18%</td>
<td>9%</td>
<td></td>
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<tr>
<td>12°</td>
<td>89%</td>
<td>78%</td>
<td>68%</td>
<td>58%</td>
<td>48%</td>
<td>39%</td>
<td>29%</td>
<td>21%</td>
<td>12%</td>
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<tr>
<td>13°</td>
<td>89%</td>
<td>79%</td>
<td>69%</td>
<td>59%</td>
<td>50%</td>
<td>41%</td>
<td>32%</td>
<td>22%</td>
<td>15%</td>
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Lesson 3: The Water Cycle

Use this page when you introduce the Water Cycle to your students. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

The water cycle is a continuous process of evaporation, condensation, and precipitation. It happens over and over again, day after day. As a matter of fact, the water that falls as rain today has probably fallen millions of times before. Here’s how:

Heat from the Sun causes water on Earth (rivers, puddles, the ocean, and even your dog’s water dish) to evaporate. This process turns the water that was on Earth into water vapor, which is gas.

The water vapor rises, cools, and condenses to form a cloud. Then, the clouds become heavy and dark. Rain (or another form of precipitation) falls to the Earth and the cycle starts all over again!

Prove It!

Discuss the Terrific Terrarium and Make it Rain experiments outlined on the next few pages by asking students whether they think they can make it rain. Then, photocopy the experiments for each student or post one of each at the Experiment Learning Center. Photocopy and distribute the corresponding Science Log pages to each student. Make sure that students know how to cut the bottle for the terrarium by demonstrating the process. Then, express the importance of safety when working with the hot plate in the Make it Rain experiment.

Experiment 1: Terrific Terrarium Teaching Notes
This is a fun experiment for students to do because they’ll see the water cycle at work and get to create a conservatory. In this experiment, the sun will warm the soil, causing the water in the soil to evaporate. The evaporated water should rise to the top of the bottle and turn into droplets, which will eventually fall back to the soil as rain.

Experiment 2: Make it Rain Teaching Notes
With this experiment, students are also seeing condensation at work. In this experiment, the boiling water inside the teakettle will cause water vapor (steam) to leave the kettle. When the water vapor hits the cold pie plate, condensation occurs, forming droplets of water. The droplets will eventually get too heavy to hang on to the pie plate, so they will rain down.

Journal Prompt
Why is a serious drought a cause for concern? List examples. How could flooding be just as serious as a drought?

Homework Idea
Have students write a short story that tells the story of one raindrop as it travels through the water cycle.

- Each day, about 4 trillion gallons of water fall to the Earth in the form of rain, snow, sleet, or hail.
- Over 70% of the earth’s surface is covered with water. Yet less than 1% of this can be used for drinking water. Around 97% of the water is in the ocean.
THE WATER CYCLE

Experiment 1: Terrific Terrarium

Try This!
Work in small groups to complete the experiment below. Record your findings on the Terrific Terrarium Science Log.

Procedure
1. Remove the dark plastic bottom from the soda bottle. It may be necessary to soak the bottle in warm water to get the plastic off. Discard the plastic bottom.

2. Place the flower pot with the plants by the window. Water the plants.

3. Place the remaining piece of your soda bottle over the top of your plant to create a sealed dome. This is your mini-greenhouse.

4. Observe the terrarium for a few days.

What Happened?
What did the soil look like after a day? Did you notice water at the top of the bottle? Did the droplets fall back to the soil? Can you explain the water cycle at work in your terrarium?
THE WATER CYCLE

Experiment 2: Make it Rain

Try This!

Work in small groups to complete the experiment below. Record your findings on your Make it Rain Science Log. **DO NOT** touch the hot plate because you can burn yourself.

Procedure

1. Fill a pot 2 inches (5.1 cm) deep with water, and put the pot on the hot plate.

2. Fill the bottom of a second pot with ice cubes.

3. Using an oven mitt, hold the cold pot over the pot with boiling water. What happened?

4. Dump the ice out of the cold pot and wipe it dry.

5. Hold the empty pot over the steam. What happened?

What Happened?

What left the pot with water when the water boiled? What happened to the water vapor when it hit the second pot? What is this called? (Hint: Check your vocabulary words for the answer.)
Science Log

Use this log sheet to record the findings from the Terrific Terrarium experiment.

Question: Why does it rain?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What I did:

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What happened:

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Why it happened:

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
Science Log

Use this log sheet to record the findings from the Make it Rain experiment.

Question: Why does it rain?
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___________________________________________________________________
___________________________________________________________________
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___________________________________________________________________

What I did:
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What happened:
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Why it happened:
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Activity 1: Illustrate the Water Cycle

Use this picture of the water cycle to label:

- Condensation
- Evaporation
- Precipitation

1. ______________________
2. ______________________
3. ______________________
Lesson 4: Clouds

Use this page when you introduce Clouds to your students. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

We see clouds every day, yet we so often take them for granted. Clouds can cause rain, but did you also know that clouds can affect the temperature? This is because they block incoming sunlight and outgoing radiation from the Earth, which can warm temperatures.

Three things are needed for a cloud to take form. First, the relative humidity must be close to 100%. Second, tiny bits of matter, like dust, must be present so water can collect and condense around the dust. Third, something must happen to cool the air. With all that, clouds are actually masses of water droplets that are suspended in the air. When the droplets become too heavy to remain suspended, they fall to Earth. The type of clouds that are formed depend on how cold the air is and how much water is in the air. A meteorologist can tell a great deal about the cloud just by studying a cloud’s shape. The four basic cloud shapes are as follows:

1. Cumulus — heaps of clouds that look like mounds of cotton

2. Stratus — clouds that are spread out and look like a low covering just overhead

3. Cirrus — wispy curly clouds

4. Cumulonimbus — dark clouds that look like a huge puff of smoke

Cloud heights are determined by the heights of their bases, with the exception of heap clouds, where the heights are determined by the cloud tops.

Cloud shapes were first named and identified in 1803. The names and classifications used then are very similar to those used today.
Lesson 4: Clouds (continued)

Clouds can be divided even further by classifying them into groups based on their shape, structure, and height above ground.

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<thead>
<tr>
<th>Cloud Type</th>
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<th>Upper-level</th>
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<tr>
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<td>fair-weather</td>
<td>cumulus congestus</td>
<td>non-precipitating cumulonimbus</td>
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<td>stratus</td>
<td>altostratus</td>
<td>cirrostratus</td>
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<td>Combined Cloud Types</td>
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<td>altocumulus</td>
<td>cirrocumulus</td>
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<td>nimbostratus</td>
<td>precipitating altocumulus</td>
<td>cirrus/precipitating cumulonimbus</td>
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Prove It!

Discuss the Cloud in a Bottle and A Dusty Cloud? experiments outlined on the next few pages. You may wish to photocopy the handouts for each student or post them at the Experiment Learning Center. Also photocopy and distribute the corresponding Science Log pages to each student, and allow students time to work through one or both experiments.

Experiment 1: A Dusty Cloud? Teaching Notes

After students conduct the experiment, discuss what happened. Ask students which jar created a more visible cloud. Point out that a small amount of dust is required for cloud formation because water collects and condenses around these particles. Then, ask whether the amount of dust in the air can affect cloud formation.

Experiment 2: Cloud in a Bottle Teaching Notes

Clouds form when water vapor cools and the moisture condenses around dust particles. Clouds may also occur when warm and cool air mix together, such as in this experiment. Talk to your students about the different types of clouds they created in class. Ask them to describe the difference in the way each formed.

Journal Prompt

Do cloud types really match the weather? Go outside, draw the clouds you see, and describe the weather. Do this for a week, and compare your results.

Homework Idea

Invite students to check out the web site: http://www.usatoday.com/weather/research/wmodify.htm

Have them research cloud seeding and be ready to answer the following set of questions:

- What is cloud seeding?
- Why would someone want to use cloud seeding?
- What minerals are used for cloud seeding?
- How is cloud seeding performed?
Experiment 1: A Dusty Cloud?

Try This!

Work in small groups to complete the experiment below. Record your findings on the A Dusty Cloud? Science Log.

Procedure

1. Cut the ends off the balloons.

2. Place a few drops of warm water in the bottom of each jar.

3. Take one of the cut balloons, and stretch the open end around the mouth of one of the jars. Secure and seal the balloon with one or two rubber bands. Use the permanent marker to write an “X” on this jar indicating it is free of dust.

4. Bang together two chalkboard erasers over the other jar, and seal it with the balloon in the same manner as the first.

5. Place both jars in a cool place for 10 minutes. When the time is up, take the two jars out and compare them. Are they the same? Try pulling up on the top of the two balloons. Any changes in the jars?

What Happened?

How were the two jars different? What was necessary for the cloud to occur? How might this experiment model ways in which meteorologists predict the weather?

MATERIALS NEEDED

- 2 identical large glass jars (mayonnaise or pickle jars)
- 2 large balloons
- warm water
- scissors
- chalk dust
- large rubber bands
- permanent marker
- refrigerator, freezer, or ice chest
Experiment 2: Cloud in a Bottle

Try This!
Work in small groups to complete the cloud experiment below. Record your findings on your Cloud in a Bottle Science Log.

Procedure
1. Fill the bottle with warm water. This will warm the air inside the bottle. Leave the warm water in the bottle for 2 to 3 minutes.
2. Pour out all but 1 inch (2.5 cm) of the water.
3. Rest an ice cube against the opening of the bottle. Leave the ice cube sitting in this position.
4. Check the bottle every 5 minutes and record your observations.

What Happened?
What happened inside the bottle? How did the cold air play a part in this?

MATERIALS
- 2-liter plastic soda bottle
- ice cube
- water
Science Log

Use this log sheet to record the findings from A Dusty Cloud? experiment.

Question: Is dust important in cloud formation? Why or why not?

___________________________________________________________________
___________________________________________________________________

What I did:

___________________________________________________________________
___________________________________________________________________

What happened:

___________________________________________________________________
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Which jar formed a better cloud?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Why it happened:

___________________________________________________________________
___________________________________________________________________
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Science Log

Use this log sheet to record the findings from the Cloud in a Bottle experiment.

Question: What causes a cloud to form?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What I did:

___________________________________________________________________
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What happened:

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Why it happened:

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What do you think causes fog?

___________________________________________________________________
___________________________________________________________________

Name ______________________________
Activity 1: Show What You Know About Clouds

Draw four scenes showing the same city with different cloud formations and different weather. Follow the cloud types below when you draw your city.

1. Cloud Type: Cumulus
   Weather Conditions: __________________________

2. Cloud Type: Stratus
   Weather Conditions: __________________________

3. Cloud Type: Cirrus
   Weather Conditions: __________________________

4. Cloud Type: Cumulonimbus
   Weather Conditions: __________________________
Lesson 5: Thunder & Lightning

Use this page when you introduce Thunder and Lightning to your students. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

During a storm, thunder and lightning do not occur at the same time. Light travels almost a million times faster than sound, so we see the lightning before we hear the thunder.

Lightning is created the same way that static electricity is created when you drag your feet across a carpet, only on a much larger scale. The tiny particles in a cloud are constantly moving around. As they move, these particles pick up positive and negative charges. The positive charged particles (protons) are light and rise up to the top of the cloud. The negatively charged particles (electrons) are heavier and stay near the bottom of the cloud.

When the cloud is filled with positive and negative particles, the attraction becomes too great and the particles rub up against each other, discharging electricity through friction. The end result is that the cloud gets rid of its charge and releases energy. When a cloud gets rid of its charge by releasing energy, the energy creates a path for electricity to travel through the air called lightning! The same kind of thing happens when you drag your feet across the carpet and get zapped when you touch the doorknob. These are great experiments for students to model lightning. Encourage students to explain how they created sparks.

Lightning will always produce thunder because of a strike’s high temperature. When air is heated quickly by lightning, it expands and then contracts, like an explosion. It’s that explosion of air that creates sound waves, which we call thunder.

Thunder on page 52. If students complete How Far Away? on a sunny day, make up your own lightning word problems. For example, tell students that lightning strikes and 5 seconds later thunder occurs. Then have them calculate the number of miles between them and the lightning bolt by using the formula on the page. If time permits, divide the class into three small groups and have them rotate around to perform one of the Making Lightning experiments and the Taking a Bite of Lightning experiment.

Experiment 1 and Experiment 2: Making Lightning Teaching Notes: When students rub the balloon against their clothing or head, it creates friction, which in turn creates a buildup of static electricity. When the two balloons touch, there is a release of that electricity. The same thing happens when students rub a comb against a piece of flannel and touch a doorknob. These are great experiments for students to model lightning. Encourage students to explain how they created sparks.

Experiment 3: Taking a Bite of Lightning Teaching Notes: Explain to students after this experiment that when they bit the LifeSaver®, they broke up the sugars within the candy. This released little electrical charges into the air. The charges attracted oppositely charged nitrogen in the air. When the two met, they reacted with a tiny spark.

Journal Prompt

When lightning strikes, it’s not safe to be outside. Brainstorm a list of rainy day activities you can do when that happens. Thunderstorms offer unique opportunities for quality time with friends and family.

Homework Idea

Have students create a thunderstorm safety booklet designed to tell younger students about the importance of safety during a severe storm. If you have access to the Internet, suggest that your students visit the following site for help with this assignment: www.co.honolulu.hi.us/ocda/thunder4.htm

• There are over 8 million lightning strikes each day.
• Florida has more lightning strikes than any other state in the United States.

Prove It!

Have the class try Activity 1: Make Your Own
Experiment 1: Making Lightning, Take 1

Try This!
Work in small groups to complete the experiment below. Record your findings on the Making Lightning Science Log.

Procedure
1. Blow up the balloons.
2. Rub the balloons against your head, carpet, or clothing.
3. Turn off the lights.
4. Rub the two balloons together.

What Happened?
Did you create sparks? What caused a buildup of static electricity? How is this similar to what happens in a cloud?

MATERIALS NEEDED
- two balloons
Experiment 2: Making Lightning, Take 2

Try This!
Work in small groups to complete the experiment below. Record your findings on the Making Lightning Science Log.

Procedure
1. Turn off the light.
2. Rub the comb with the piece of wool fabric.
3. Hold the comb near a metal doorknob.

What Happened?
Did you create sparks? What caused a buildup of static electricity? How is this similar to what happens in a cloud?
Experiment 3: Taking a Bite of Lightning

Try This!
Work in small groups to complete the experiment below. Record your findings on the Making Lightning Science Log.

Procedure
1. Go into a dark room.
2. Place one of the LifeSavers® in your mouth.
3. Bite down and chew the candy with your mouth open to allow other group members to see inside your mouth.

What Happened?
What did you see? Were you surprised by it? Seek out your teacher for an explanation.

*MATERIALS NEEDED*
- “Wint-O-Green” or “Pep-O-Mint” LifeSavers® candy
- a dark room
Science Log

Use this log sheet to record the findings from the Making Lightning experiment(s) you’ve completed.

1. Experiment: ____________________________________________________________

Question:  How is lightning formed?

___________________________________________________________________
___________________________________________________________________

What I did:

___________________________________________________________________

What happened:

___________________________________________________________________

Why it happened:

___________________________________________________________________

2. Experiment: ____________________________________________________________

Question:  How is lightning formed?

___________________________________________________________________
___________________________________________________________________

What I did:

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What happened:

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Why it happened:

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THUNDER & LIGHTNING

Activity 1: Make Your Own Thunder

Try This!
1. Blow air into the paper bag.
2. Pop the bag.

The loud noise from popping the bag is the result of the sudden movement of the air out of the bag. This is similar to what happens when lightning suddenly moves the air. Now, follow the directions below to find out how far away a lightning strike is from your home or school.

Procedure
1. Wait for a thunderstorm.
2. When you see a flash of lightning, begin to count the seconds between the flash and when you finally hear the thunder.
3. Use the formula below to find out how far away you are from the storm.

\[
\frac{\text{seconds}}{5} = \text{miles away}
\]

Why do you hear thunder after a lightning bolt?

Name ______________________________
Lesson 6: Wind

Use this page when you introduce Wind to your students. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

It’s impossible for the Sun to heat all areas of Earth evenly. Areas nearer to the equator are very warm, while the areas surrounding the North and South Poles stay cool. The uneven heating of the earth’s surface causes air to move. In warmer air, the particles spread out, making the air lighter, so it rises. Cooler air is heavier and sinks. When warm air rises, the cooler air flows in to take its place. Movement of warm and cold air is called convection. Convection causes wind.

Without wind, our weather would never change. Wind circles the Earth constantly and plays an important role in our weather. When moist air blows into a cold part of the Earth, it rains, hails, or snows. When hot and cold air smash into each other, hurricanes and tornadoes form.

Prove It!

The experiment and activity on the pages that follow provide great visual examples of air displacement, or convection. You may wish to photocopy the handouts for each student or post them at the Experiment Learning Center. Also photocopy and distribute the corresponding Science Log page to each student, and allow students time to work through the experiment.

Experiment 1: Warm and Cold Air Masses

Teaching Notes: In this experiment, the water represents air’s different temperatures and how they react. The cooler water moves to the bottom of the jar just as cool air moves to the bottom of Earth’s atmosphere, while the warmer water moves to the top of the jar just as warmer air rises to higher levels of our atmosphere. This experiment is well worth the effort because the displacement of warm and cold material is obvious.

Journal Prompt

What would happen if the wind stopped blowing? Imagine all the things that might be affected. What would Earth look like? Would the way we live, travel, or conduct business change?

Homework Idea

Have students build their own anemometer using the instructions on page 56. Encourage them to work with a parent or friend to take readings at the same time each day over the next three days.

FUN FACTS!

- The highest wind speed ever recorded was 231 miles per hour (372 km/h)!
- If you’re not sure what direction the wind blows, set a compass on the ground, throw a small piece of grass up in the air, and see which way it blows. Wind direction is described as the direction from which the wind comes. That means a west wind is actually blowing from the west and moving in an easterly direction.
Experiment 1: Warm and Cold Air Masses

**Try This!**

Work in small groups to complete the experiment below. Record your findings on the Warm and Cold Air Masses Science Log.

**Procedure**

1. Fill one jar with warm water, and add two drops of red food coloring.
2. Fill the other jar with cold water, and add two drops of blue food coloring.
3. Cut a square piece of cardboard to cover the top of the jar with the blue water.
4. Place newspapers on your workspace. Place the red jar on the newspapers.
5. Flip the blue water jar over while keeping the cardboard in place, and carefully place it on top of the warm water jar, opening-to-opening, with only the cardboard separating the two.
6. Quickly remove the cardboard and watch what happens.
7. Record your observations on your Science Log or in your journal.

**What Happened?**

What did the two colors do? Did the colors ever stop moving? How does this model wind?

**Materials Needed**

- 2 baby food jars
- red food coloring
- blue food coloring
- water
- cardboard
- newspaper
Science Log

Use this log sheet to record the findings from the Warm and Cold Air Masses experiment.

Question: How does the cold water react to warm water?

What I did:

What happened:

Why it happened:

Why do meteorologists call cold air over warm air unstable?
Activity 1: Make an Anemometer

Procedure

1. Cut a 12-inch (30-cm) length of string, and tape one end to a Ping-Pong ball.

2. Tape the other end of the string to the center mark on a protractor.

3. Hold the protractor so that the ball has a chance to swing free in the wind. Use the compass to determine which direction the wind is blowing.

4. Hold the protractor with the base perpendicular to the ground, and face the wind. The Ping-Pong ball should push the string to an angle between 0 and 90 degrees. (Ignore numbers higher than 90 degrees.)

5. Record the angle measurement and use the chart to convert that number into the wind speed.

6. Were you able to measure wind speed easily using your anemometer? What did you do if the string changed position with the wind?

- Ping-Pong ball
- protractor
- string
- tape
- compass

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</table>
Lesson 7: Tornadoes

Use this page when you introduce Tornadoes to your students. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

Tornadoes are huge funnel clouds of twisting hot and cold air. These funnel clouds drop down from storm clouds and can destroy anything in their path. The wind speed inside the funnel cloud can reach up to 140 miles per hour (225 km/h)!

Tornadoes can strike at any time, but they usually occur during the warmest part of the day when thunderstorms are also developing. Here’s what happens:

1. A thunderstorm forms.
2. Cool air flows into an area trapping the hot air beneath it.
3. Hot, humid air pushes a hole through the cool air and rises rapidly to the top.
4. These unstable conditions of rising and falling air create a violent swirling storm.

Watch or Warning?

A tornado watch is issued when tornadoes can form because of the weather conditions. A tornado warning is issued when an individual spots an actual tornado or one is picked up by weather radar.

Prove It!

What better way is there to understand a tornado than to actually make one!

The experiment on the next page is beneficial as a whole class experiment or in small groups. Be sure to discuss what the students are seeing and why it’s happening. Then have students work through the Science Log on this experiment. If time permits, go to the Tornado Alley site listed on Activity 1: Where is Tornado Alley? Discuss the precautions that must be taken in the event of a tornado watch or warning.

Experiment 1: Make a Tornado Teaching Notes

After your students complete this experiment, ask them whether they think the empty bottle is really empty. Then tell them that it is not. It’s filled with air. As gravity pulls the water down into the empty bottle, the air in the “empty” bottle gets pushed into the top bottle. The water coming down swirls around the hole created by the air. Explain that this is what happens when a tornado forms.

Journal Prompt

Explain what a tornado is in your own words. What are some of the warnings for a tornado? What should you do if you encounter a tornado?

Homework Idea

Have students discuss weather safety with their family and write a tornado plan for their family. Ask them to consider what precautions they should take in the event of a tornado watch or warning.

• Tornadoes can hover over one spot for up to 45 minutes!
• The winds of a tornado have been known to pluck feathers off a chicken, lift buildings from their foundations, and even suck all the water from a small pond causing frogs and fish to rain from the sky!
Experiment 1: Make a Tornado

Try This!

Work in small groups to complete the experiment below. Record your findings on the Make a Tornado Science Log.

Procedure

1. Fill one of the bottles 3/4 full with water.
2. Add a pinch of glitter to the water.
3. Use duct tape to attach the empty bottle’s open end to the full bottle’s open end. Make sure the connection is tight and securely bound with the duct tape.
4. Turn off the lights.
5. Flip the bottles over, placing the full bottle on top and the empty bottle on the bottom.
6. Shine the flashlight on the bottle, and watch what happens.

What Happened?

Where did the water go when you flipped the bottles? What do you think caused this to occur?
Science Log

Use this log sheet to record the findings from the Make a Tornado experiment.

Question: What causes the water to swirl?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What I did:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

What happened:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Why it happened:
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

How is this different from a real tornado? How is it the same?
___________________________________________________________________
___________________________________________________________________
Activity 1: Where is Tornado Alley?

Visit the following web site for help completing this activity:
www2.sunysuffolk.edu/mandias/honors/student/tornado/alley.htm

1. What is Tornado Alley?

2. List the ten states that are part of Tornado Alley and shade them on the map above.
   1. __________________________
   2. __________________________
   3. __________________________
   4. __________________________
   5. __________________________
   6. __________________________
   7. __________________________
   8. __________________________
   9. __________________________
  10. __________________________

3. What are the peak times of the year for tornadoes?

4. What is the one thing that all these states have in common?

5. What type of barriers do most of these states lack?
Lesson 8: Hurricanes

Use this page when you introduce Hurricanes to your students. The fun facts can be used to draw your students into the topic, especially so students can complete the activity on page 64.

They’ll Need to Know ...

Hurricanes are large storms with rotating winds. They form over the warm waters of the ocean when there are large pressure and temperature differences between the warm water and the clouds. The clouds pull the moisture and the air near the surface of the water up, toward the clouds, which creates a column of fast-moving air.

In the beginning, the ocean storm is called a “tropical disturbance,” which is like a bunch of thunderstorms with very little wind circulation. When wind speeds up to 20 to 34 miles per hour (32-55 km/h), the ocean storm becomes a tropical depression. A tropical depression can quickly become a tropical storm if the wind speeds reach 35 to 64 miles per hour (56-103 km/h). Once the whirling mass of air grows and continues to spin around a center of low pressure, wind speeds increase. When wind speeds reach 74 miles per hour (119 km/h) or greater, the storm is considered a hurricane and given an official name.

The words hurricane, cyclone, and typhoon are all names for the same type of storm. The name tells you where the storm occurred.
1. Hurricanes are storms over the North Atlantic or the Caribbean.
2. Cyclones are storms over the Indian Ocean.
3. Typhoons are storms over the Pacific Ocean.

Prove It!

Discuss Hurricane Andrew, the costliest hurricane to ever hit American shores. Hurricane Andrew occurred in August of 1992. It left 50 people dead and caused over $25 billion in damages. Have students visit web sites to view first-hand photos and read information about this devastating storm. After, ask students to complete the storm safety and tracking activities on the pages that follow.

Journal Prompt

Imagine that you live in a coastal area that is under an emergency evacuation. A hurricane is headed your way. What precautions will you take? What will you take with you and what will you leave behind?

Homework Idea

Have students visit:
http://www.hurricanehunters.com
to learn about hurricane hunters. Then ask them to answer the following questions on paper.
What is a hurricane hunter? What does he or she do? What do hurricane hunters report back to weather forecasters? Is this a job you’d like to have?

- Names chosen for hurricanes are used in a six-year rotation.
- The eye of a hurricane is the core or center area. It’s almost like a hole in the middle of the storm. In this area you will find light winds or total calm and no rain.
- The intensity of a hurricane is measured on the Saffir-Simpson Scale. This scale measures the wind speed and air pressure of the storm. Based on these characteristics, a hurricane is ranked with a number between 1 and 5. Category 3, 4, or 5 hurricanes are considered intense and extremely dangerous.
- Hurricanes are usually 300 miles (483 km) across. This is much larger than a tornado, which is usually only a few feet to a quarter of a mile wide.
- Typhoon John lasted 31 days in August and September of 1994.
Activity 1: Storm Safety Poster

Wouldn’t it be great to live in an area with perfect weather? Is there such a place? In just about any location, weather poses a risk of some type. The threat of a hurricane is real to many people who live on or near the coast. Find out why with this poster activity.

**Procedure**

1. Research hurricane precautions and safety measures.

2. Create a list of hurricane safety tips.

3. Design a poster that will inform others of the proper precautions to take should a hurricane strike.

4. Be sure to include images and wording that clearly state the danger and precautions.

**Don’t forget to include:**

- emergency supplies (including clothing, food, communication tools, etc.)
- tips for those who live close to the water
- the best location to ride out the storm
- evacuation warnings and routes

**MATERIALS NEEDED**

- poster board
- paint or markers
- books on hurricanes
- Internet
Activity 2: Track a Hurricane

Meteorologists use latitude and longitude positions on a map to track the movement of a hurricane. Latitude measures the distance north or south of the equator, and longitude measures the distance east or west of the Prime Meridian.

Each coordinate listed below is Hurricane Michelle's position on a single day. Follow the latitude and longitude lines to plot each coordinate on the map. Then, join your marks with a line to track the storm's movement over the course of a week.

<table>
<thead>
<tr>
<th>Day</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>one</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>two</td>
<td>25</td>
<td>74</td>
</tr>
<tr>
<td>three</td>
<td>26</td>
<td>85</td>
</tr>
<tr>
<td>four</td>
<td>28</td>
<td>90</td>
</tr>
</tbody>
</table>

Note: Go to any of the sites listed below to view actual storm tracking coordinates. Try using a different-colored pen to plot the storms you view.

Hurricane and Tropical Data: weather.unisys.com/hurricane/index.html
Hurricane and Storm Tracking: hurricane.terrapin.com
Activity 3: Show What You Know, Hurricanes

Use what you know about hurricanes to connect each description about hurricanes below with the word or words that match it. The first one is done for you.

1. Center of the hurricane  
   a. 145 mph
2. Scale used to categorize hurricanes  
   b. eye
3. Storm over the Pacific Ocean  
   c. cyclone
4. Storm over the North Atlantic Ocean  
   d. Andrew
5. Storm over the Indian Ocean  
   e. Saffir-Simpson
6. Devastating hurricane in 1992  
   f. 74 mph
7. A pilot who flies into the hurricane’s eye  
   g. hurricane
8. the wind speed of a hurricane  
   h. 5
9. Category ____ hurricanes are the most dangerous  
   i. hurricane hunter
10. Hurricane Andrew’s winds reached this speed  
    j. typhoon

List two ways in which hurricanes are different from tornadoes or thunderstorms.

1. __________________________________________________________________________
2. __________________________________________________________________________
Lesson 9: Weather Instruments

Use this page when you introduce Weather Instruments to your students. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

Meteorologists depend on tools and instruments to help them generate a weather forecast. They take the information gathered from these tools and instruments, analyze it, and then create a forecast. The more traditional tools have been around for many years and are still reliable sources of information. New technology, including satellites and radar, have helped make weather forecasting an even more precise science. Here are the main tools used to forecast weather:

• A rain gauge measures rainfall.
• A thermometer measures temperature.
• A wind vane measures wind direction.
• A barometer measures air pressure.
• An anemometer measures wind speed.
• A psychrometer measures relative humidity.

Radar and satellites are two more important tools. Radar is used to send out a radio wave at a high frequency. When the wave hits a raindrop or other type of precipitation, the signal is bounced back so meteorologists can figure out how far away the rain is. Doppler Radar can detect severe weather storms before they threaten an area.

Satellites orbit Earth and take pictures from space for meteorologists to “see” the weather. Satellites allow meteorologists to track weather systems that are far away. Satellites also allow a forecaster to see the big picture — all the weather that’s occurring around the world. The most commonly used satellite images are from the GOES 8 and GOES 9 Satellites.

Prove It!

If possible, bring in actual working weather instruments for the students to experiment with. If you don’t have the actual instruments, instructions for making a rain gauge and a wind vane are included on the next few pages. Instructions for making other instruments are included in Lesson 1 (barometer), Lesson 2 (psychrometer), and Lesson 6 (anemometer).

Once students have had time to work with the instruments, have them complete the Know Your Weather Instruments worksheet on page 68.

Journal Prompt

What was weather forecasting like before the days of radar and satellite images? List ways in which this new technology benefits our society as a whole. What specific jobs or trades use these up-to-the minute forecasting tools?

Homework Idea

Invite students to watch the weather tonight on the local news and write a list of terms they’re familiar with. Then, challenge students to define the terms.

- Many of the tools used to predict the weather contain the word meter. The Greek word “meter” means to measure.
- The lowest temperature ever recorded was –80 degrees Fahrenheit on January 23, 1971 in Prospect Creek, Alaska.
Activity 1: Make a Rain Gauge

Procedure
1. Place the ruler inside the jar so that the markings are visible from outside the jar. Make sure the bottom of the ruler is even with the bottom of the jar.
2. Tape the ruler to the jar, securing it against the jar’s mouth.

Gathering Data
1. Take your rain gauge outside and place it in an open area. Make sure there aren’t any trees or buildings blocking the rain.
2. Wait for it to rain!
3. Check the rain gauge every day at the same time. If it has rained, record the amount to the nearest 1/4.”
4. Empty the gauge every day.

MATERIALS NEEDED
- plastic ruler
- clear tape
- clear jar
Activity 2: Make a Wind Vane

**MATERIALS NEEDED**
- drinking straw
- index cards
- pushpin or thumb-tack
- pencil
- stapler
- scissors
- compass

**Procedure**

1. Trace the arrowhead and tail shapes below on the index cards. Cut them out.

2. Staple the tail to one end of the straw and the arrow to the other.

3. Place the tack or pushpin through the middle of the straw and then into the center of the eraser. Don’t push down too hard. You’ll want the straw to spin around freely.

4. Test your wind vane with a blow dryer to see if the arrow spins freely.

5. Take your wind vane outside where the wind is blowing.

6. Hold the bottom of the pencil. The arrowhead should point in the direction that the wind blows.

7. Use a compass to find out which direction the arrow is pointing: from the north, northeast, northwest, south, southeast, southwest, east, or west.
Activity 3: Know Your Weather Instruments

Read each sentence below. Then choose the weather tool from the list that fits the description.

barometer  anemometer  satellite
thermometer  doppler radar  wind vane
psychrometer  rain gauge

1. Meteorologists use this technology to detect dangerous weather like tornadoes. ______________________________

2. What you use to tell how much rain fell yesterday. ________________

3. This tool can tell you how warm it is outside. ________________

4. If you want to know the air pressure, this would be the instrument to use. ________________________________

5. Want to know the direction of the wind? Look at this. ______

6. Check this if you want to know the speed of the wind. ______

7. Images from this help meteorologists see weather systems that are far away, show cloud cover over an area, and much more. ________________________________
Lesson 10: Weather Maps & Forecasting

Use these pages when you introduce Weather Maps & Forecasting to your students. It may be helpful at this time to explain the symbols in the pocket chart as part of your mini-lesson. The fun facts can be used to draw your students into the topic.

They’ll Need to Know ...

Today’s meteorologists depend on sophisticated instruments and technology to help them predict the weather. They’ll look at maps of current winds and temperatures to forecast future temperatures. Southerly winds usually mean warmer temperatures and Northerly winds usually mean cooler temperatures.

Studying radar images and the motion of precipitation over the past few hours or days is helpful when forecasting precipitation. But nearly all of today’s meteorologists rely on computers to help them create their weather forecast. The computers are set to take weather readings every 6 to 12 hours and record a variety of weather conditions including rainfall, temperature, wind speed, and humidity. Then, the computer uses mathematical formulas to create a forecast for a particular area. The computer programs can even create detailed weather maps.

Once instruments have been read, a meteorologist writes a forecast and creates the weather maps that appear in newspapers or on your local news. The weather maps feature symbols that tell us about specific weather conditions.

The numbers and symbols on a weather map show the location and strength of current weather systems. These symbols include symbols for fronts, high pressure areas, and low pressure areas.

The area where an air mass is meeting and overtaking another air mass is called a front. A cold front usually means that cold air is moving and coming in contact with warmer air. A warm front is a mass of warm air that rises over a colder air mass. If a warm front and a cold front won’t budge, a stationary front is formed. This means warm weather is on one side, and cold, wet weather is on the other side.

These pictures above are the symbols for the different kinds of fronts. The side with the points show the direction the front is moving. A stationary front has warm and cold front symbols on both sides.

When you see a map with a capital “H,” it means high-pressure systems are on the horizon. High-pressure areas usually indicate good weather. Lows are shown with a capital “L.” Low-pressure areas will probably mean overcast skies, rain, or severe weather including tornadoes or hurricanes.
Lesson 10: Weather Maps & Forecasting (continued)

The lines to the right are isobars. Isobars show the difference in pressure between high- or low-pressure areas.

Temperature on a weather map is often shown by a color shading of an area. The temperature is also shown numerically on a map.

Prove It!
Divide students into two small groups. Distribute local or national newspapers to each group. Have one group complete the Weather Watcher activity on page 71. Give the second group the Create a Weather Map activity on page 72. If time permits, challenge the groups to try the other activity.

Journal Prompt
Would you want to be a meteorologist? What would you like about the job? What would you dislike?

Homework Idea
Have students place an order for the perfect day by filling in the following:

Ideal temperature _________
Relative Humidity _________
Heat Index _________
Cloud Cover _________
Wind Speed _________
Rainfall _________

Invite students to journal on what they would do with this perfect day.

• The Farmer’s Almanac is a printed booklet that started in 1818 and was the first true weather forecasting this country had ever seen. The Almanac is still in print and many farmers swear by its accuracy.

• Some weather maps include Air Quality Index (AQI) information. An AQI reading tells you how clean or polluted the air is in your area and about the health concerns.

• Some weather maps include an Ultraviolet Index (UV Index). The UV Index tells you your expected risk of overexposure to the Sun.
Activity 1: Weather Watcher

Using today’s newspaper, answer the following questions:

1. What is today’s forecast?

_______________________________________________________________________________

2. What was yesterday’s high for our area? Yesterday’s low?

_______________________________________________________________________________

_______________________________________________________________________________

3. What is the average high temperature in our area today?

_______________________________________________________________________________

4. What is the record high for today? What is the record low?

_______________________________________________________________________________

_______________________________________________________________________________

5. What is the forecast for Tampa, Florida?

_______________________________________________________________________________

6. What is the forecast for Des Moines, Iowa?

_______________________________________________________________________________

7. Give the high and low temperatures for today in Las Vegas, Nevada.

_______________________________________________________________________________


_______________________________________________________________________________

9. What is the AQI (Air Quality Index) for our area?

_______________________________________________________________________________
Activity 2: Create a Weather Map

Use information found in today's newspaper to create your own weather map.

1. Write today's temperature in your state above.

2. Write the temperatures of local cities in the states above.

3. Write the temperatures of famous U.S. cities in their state.

4. What is the rainfall for your area?
   _____________________________________________________________

5. What is the UV Index for your area?
   _____________________________________________________________
Math and Weather

There’s no better way to enhance learning and make it relevant to students than to tie it with all areas of the curriculum. In this step, you’ll find a few fun, curriculum-extending activities you might want to try! These pages are meant for you to photocopy, cut by activity, and distribute to your students.

This page is filled with ways you can extend the learning to Math.

1. Find the Distance Between You and a Thunderstorm

The next time there is a thunderstorm, count the seconds between a flash of lightning and the thunder. Then, divide the number of seconds by 5.

The answer is the number of miles away from where the storm is actually located. So, when you see lightning and immediately hear thunder, the storm is right overhead! Use this formula in your calculations:

\[
\frac{\text{seconds}}{5} = \text{miles away}
\]

Now convert the number of miles to kilometers by multiplying that number by 1.06.

2. A Folklore Thermometer

Another fun math trick requires chirping crickets! Folklore says that you can actually come close to measuring the actual temperature by listening to the chirping of crickets. Using a watch with a second hand, count the number of cricket chirps you hear in 15 seconds. Add 37 to the number of chirps you heard and that should be close to the actual Fahrenheit temperature!

Use this formula in your calculations:

\[
\text{number of chirps} + 37 = \text{temperature}
\]
Social Studies & Weather

This page is filled with ways you can extend the learning to Social Studies. Photocopy the page, cut by activity, and distribute to students.

1. Charting the World’s Temperature

Choose three international cities, locate them on a world map, and then chart their weather for a week. Be sure to include temperatures, information on highs and lows, and even record deadly storms. Use the table below to help you out.

<table>
<thead>
<tr>
<th>CITY</th>
<th>MON</th>
<th>TUES</th>
<th>WED</th>
<th>THURS</th>
<th>FRI</th>
<th>SAT</th>
<th>SUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What’s the weather like? Would you like to visit these places?

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

2. “X” Marks the Wild Weather

Photocopy a map of the world from an Atlas. Then, use the Internet and books on hurricanes to plot the locations of deadly storms in history. Remember to include typhoons and cyclones!
Language Arts & Weather

This page is filled with ways you can extend the learning to Language arts. Photocopy the page, cut by activity, and distribute to students.

1. Wordiest Weather Wins!
Here’s a game to play with a group of friends. For one minute, each person comes up with a list of adjectives and adverbs to describe weather. When the minute is up, everyone in the group reads from his or her list and crosses off the words that other members have mentioned. The person with the longest list of noncrossed off words wins!

2. Weather Poems
Write a poem about your favorite type of weather. Some poem types are haikus or acrostic poems. A haiku uses five syllables for the first sentence, seven syllables for the second sentence, and five syllables again for the third sentence. Acrostic poems spell out a word vertically by taking the first letter of the first word in each new sentence. Here’s an example of each (haikus don’t need to rhyme):

**Haiku**
- Rain is on the way
- It’s a humid kind of day
- Low pressure and gray!

**Acrostic Poem**
- We celebrate when it’s warm
- Eating pizza in the sun
- And then we’ll go swimming but
- Three hours later
- Humidity takes over
- Everyone runs away. Why?
- Rain

3. Hot Travel Spots
Write a travel brochure describing the perfect vacation spot. Be sure to describe the climate.

4. Tornado Works
Write a nonfiction article describing step-by-step how a tornado is formed.

5. All About the Instruments
Become a technical writer and write an instruction sheet for one of the weather instruments.
CROSS THE CURRICULUM

Reading, Art & Weather

This page is filled with ways you can extend the learning to Reading and Art. Photocopy the page, cut by activity, and distribute to students.

1. Taping a Weather Story

Create a read along tape for younger children using great weather-related books like Cloudy with a Chance of Meatballs by Judi Barrett or Flash, Crash, Rumble, and Roll by Franklyn M. Branley. Be sure to use an expressive voice as you read. You might even follow up with a list of questions for your audience.

2. Open Mic Weather

Share your love of weather with your classmates and others in the school with a public reading. Check out the weather folklore book, A January Fog Will Freeze a Hog by Hubert Davis. Select a partner and a poem from the book and come up with a creative reading style to read your poem. Then, invite other classes and teachers in your school to come to your class for a reading. Provide snacks like juice and graham crackers for your guests to nibble on during the Open Mic.

3. Non-Rainy Day Art!

Here are some fun weather art activities to try, and it doesn’t need to be a rainy day.

A. Find some great backdrops or props for your Weather Station Bulletin Board. Some ideas include posting a map of the United States and the world, decorating and putting up a weather bulletin border, finding or drawing pictures of destructive storms, or taking a photograph of a rain gauge. The ideas are limitless! Let your creativity be your guide!

B. Fold and cut paper into paper snowflakes. Then, draw a line of symmetry showing how the two halves of the snowflake are the same.
TIE IN TECHNOLOGY

Two Great Projects

Technology offers wonderful opportunities for reinforcing learning of all types. In this section you’ll find two great projects that will allow you to take full advantage of all technology has to offer while at the same time strengthening the knowledge gained during the unit of study. You may need to adjust these activities to fit your students’ learning styles. One way is to conduct these activities as a whole class or not use the technology. The ideas are limitless!

1. Create a Multimedia Presentation: Weather Instruments

This unit of study concentrates not only on understanding weather, but also on understanding how various weather elements are measured with weather instruments and interpreting the data. A multimedia presentation provides a great way for students to explain the process of collecting data and the instruments used.

Divide students into groups of two or three. Then, discuss what you expect as far as content, including how many weather instruments you’d like them to discuss, how many cards or slides per instrument, and how they should cite their resources in a bibliography.

Give them time to brainstorm their presentation and then distribute the Storyboard worksheet on page 79. (The groups will more than likely need multiple copies of the page.) If possible, allow the students to spend some time at the computer experimenting with design elements and searching for movies, photos, links or other elements they’d like to include in their presentation. Encourage the use of original artwork and sounds.

Distribute the Multimedia Presentation Checklist on page 78. Allow multiple work sessions for planning and the actual creation of the presentation. Then, plan a class “showing” of each group’s presentation.

The computer tools your students use will depend on what is made available to your school. Some programs that may enhance the project include many of the word processing and desktopping software on the market. Other tools include a digital camera and even an audiocassette tape recorder. Another way to go is to create a poster per Storyboard and use the posters in the presentation. The choices are limitless! However, be sure that students are comfortable using the tools before they start. Also, when students present the project to the class, allow them to use the computer to enhance the presentation.
MULTIMEDIA PRESENTATION

Name ______________________________

Planning
® Have I researched the topic and decided how to show it in a presentation?
® Have I located outside sources (graphics, sounds, links to web sites, and movies) to use within the presentation?
® Have I developed a Storyboard?
® Have I determined which tools I need to complete the task?
® Has each slide or card been designed and numbered?

Content
® Does my presentation clearly prove a point, explain something, or answer a question?
® Does the presentation support the content: not too silly if the subject is serious and vice versa?
® Did I include a table of contents or clear navigation?
® Are all my references properly cited on a bibliography or reference card?
® Did I include an “about the author(s)” card?

Design
® Is it easy to work through the presentation?
® Is there a good contrast between text color and background color?
® Are font choices consistent? (Try to use 3 font types or fewer.)
® Are the sounds, movies, and animations appropriate to the content?
® Is the text free of spelling, grammar, and punctuation errors?
® Are the graphics clear?
® Is the presentation interactive and interesting?

Presentation
® Have I rehearsed the presentation?
® Have I completed a “dry run” in front of others to make sure the presentation will run smoothly?
MULTIMEDIA PRESENTATION

Name ________________________________

Use these boxes as you’re designing each screen for your presentation on weather instruments.

1.  

2.  

3.  

4.  

5.  

6.  

© Learning Resources, Inc.
2. Create a Web Site: How a Tornado is Formed

This second project will allow you to take full advantage of all technology has to offer while at the same time strengthening the knowledge gained during the unit of study. The next few pages explain what items to include on a web page, but they do not explain how to set up a web site. For more information on setting up a web site if you don’t already have one, consult a librarian or search online at any of the many sites addressing this topic.

If your students have already experimented or are ready to learn about web page development, creating a web page is another great way to "show what they know." The steps in this book explain how to create a compelling web site on the development of a tornado. They do not provide directions on how to build the actual web site.

First, spend time viewing web sites. Then, discuss what makes a web site a good example and what would be considered a poor example. (Use the checklist on page 81 as a guide here.) Then, introduce the topic for your students’ web development project, and divide them into groups of two or three.

Then, discuss what you expect as far as content. This includes whether you would like students to tell what a tornado is, have each step in the creation of a storm or other information like statistics or safety information, and whether they should include bibliography information and if so how to cite their references.

Give them time to brainstorm their web site and then distribute the Web Site Flow Chart worksheet on page 82. If possible, allow the students to spend some time at the computer experimenting with design elements and searching for movies, photos, links or other elements they’d like to include as part of their web site. Encourage the use of original artwork and sounds.

Distribute the Web Design Checklist from page 81. Allow multiple work sessions for planning and the actual creation of the web pages. If possible, post the sites to the school server to allow other classes within the school to view the pages. Beforehand, be sure to use only first names and obtain parent permission. Give students ample time to view each group’s site.
WEB DESIGN CHECKLIST

Name ______________________________

◎ Is my site’s objective clear?

◎ Is the subject divided with different subject matter on different pages?

◎ Is the text easy to read?

◎ Do all links work correctly?

◎ Have spelling and punctuation been checked on each page?

◎ Is navigation simple to use?

◎ Are there links at the bottom of each page so the user can navigate back to the top of the page, the home page, the table of contents, or related information on the subject?

◎ Is there a balance between graphics and text?

◎ Are font and point size consistent?

◎ Is the design consistent?

◎ Do all links work correctly?
Use this flow chart to help you think through the design and structure of your web site. Provide notes on buttons, links, design elements, and content.

Name ______________________________
Assessment Tools

You’ve done your job. The content was incredible, the hands-on learning opportunities were abundant, and the delivery was no doubt sublime! Now let’s see how much learning took place.

There are a number of great ways to assess student learning. We’ve included some of these methods within the next few pages, complete with rubrics and actual assessments you can photocopy and have students take.

Tests
A well-written test is the granddaddy of all assessment tools. If you’ve included everything you want the students to know, a test can be a very reliable measure. We’ve included two types of tests for this unit: 1.) a Q&A test, 2.) and a multiple choice, matching, and True or False test.

Rubrics
Rubrics allow students and teachers to record their perceptions and opinions. Whenever, using rubrics, it’s important to encourage honest reporting on the students’ part. We’ve included two rubrics in this section — one for the student and one for the teacher.

Journals
Journals are great assessment tools. Requiring students to keep a journal as you study a topic serves two purposes:

1. It causes the students to recall the information they’ve just studied.
2. It helps you see just how much information they took away from the lesson, which you can use to determine the points that need to be re-taught.

The sample journal page included in this book has the following areas:

1. What we studied today. This encourages students to recap the day’s learning.
2. My experience with this topic. Students use this space to share their own experiences with the topic like if they’ve been through a hurricane, lived in an area with a high level of humidity, or if they’ve done the same experiment before in another class. If students discuss the latter in this section, encourage them to discuss what the experiment proves.
3. Questions I still have. This is an excellent area for you to see what students do not understand or to take the learning to the next level. This space allows students to ask any questions they still have surrounding the subject. It might be something you covered and they didn’t comprehend or it could be an extension question based on the information you covered in class.

Science Logs
Reading a student’s Science Log will give you clear feedback on whether he or she understood the scientific concept associated with the experiment. Throughout the lessons in Step 6, we’ve included Science Logs for students to fill out when they conduct an experiment. Even though you might provide students with directions for completing each experiment, it’s important for them to write down exactly what they did, what materials they used, what the results were, and what they feel the reasons were for the outcome. If what they write is correct and scientifically true, great! If not, you’ll know what to re-teach in your upcoming lessons.

A Note About Assessing Projects
While the projects in Step 5: Plan a Project provide a great way to reinforce learning, they can be tricky to assess — especially if the projects are group activities. In the case of a group activity, always monitor each group’s performance. Make sure each person is doing a fair amount of the work. It’s also a good idea to include a peer assessment as part of the overall grade. It should be noted that projects don’t always cover a complete topic, but rather portions of a topic. Therefore, never base a student’s grade for the unit of study solely on a project. We have included some sample project assessment pages throughout this chapter on pages 85-86 for Step Five: Plan a Project.
MY WEATHER JOURNAL

Name ___________________________________          Date ______________

What we studied today:
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

My experiences with this topic:
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

Questions I still have:
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

__________________________  ___________________________
# Peer ASSESSMENT RUBRIC

## Student-to-Student Assessment

<table>
<thead>
<tr>
<th>Expectations</th>
<th>Actual Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
</tr>
<tr>
<td>My teammate was helpful.</td>
<td>1 point</td>
</tr>
<tr>
<td>My teammate listened to the ideas presented and participated in group</td>
<td>1 point</td>
</tr>
<tr>
<td>decisions.</td>
<td></td>
</tr>
<tr>
<td>My teammate contributed a fair amount of work toward the final outcome.</td>
<td>1 point</td>
</tr>
<tr>
<td>My teammate accepted criticism and redirection in a positive manner.</td>
<td>1 point</td>
</tr>
<tr>
<td>Other</td>
<td>1 point</td>
</tr>
</tbody>
</table>

Total Points

Evaluator’s Name: ________________________________________________

Comments: _______________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

Subject’s Name: _________________________________________________

Comments: _______________________________________________________

_________________________________________________________________
# Teacher Assessment

<table>
<thead>
<tr>
<th>Expectations</th>
<th>Actual Performance &amp; Point Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Poor</td>
</tr>
<tr>
<td>Organization</td>
<td>1 point</td>
</tr>
<tr>
<td>Content</td>
<td>1 point</td>
</tr>
<tr>
<td>Mechanics</td>
<td>1 point</td>
</tr>
<tr>
<td>Design</td>
<td>1 point</td>
</tr>
<tr>
<td>Presentation</td>
<td>1 point</td>
</tr>
<tr>
<td>Other</td>
<td>1 point</td>
</tr>
</tbody>
</table>

Total Points

Group Members: 

Subject’s Name: 

Teacher’s Comments: 

Organization: 

Content: 

Mechanics: 
True or False

Read each sentence below. Write a T on the line if it is true or an F on the line if it is false.

1. Hurricanes and tornadoes are the same type of storm. _______
2. Thunder occurs when two clouds bump into one another. _______
3. Wind has an affect on our temperature. _______
4. Wind is caused by the uneven heating of our the Earth’s surface. _______
5. The eye of a hurricane has violent winds and rain. _______

Fill in the Blank

Fill in the blank with the correct tool that finishes the sentence.

6. A __________________________ measures temperature.
7. A __________________________ measures air pressure.
8. An __________________________ measures wind speed.
10. A __________________________ tells the wind’s direction.
11. A __________________________ studies weather and makes predictions.

Multiple Choice

Circle the correct answer that finishes the sentence.

12. Hot air:
   - A. rises  
   - B. falls  
   - C. stays in one place

13. The Saffir–Simpson scale measures:
   - A. tornado damage  
   - B. volcanic eruptions  
   - C. hurricane intensity

14. A rain gauge measures:
   - A. intensity of a storm  
   - B. amount of rain  
   - C. size of raindrops

15. Radar can detect:
   - A. severe storms  
   - B. humidity  
   - C. wind speed

16. A front that doesn’t move is:
   - A. a warm front  
   - B. a stationary front  
   - C. a cold front

17. High pressure usually indicates:
   - A. a storm  
   - B. a hurricane  
   - C. great weather

18. Movement of warm and cold air is called:
   - A. microwave  
   - B. convection  
   - C. traditional

19. Heat from the Sun causes water to:
   - A. evaporate  
   - B. freeze  
   - C. boil

20. Relative humidity tells you how much ________ is in the air:
   - A. wind  
   - B. snow  
   - C. water
UNDERSTANDING WEATHER Q&A

Name___________________________________________     Date

1. How does humidity affect our weather?
_______________________________________________________________________________
_______________________________________________________________________________

2. Why do we see lightning before we hear thunder? What causes thunder?
_______________________________________________________________________________
_______________________________________________________________________________

3. List 2 ways in which wind is involved in our weather:
   1. __________________________________________________________________________
   2. __________________________________________________________________________

4. List 2 ways in which hurricanes and tornadoes are different:
   1. __________________________________________________________________________
   2. __________________________________________________________________________

5. Are tornadoes and hurricanes similar in any way? If so, how?
_______________________________________________________________________________
_______________________________________________________________________________

6. Draw and label 2 types of clouds.

7. List 3 weather instruments and what they measure.
   1. __________________________________________________________________________
   2. __________________________________________________________________________
Step 10
CELEBRATE!

Weather Olympics

It’s been an interesting few weeks. You’ve worked hard to insure student learning and required a lot of your students. It’s time to celebrate in this final step! What better way than with a fun, informative game show!

1. You’ll Need Questions and Answers
Assign each student a weather topic. If you’ve taught each of the lessons in Step 6 of this book, it’ll be a good idea to stick with the topics: Air & Air Pressure, Water Vapor & Humidity, The Water Cycle, etc.

Distribute two Weather Olympics Question Forms from page 90 (cut this form into three sections after you make copies) to each student. Instruct students to write their topic at the top of the form and then write two questions and answers that are related to their assigned topic.

2. You’ll Need a Set and a Buzzer
Your classroom bulletin board will fit in nicely as the backdrop. Make heading signs for each topic (i.e., Air & Air Pressure, Humidity, The Water Cycle, etc.), and staple them across the top of the bulletin board. Under each heading place the backside of the cards with assigned point values (100 points, 50 points, 25 points, 10 points, and 5 points). Use desks as the contestant podiums and small bells, whistles, blocks, or chimes for a buzzer. Ask the school music teacher for ideas. Remember, you’ll need four or five: one for each contestant.

3. You’ll Need Contestants and an Audience
Divide the class into groups of four or five, and have each group pick a name for themselves having to do with weather. Practice by having each person per group answer one question, and then go to the end of the line in their group once that question has been answered. Plan to play a few rounds of the game.

You know all game shows have audiences to clap and cheer for the contestants. Why should your show be any different? We’ve included an invitation in this section for you to send out. Fill in the when, where, and what time information on the invitation, make multiple copies, and encourage the students to decorate the invitations. Then, distribute the invitations to parents, other classes, school administrators, and friends.

4. Show Time!
You’ve done all the prep work, the contestants have studied, and the audience is in place. Now, it’s time to play! Assign one non-contestant student to keep score and another to remove point value cards as the questions are answered. Remind the audience to remain silent when a contestant is answering. Have students role dice to see who begins the game. That person chooses the first topic and point value. Remind contestants of rules:

1. Contestants must “buzz in” first to answer.
2. The next team member from the team with the winning contestant chooses the next question.
3. When all point value cards are removed, the points are totaled and a winning team is declared.

Consider having a championship round featuring the winning groups!

Tips and Ideas:
1. See if your principal could be the host of your game show.
2. Have multiple shows for other classes, friends, parents, etc.
3. Type questions and answers onto a study sheet, and distribute to students a few days before the show. This will help prepare them for the big day.
4. Place the question forms on construction paper. Laminate and then bind the forms with a ring or other method. This gives you a great fact book for future classes and serves as a memento of this fun event.
CELEBRATE WEATHER OLYMPICS

Weather Olympics Question Form

Topic: ______________________________________________________________

...................................................................................................................

Answer: ______________________________________________________________

...................................................................................................................

Question: ___________________________________________________________

...................................................................................................................

Weather Olympics Question Form

Topic: ______________________________________________________________

...................................................................................................................

Answer: ______________________________________________________________

...................................................................................................................

Question: ___________________________________________________________

...................................................................................................................

Weather Olympics Question Form

Topic: ______________________________________________________________

...................................................................................................................

Answer: ______________________________________________________________

...................................................................................................................

Question: ___________________________________________________________

...................................................................................................................

Weather Olympics Question Form

Topic: ______________________________________________________________

...................................................................................................................

Answer: ______________________________________________________________

...................................................................................................................

Question: ___________________________________________________________

...................................................................................................................

Weather Olympics Question Form

Topic: ______________________________________________________________

...................................................................................................................

Answer: ______________________________________________________________

...................................................................................................................

Question: ___________________________________________________________

...................................................................................................................
Our class has just completed an incredible unit on weather, and now we'd like to challenge each other in a game! Come see what you think.

What? Weather Olympics

When?

Where?

What Time?

Choose from one of the private sessions listed below:
Page 11: Weather Vocabulary Practice
1. anemometer
2. humidity
3. hurricane
4. thunder
5. cirrus
6. eye
7. absorption
8. air pressure
9. climate
10. cumulonimbus
11. water cycle
12. wind
13. thermometer
14. barometer
15. meteorologist

Page 12: Weather Vocabulary Crossword Puzzle
Across
1. condensation
2. wind
3. meteorologist
4. eye
5. temperature
6. thermometer

Down
1. climate
7. anemometer
8. dew point
9. humidity

Answer Key

\[
\begin{array}{llllll}
\text{e} & \text{n} & \text{s} & \text{a} & \text{t} & \text{i} \\
\text{n} & \text{p} & \text{d} & \text{i} & \text{n} & \\
\text{m} & \text{e} & \text{t} & \text{e} & \text{r} & \text{o} \\
\text{o} & \text{m} & \text{e} & \text{t} & \text{e} & \text{r} \\
\text{e} & \text{t} & \text{h} & \text{e} & \text{r} & \text{m} & \text{o} & \text{m} & \text{e} & \text{t} & \text{e} & \text{r} & \text{e} & \text{r} \\
\end{array}
\]
Page 39: Activity 1: Illustrate the Water Cycle
1. Evaporation
2. Condensation
3. Precipitation

Page 46: Activity 1: Show What You Know About Clouds
1. Cumulus: heaps of cotton-looking clouds;
2. Cirrus: wispy, curly clouds;
3. Stratus: clouds that are spread out and look like a low covering;

Page 60: Activity 1: Where is Tornado Alley?
1. Area of United States where tornadoes are most prevalent.
2. Alabama, Arkansas, Florida, Iowa, Kansas, Mississippi, Missouri, Oklahoma, Texas, and Nebraska
3. Southern states between March and May and then again in November. Northern States between April and June.
4. Location — all are east of the beginning of the great plains.
5. They all lack mountain barriers.

Page 64: Activity 3: Show What You Know: Hurricanes
1. b; 2. e; 3. j; 4. g; 5. c; 6. d; 7. i; 8. f; 9. h; 10. a; 1. Hurricanes form over water;
2. Hurricanes are bigger than tornadoes.

Page 68: Know Your Weather Instruments
1. doppler radar
2. rain gauge
3. thermometer
4. barometer
5. wind vane
6. anemometer
7. satellite
8. psychrometer
9. Satellites track weather systems; radar tracks severe storms and precipitation.

Page 87: Understanding Weather
Assessment
1. F; 2. F; 3. T; 4. T; 5. F
6. thermometer
7. barometer
8. anemometer
9. psychrometer
10. wind vane
11. meteorologist
12. A. rises
13. C. hurricane intensity
14. B. amount of rain
15. A. severe storms
16. B. a stationary front
17. C. great weather
18. B. convection
19. A. evaporate
20. C. water

Page 88: Understanding Weather Q & A Assessment
1. answers may vary
2. Light travels faster than sound so we see the lightning before we hear the thunder. The sound is caused by the rapid movement of air.
3. answers may vary
4. answers may vary
5. answers may vary
6. answers may vary
7. answers may vary
8. great weather
9. Satellites track weather systems; radar tracks severe storms and precipitation.
<table>
<thead>
<tr>
<th>absorption</th>
<th>air pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>cirrus</td>
<td>climate</td>
</tr>
<tr>
<td>cloud</td>
<td>condensation</td>
</tr>
<tr>
<td>lightning</td>
<td>meteorologist</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>precipitation</td>
<td>rain</td>
</tr>
<tr>
<td>snow</td>
<td>stratus</td>
</tr>
</tbody>
</table>
high

a person who studies weather

cold front

low

stationary front

warm front

barometer

isobar
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermometer</td>
<td>Measures temperature</td>
</tr>
<tr>
<td>Anemometer</td>
<td>Measures wind speed</td>
</tr>
<tr>
<td>Rain gauge</td>
<td>Measures rainfall</td>
</tr>
<tr>
<td>Wind vane</td>
<td>Measures wind direction</td>
</tr>
<tr>
<td>Psychrometer</td>
<td>Measures humidity</td>
</tr>
<tr>
<td>Measures air pressure</td>
<td>Measures air pressure</td>
</tr>
</tbody>
</table>
measures rain

measures wind speed

measures temperature