

# WEATHER AND WATER

3-8 Science Unit Study

# WEATHER AND WATER

CREATED BY THE GOOD AND THE BEAUTIFUL TEAM

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# UNIT INFORMATION

## Student Journal



All The Good and the Beautiful science units include activities in a student journal. Each student should have his or her own student journal, and the parent or teacher will direct the student regarding when to complete the activities in the lessons. Student journals can be purchased by going to [goodandbeautiful.com/science](https://www.goodandbeautiful.com/science) and clicking on the *Weather and Water* unit link.

## Science Wall



All The Good and the Beautiful science units include vocabulary words to be placed on your science wall, which is a wall or trifold presentation board in your learning area on which you can attach the vocabulary words and other images. **Cut out the vocabulary word cards at the beginning of the unit.** The course will indicate when to place them on the wall.

## Lesson Preparation



All The Good and the Beautiful science units include easy-to-follow lesson preparation directions at the beginning of each lesson.

## Activities and Experiments



Many of The Good and the Beautiful science lessons involve hands-on activities and experiments. An adult should always closely supervise children as they participate in the activities and experiments to ensure they are following all necessary safety procedures.



## Experiment Videos



Go to [goodandbeautiful.com/sciencevideos](https://www.goodandbeautiful.com/sciencevideos) and click on the *Weather and Water* link or use the Good and Beautiful Homeschool app to see videos of

experiments used in this unit. This is a convenient way to watch experiments that may be more complicated. Children often learn best through hands-on experience; therefore, this unit includes a supply list and instructions for all experiments, and you may choose to do as many as you wish.

## Unit Videos



Some lessons include videos that were created by The Good and the Beautiful. Have a device available that is capable of playing the videos from [goodandbeautiful.com/sciencevideos](https://www.goodandbeautiful.com/sciencevideos) or on the Good and Beautiful Homeschool app.

## Content for Older Children



Some lessons include extra content that is more applicable for older children (grades 7–8). Parents or teachers may choose to skip this content if instructing only younger children.

## Content for Younger Children



Some lessons include extra content that is more applicable for younger children (grades 3–6). Parents or teachers may choose to skip this content if instructing only older children.

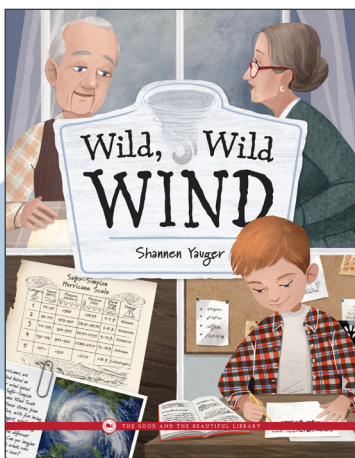
## Versions

New discoveries are being made on an ongoing basis. This course is reviewed and revised periodically to keep information as up to date as possible. This version is the first edition of this unit.

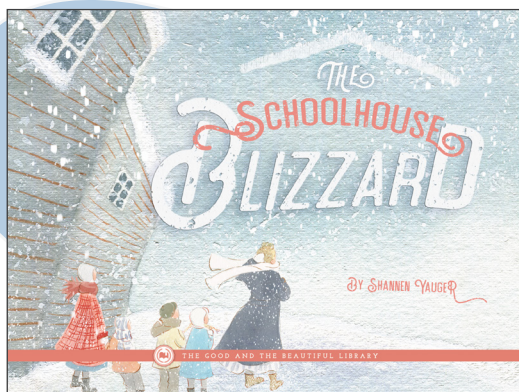


# READ-ALOUD BOOK PACK

The books below are optional read-aloud books that complement this unit. These books can be purchased as a book pack by going to [goodandbeautiful.com/science](https://goodandbeautiful.com/science) and clicking on the *Weather and Water* unit link.



*Wild, Wild Wind*  
By Shannen Yaeger



*The Schoolhouse Blizzard*  
By Shannen Yaeger



*Changing Weather: The Story of June Bacon-Bercey*  
By Ashlee Klemm

## Correlated Books

The Good and the Beautiful Library has several books that correlate well with the *Weather and Water* unit. It can be a wonderful experience for children to read books at their levels that are related to the subjects they are learning. The library includes both fiction and nonfiction books organized according to reading level. Find the Correlated Books by going to [goodandbeautiful.com](https://goodandbeautiful.com) and clicking on the *Weather and Water* unit product page.



# GRADES 7–8 LESSON EXTENSIONS

## How the Extensions Work

Each lesson has an optional lesson extension for children in grades 7–8. Complete the lesson with all the children, and then have the older children complete the self-directed lesson extension. These extensions are located in the *Grades 7–8 Student Journal*.

## Answer Key

The answer key for the lesson extensions can be found on the free Good and Beautiful Homeschool app in the science section. Visit [goodandbeautiful.com/apps](https://goodandbeautiful.com/apps) for information on accessing the app. The app can be accessed from a computer, phone, or tablet.

## Flexibility

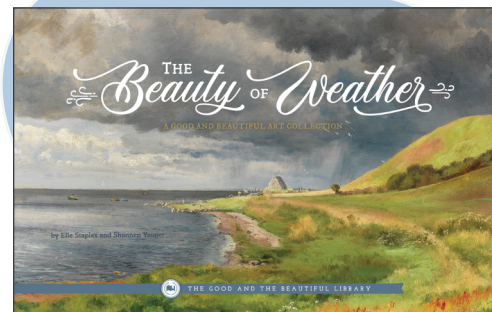
The amount of time it will take to complete each lesson extension will vary for each child. The average time is about 10–15 minutes per extension. Parents, teachers, and children may choose to omit parts of the lesson extension if desired. Encourage the children to stretch their capabilities, but also reduce work if needed.

## Taking Notes

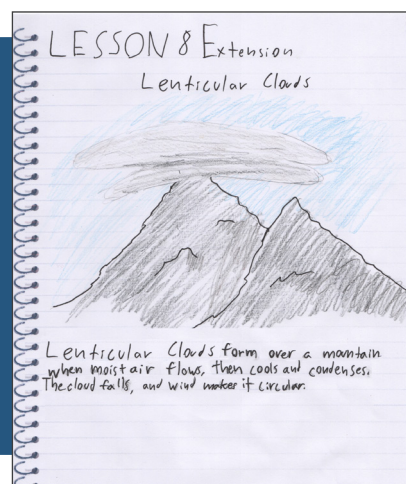
Some of the grades 7–8 lesson extensions have the children summarize the material read. Teach the children to look for key information, summarizing the most important points. Students can also add notes with their thoughts and the facts that are most interesting to them.

## Optional Grades 7–8 Reading Book

We recommend *The Beauty of Weather* by Elle Staples and Shannen Yauger as extra reading for students in grades 7–8. This book can be purchased by going to [goodandbeautiful.com/science](https://goodandbeautiful.com/science) and clicking on the *Weather and Water* unit link.



*The Beauty of Weather*  
By Elle Staples and Shannen Yauger





# SUPPLIES NEEDED

o o o

This section is divided into supplies needed for **activities** and supplies needed for **experiments**. If you would prefer to watch the experiments instead of perform them, you can watch all the experiments at [goodandbeautiful.com/sciencevideos](http://goodandbeautiful.com/sciencevideos). The activities, however, are not filmed.

## Lesson 1

- none

## Lesson 2

- none

## Lesson 3

- 1 jar of hot water with a lid
- 2 pennies per child
- 1 eye or medicine dropper per child

## Lesson 4

- scissors
- stapler or glue stick

## Lesson 5

- 1 clean, empty bottle
- 1 scrap of paper, wadded up small enough to fit in the bottle opening, per child
- 12" balloon
- 1 empty, clear, sturdy plastic bottle (like a sports drink bottle)
- scissors or a nail
- tape

## Lesson 6

- 2 paper plates
- scissors
- construction paper
- drinking straw
- straight pin
- pencil with fresh eraser
- a small ball of clay about the size of a cherry
- compass or phone with a compass app

## Lesson 7

- light-blue, dark-blue, green, gray, and black crayons or colored pencils
- 1 glass of ice water, per person
- 2 similar-sized glass jars or plastic containers filled with water, 1 with a lid that fits securely
- dry-erase marker

## Lesson 8

- scissors
- sheet of blue or other dark cardstock or cardboard
- glue stick
- paint stir stick or something similar to make a handle (optional)

## Lesson 9

- wide-mouthed glass jar (the wider, the better)
- very hot water
- blue food dye (optional)
- a metal pie pan
- ice cubes
- clock or watch
- empty 2-liter plastic bottle with straight sides, if possible (optional)
- scissors (optional)
- permanent marker (optional)
- ruler (optional)
- 1 or 2 handfuls of small stones (optional)
- 2 binder clips (optional)

## Lesson 10

- blank sheets of paper
- scissors

## Lesson 11

- aluminum pie pan
- thumbtack
- pencil with a fresh eraser
- Styrofoam® plate
- tape
- small piece of wool fabric
- very dark room
- metal fork (optional)
- fluorescent lightbulb (optional)

## Lesson 12

- plastic water bottle
- dish soap
- glitter or food dye (optional)

## Lesson 13

- 1 dice
- 1 game piece or small object, such as a coin, eraser, or small toy

## Lesson 14

- colored pencils, pens, or crayons
- glue stick for each child in grades 3–6



# VOCABULARY

**Instructions:** Cut out the vocabulary cards in this section. Place them on your science wall when prompted to do so in the lessons. Review the vocabulary words several times during this unit and, if desired, at various times throughout the school year.



## Weather

the state of the atmosphere over a short period of time

## Meteorology

a branch of science that focuses on the atmosphere, weather, and weather forecasting



## Climate

the weather conditions of a particular region over a long period of time

# INTRODUCTION TO WEATHER

## Objective

Give the children an overview of the wonders of weather and explain why studying it is so important.



## Preparation:

- ☐ Cut out the meteorology timeline cards found at the end of this lesson.

## Activity Supplies:

- none

## ☐ Wonder of Weather Video



Watch the video “Wonder of Weather” at [goodandbeautiful.com/sciencevideos](http://goodandbeautiful.com/sciencevideos) or from the Good and Beautiful Homeschool app.

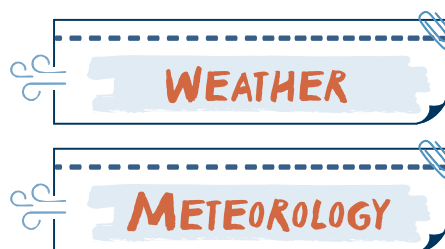
## ☐ Science Wall: Vocabulary Words



Place the vocabulary cards WEATHER and METEOROLOGY on your science wall. Read and discuss the words and definitions.

## ☐ Weather: A Daily Reminder of God

**Read to the children:** *Weather* brings us precipitation, fresh water, rainbows that remind us of God’s promises to protect us, and the occasional storm. Weather can be beautiful and sometimes thrilling, but it is also vital and beneficial to the earth and its inhabitants. No matter if the weather is sunny, rainy, or stormy, it is always occurring as a daily reminder of God’s love for us.



## ☐ The Impact of Weather

**Read to the children:** Weather is constantly changing, and it’s this change that often fills us with wonder or awe. I’m sure you’ve had a day when the weather started out one way in the morning but ended the day completely different. Can you remember a day like that? What was it like?

Weather doesn’t just affect our lives. It affects all living creatures on Earth. Its impact can be the difference between a great day and a very hard day—or sometimes between life and death. This is why people





devote their lives to studying **meteorology**. We call them “meteorologists.” Meteorologists help us to know what kind of weather we can expect each day so that we may prepare and plan.



## ☐ Meteorology Timeline Activity



**Read to the children:** Like all the sciences, meteorology has come a long way since people first began to study it. Let’s look at some interesting moments in meteorology’s history.

Mix up the timeline cards, and then randomly read and discuss the cards. Depending on students’ ages and interest levels, your discussion may be quite brief or in-depth. Here are some sample discussion prompts: How would \_\_\_\_ make a difference? What else was going on in the world then? Do we see any \_\_\_\_ today? What questions might be left to discover?

After all cards have been read, place them in order chronologically.

## ☐ Wonderful Weather



Have the children turn to the “Wonderful Weather” page in Lesson 1 of their student journals and complete the page. Have each child share the topic that interests him or her most and the questions about that topic. Help the children with ideas if needed.

## ☐ The Scientific Method

**Read to the children:** In your student journal activity, you were a question-asker, just like scientists. The

*scientific method* is the approach all scientists use to do experiments in a way that lets them find answers. Whether in a fancy laboratory or in a home kitchen, this method works. We will be using the scientific method in this unit to find our own answers. Let’s review the steps of the scientific method using an everyday question: what is the weather today?

### 1. **Observe.** (What do you notice?)

👉 You look out a window and see that the sky is darker than normal for 2:00 p.m. The trees are swaying a little, and you do not see anyone playing or working outside.

### 2. **Ask a question.** (Consider what you observed to form a good question.)

👉 You wonder what type of weather is happening or might happen. Are there any signs of precipitation or wind?

### 3. **Make a hypothesis.** (A hypothesis is the best guess to answer your question.)

👉 As the sky gets darker still, you decide that a severe storm is starting and you need to share this information with your family.

### 4. **Test your hypothesis.** (This is the step where you experiment!)

👉 Once you ensure your family is aware of a pending storm, you continue to observe the changing weather outside. The clouds continue to darken as rain falls heavily, and lightning can be seen in the distance.



## 5. Evaluate the results.

↳ After observing the storm for another five minutes, your family checks a cell phone to confirm that a severe thunderstorm has entered your area and will be clearing up in the next 10–15 minutes.

Was your hypothesis correct or incorrect? What did you learn? Often this is when scientists go back to step one and repeat the process.

Many times you'll make a hypothesis or prediction and discover after testing that you were incorrect. That's okay! The results provided an answer and made way for you to think up the next possibility. American inventor Thomas Edison once said in an interview:

“I never allow myself to become discouraged under any circumstances. I recall that after we had conducted thousands of experiments on a certain project without solving the problem, one of my associates, after we had conducted the crowning experiment and it had proved a failure, expressed discouragement and disgust over our having failed ‘to find out anything.’ I cheerily assured him that we had learned something. For we had learned for a certainty that the thing couldn’t be done that way, and that we would have to try some other way. We sometimes learn a lot from our failures if we have put into the effort the best thought and work we are capable of.”



## Weather Observation



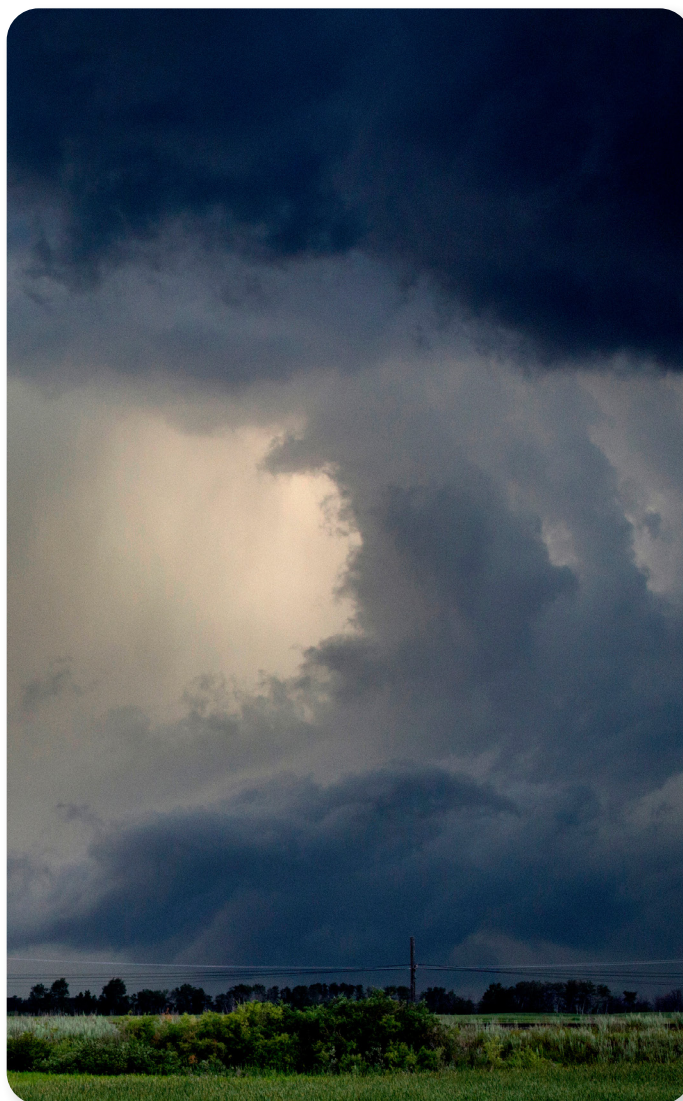
**Read to the children:** We are going to take a few moments to observe weather firsthand. We will be going outside, or observing from a window, to really notice the weather. We will be doing this a few times throughout this unit, and hopefully we can experience a few different types of weather.

Once outside (or looking through the window) ask the children what they are seeing and hearing using these questions or any of your own. Is the sun out, or is it cloudy or partly cloudy? Is there any precipitation (rain, snow, etc.) falling, or has any fallen recently? Do you see any clouds in the sky? If so, what color, shape, and size are they?

## Lesson 1 Extension



Have children grades 7–8 complete the self-directed Lesson 1 extension titled “Meteorological Pioneers” in their student journals.







### Babylonian Weather Predictions

Babylonians made short-term weather predictions by watching cloud patterns.



650 BC



### Aristotle's Weather Treatise

A set of four books called *Meteorologica* was the weather authority for nearly 2,000 years.



340 BC

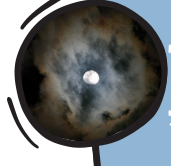


### Chinese Weather Calendar

Created by 300 BC, the calendar divided the year into 24 sections—each marking a different type of weather.



300 BC



### Weather Lore

People relied on traditions and myths to predict the weather. Many persist today, such as "If a circle forms 'round the moon, 'twill rain soon."



300 BC–AD 1400



### First Hygrometer

The first known hygrometer (an instrument that measures moisture in the air) was designed by Nicholas Cusa around 1450.



1450



### First Thermometer

The first known thermometer (an instrument that measures air temperature) was designed by Galileo Galilei around 1592.



1592



### First Barometer

The first known barometer (a tool that measures air pressure) was designed by Evangelista Torricelli in 1643.



1643

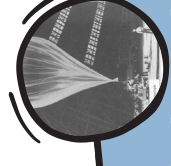


### Telegraph Invented

The telegraph allowed scientists to share weather data. At about the same time, the first weather maps were drawn, and moving storms could be identified and studied.



1850

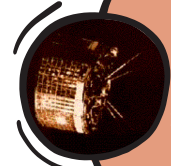


### Radiosonde Invented

Launching weather balloons with radiosondes, instruments that measure pressure, temperature, and relative humidity, was a big step in meteorology.



1920



### First Weather Satellite

TIROS was the first to launch, and it operated for 78 days. It took pictures of Earth's cloud cover.



1960

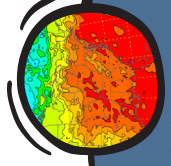


### Digital Thermometers

Mercury thermometers were the standard until they were replaced with safer digital thermometers.



1973



### Weather Super-computers

Incredibly fast super-computers compile large amounts of data to make more accurate weather forecasts.



2009

# WATER AND OUR WORLD

## Objective

Help the children understand the properties and importance of water.



### Preparation:

☐ None

### Experiment Supplies:

- 1 jar of hot water with a lid
- 2 pennies per child
- 1 eye or medicine dropper per child

## ☐ Wonderful Water



**Read to the children:** Today we are going to learn about Earth's most abundant resource. What do you think it might be? [water]

Bring out a hot, but not too hot to touch, lidded jar of water. Have the children touch it and discuss how warm it feels to them.

Tell me what you already know about water. **Point to the jar of water as needed.** What does water smell like? [odorless in the pure state at room temperature] What does water taste like? [tasteless in its pure form—treated water has a taste; water also picks up minerals that can add taste to the water] What does water look like? [transparent (clear) and colorless in its pure form] Water is the only commonly available natural resource that is a transparent, colorless, odorless, and tasteless liquid.

Water as a liquid and as ice covers more than 70% of the surface of the earth. Where have you seen water? [Answers might include puddles, creeks, lakes, oceans, etc.] There is water in many places, but most of the earth's water—97% in fact—is held in the oceans.



## ☐ Water Influences the Weather



**Read to the children:** *Heat capacity* is the number of heat units needed to raise the temperature of an object by one degree Celsius. Water is a substance that has a high



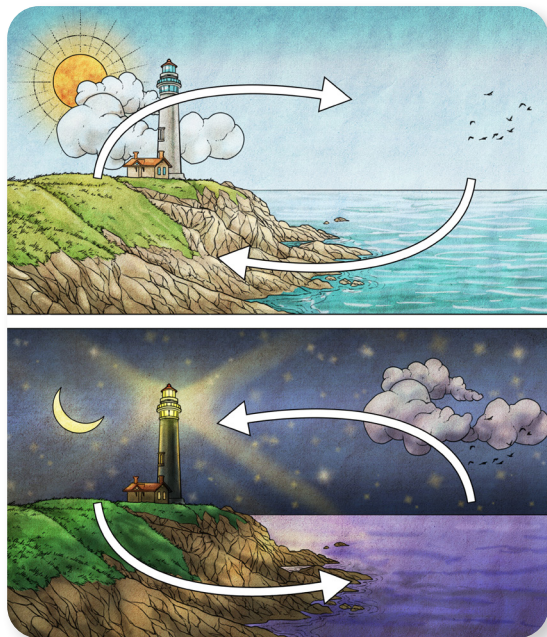
heat capacity, which means it has the amazing ability to absorb and retain a lot of heat before it begins to get hot physically. Compared to the substances that make up land and air, the high heat capacity of water means that it can gradually warm and cool down, which is why temperature change between seasons is gradual.

Feel the jar. Is it still warm? It's still warm because of the great heat capacity of the water inside the jar. This same principle is how the oceans are able to influence the weather.

If the ocean water is warm, it will warm the air above it, creating wind. Wind, in turn, influences the weather on both sea and land.

Land also influences air temperature. Things get especially interesting where land and water meet. During the day, the sun heats the land, making it warmer than the water. The warm land heats the air above it, causing the air to rise. The relatively cool air above the water rushes in to fill the space. What do you think happens at night? [The heat capacity of the water is greater than the land, so generally the opposite effect takes place.]

Look at the images below. They show us the movement pattern of air near oceans and lakes. The breezes that are created from this pattern of air movement are called sea and land breezes. Notice how clouds form where the warm, moist air is rising.



## Waterdrop Experiment



Have the children turn to the “Waterdrop Experiment” page in Lesson 3 of their student journals. Then have the children complete the experiment below or watch the video titled “Waterdrop Experiment” at [goodandbeautiful.com/sciencevideos](http://goodandbeautiful.com/sciencevideos) or on the Good and Beautiful Homeschool app. An answer key can be found at the end of the lesson.

**Read to the children:** Water has so many unique and fascinating characteristics. This amazing resource has the tendency to seek other particles from different substances. This attraction is called **adhesion**. Water molecules also like to cluster together with one another. This type of attraction is called **cohesion**. Let's see these properties in action!

In this experiment we will put drops of water on a dry penny and drops of water on a wet penny to test adhesion and cohesion. We will count drops and observe how many drops each penny can hold.



In their student journals, have the children write their predictions for how many drops they believe will stay on top of the dry penny or wet penny before the water overflows. Have the children squeeze drops of water from the eye or medicine dropper carefully onto each penny and count the drops. Have them record their numbers in their journals.

Did you see how the water formed a little dome on top of the penny before it overflowed? Which penny held more? [the dry penny] This showed cohesion in action!

The cohesive and adhesive nature of water is why we have rain. Micro water droplets inside clouds come together to form larger, heavier drops of water, which fall as rain.

### ☐ Science Wall: Vocabulary Words



Place the vocabulary cards **HEAT CAPACITY**, **ADHESION**, and **COHESION** on your science wall. Read and discuss the words and definitions.

**HEAT CAPACITY**

**ADHESION**

**COHESION**

### ☐ Weather Observation

**Read to the children:** We are going to take a few moments to observe weather firsthand. We will be going outside, or observing from a window, to really notice the weather.

**Once outside ask the children what they are seeing and hearing using these questions or any of your own.**  
Is the sun out, or is it cloudy or partly cloudy?  
Is there any precipitation falling, or has any fallen recently?  
What season is it where you live? Are you experiencing any weather that is specific to this season?

### ☐ Lesson 3 Extension



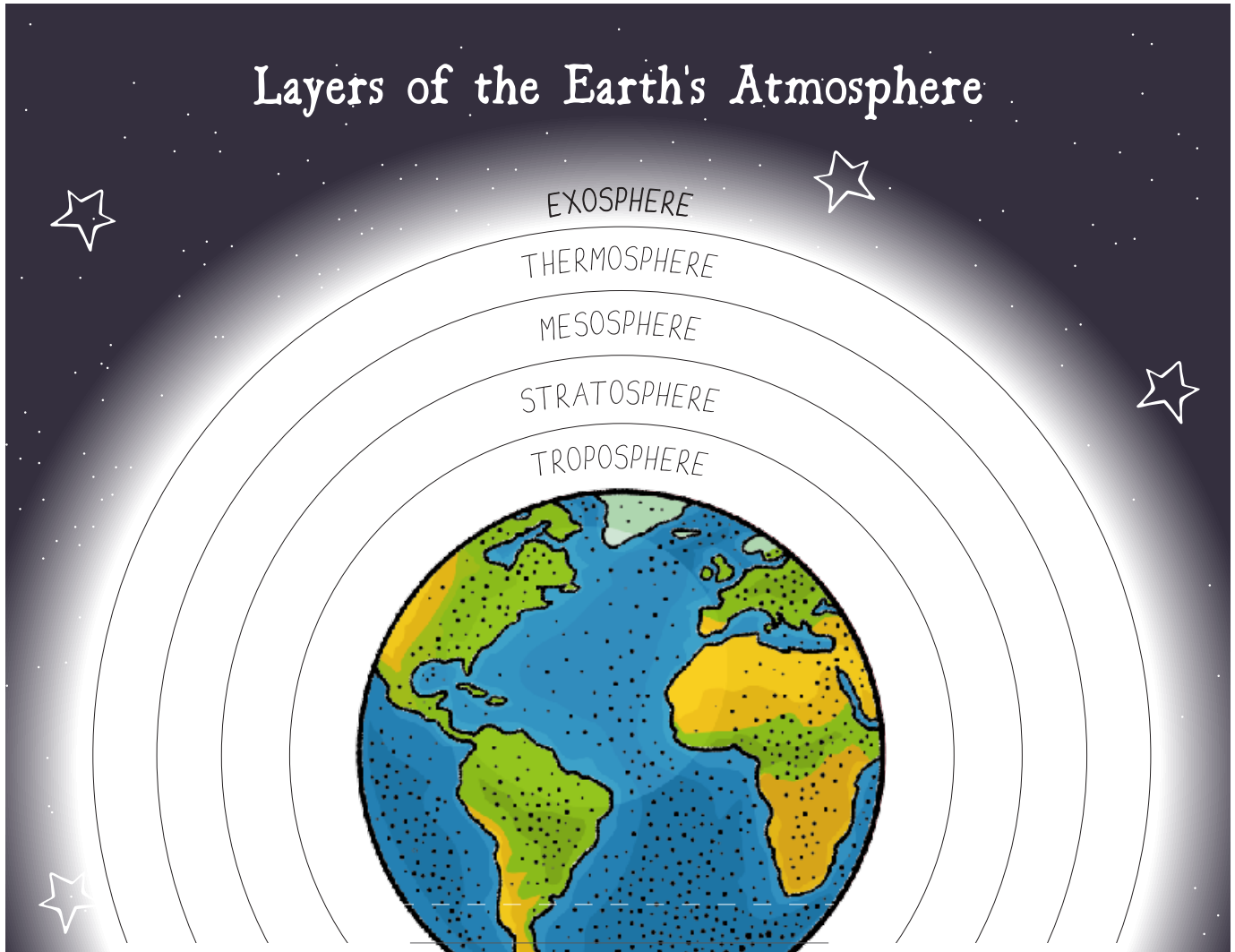
Have children grades 7–8 complete the self-directed Lesson 3 extension titled “Dangerous Droughts” in their student journals.





# EXAMPLE OF COMPLETED FLIP BOOK

*Note: Do not cut this out. This is an example of the completed Amazing Atmosphere Flipbook.*



# OUR AMAZING ATMOSPHERE FLIP BOOK

Directions: For each layer cut around the solid line; then fold on the dashed line. Do not cut or fold the exosphere layer. Starting with the exosphere page, attach one layer on top of the next by gluing or stapling it in the designated space.

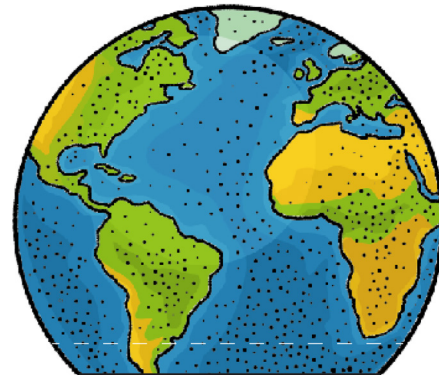
## TROPOSPHERE

The layer closest to Earth's surface is called the *troposphere*. *Tropo-* is from the Greek word *tropos*, meaning "a turn or change." This region extends about 8 to 14.5 km (5 to 9 mi) and contains almost all of the day-to-day weather we experience. The air in this layer rides on currents that descend when air is cooled and rise once the air is warmed. The process constantly repeats itself, hence the name *TROPOsphere*, which literally means "sphere of change."



ATTACH THE EARTH HERE.

FOLD HERE



## STRATOSPHERE

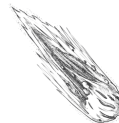
The next layer is the *stratosphere*. This layer begins where the troposphere ends and extends to about 50 km (31 mi) above sea level. Unlike the troposphere, where temperature decreases with height, this is because the stratosphere contains a special gas known as ozone. Ozone absorbs UV rays from the sun, warming the air. The result is a region with air layered like blankets on top of each other—a "sphere of layers." Weather balloons carrying radiosondes are released by meteorologists every day. These instruments travel all the way to the stratosphere before returning to Earth, collecting data along the way.



ATTACH THE TROPOSPHERE LAYER HERE.

## MESOSPHERE

The *mesosphere*, or "middle sphere," begins directly above the stratosphere and extends to about 85 km (53 mi) above sea level. Because it's a hard region to sample or measure, meteorologists still have a lot of unanswered questions about the mesosphere. This is where most meteors are vaporized, leaving long trails behind them. When we see them from Earth, we call them "shooting stars" or "falling stars." The air in this region is extremely thin and cold, with an average temperature of  $-90^{\circ}\text{C}$  ( $-130^{\circ}\text{F}$ ), and the top of the mesosphere is the coldest part of our atmosphere.



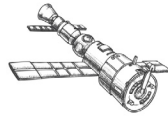
ATTACH THE STRATOSPHERE LAYER HERE.



# OUR AMAZING ATMOSPHERE FLIP BOOK

## THERMOSPHERE

Above the mesosphere and extending to about 600 km (372 mi) high is the *thermosphere*—the “hot layer.” Temperatures here can exceed 500 °C (900 °F). This is due to oxygen molecules absorbing rays from the sun, warming the air. Because there are not many molecules or atoms in this region, absorption of even small amounts of energy from the sun makes a huge difference. When air molecules interact with charged particles from the sun, incredible aurora displays are produced. These dazzling displays are seen from Earth as dancing waves of blue, purple, green, yellow, or red. Also found in this layer are satellites.

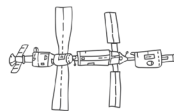


ATTACH THE MESOSPHERE LAYER HERE.

## Our Amazing Atmosphere

### EXOSPHERE

The uppermost limit of our atmosphere is the *exosphere*, the “outer sphere.” This is where the International Space Station is often in orbit. In this region, the air is so thin that it is almost just like outer space. There’s no defined limit to the exosphere. Instead, it gradually fades into space.



ATTACH THE THERMOSPHERE LAYER HERE.

# Air

## Objective

Help the children learn about the composition and characteristics of air.



### Preparation:

☐ None

### Activity Supplies:

- 1 clean, empty bottle
- 1 scrap of paper, wadded up small enough to fit in the bottle opening, per child

### Experiment Supplies:

- 12" balloon
- scissors or a nail
- 1 empty, clear, sturdy plastic bottle (like a sports drink bottle)
- tape

## ☐ Air Is Matter



Lay the clean, empty bottle down on its side and place one piece of the wadded-up paper just

outside the bottle, resting on the edge of the opening/mouth. Have one child take a turn trying to blow the paper into the bottle. Have each child try if desired.

**Read to the children:** What happened during that activity? [The paper would not go in.] Why wouldn't the paper go in the bottle? [Because the bottle was full of air, and none of the air could get out when we were blowing on the opening, so the paper wouldn't fit.] We cannot see the air that fills this bottle, but this activity illustrates that it is there because nothing else will fit in the bottle unless some of the air is able to come out.



**children:** At first glance it may seem like we didn't catch anything, but inside our hands is the same thing taking up space inside that bottle—air—more molecules of air than we have time to count. Only two gases make up 99% of the air. Can you guess what they might be? Oxygen makes up about 21% of our air, and nitrogen about 78%. The remaining 1% is made up of small amounts of gases like carbon dioxide and water vapor. These air molecules are held near the earth by the same force that holds you near the earth—gravity. As gravity pulls air toward the earth, the air exerts a force on whatever it touches. When that force pushes on a surface, it produces **air pressure**. Air pressure is greatest at sea level and decreases as **altitude** increases.

Just how great a force can the air exert? The air inside a 549 m<sup>2</sup> (1800 ft<sup>2</sup>) home weighs approximately 1,151 kg (3,341 lb). That's a little heavier than a large female hippopotamus, and that air is constantly pushing



## ☐ Composition of Air

Cup your hands together, as if to catch something in the air, and have the children do the same. Read to the

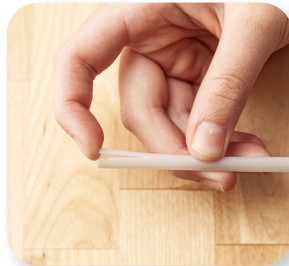


## Make a Wind Vane



Read the directions below aloud and assist the children as needed.

1. Write the four cardinal directions (north, east, south, and west) on the bottom side of the paper plate, as shown in the image to the right.
2. Cut an arrow point and tail out of the construction paper, making each about 2 inches in length.
3. Cut two  $\frac{1}{2}$ " slits at each end of the straw, across from each other.
4. Slide the arrow point and tail into the slits, one on each end of the straw.
5. Insert the pin through the center of the straw and then into the eraser tip of the pencil, making sure to leave space for the straw to spin.
6. Poke the point of the pencil through the center of the paper plate and then into the ball of clay. You may test the wind vane at this point by gently blowing the arrow point to ensure it can spin freely.
7. Place the structure on a second paper plate and tape the plates together, with the clay ball secured between them.



Take your wind vane outside and align the word NORTH written on the plate in the direction north using the compass. Watch the arrow spin as wind moves it and discover the direction the wind is blowing.



## Lesson 7 Experiment Preparation

The “Water Evaporation in (Slow) Action Experiment” in the next lesson, Lesson 7, will need to be prepared 24 hours prior to beginning the lesson. Fill the two glass jars or plastic containers with water. Place a lid securely on one of the jars. Using the dry-erase marker, draw a line on each jar at the water level. Set the jars on a windowsill or outside in the sun on a day with no rain. Show the children the jars with water, explaining that you will be conducting an experiment on the water in the jars in the next lesson.

## Lesson 6 Extension



Have children grades 7–8 complete the self-directed Lesson 6 extension titled “Global Wind Systems” in their student journals.







“The HMS ‘Prince’ Before the Wind” by Jan Karel Donatus van Beecq [1638–1722], c. 1700s



# CLOUDS AND WEATHER FRONTS

## Objective

Help the children gain an understanding of the composition and types of clouds.



### Preparation:

- Cut out the “Misty Mystery Clues” and sort them into piles by color.

### Activity Supplies:

- scissors
- glue stick
- sheet of blue or other dark cardstock or cardboard
- paint stir stick or something similar to make a handle (optional)

## □ Make a Cloud Viewer



Have the children turn to the “Make a Cloud Viewer” page in Lesson 8 of their student journals and read the information about each cloud type. Then have them cut out the pictures and follow the instructions to create a cloud viewer. Weather permitting, go outside to see if you can identify any of the clouds in the sky.



**Note:** It is incredibly dangerous to look directly at the sun. Discuss with children the importance of looking at clouds that aren’t near the sun to protect their eyes.

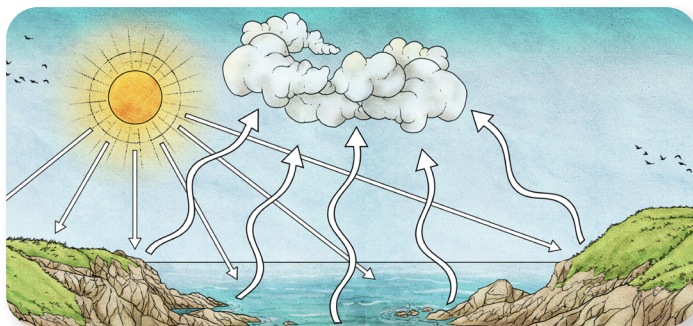
## □ How Are Clouds Formed?

**Read to the children:** In the last lesson, we learned about the water cycle. Through the water cycle, water makes its way into the air as water vapor. How many forms of water in the air can you name? [rain, snow, ice, hail, fog, clouds, etc.]

Water vapor is an important part of the formation of all these things, including clouds. **Study the image to the**

**right with the children as you read the steps on how most clouds are formed.**

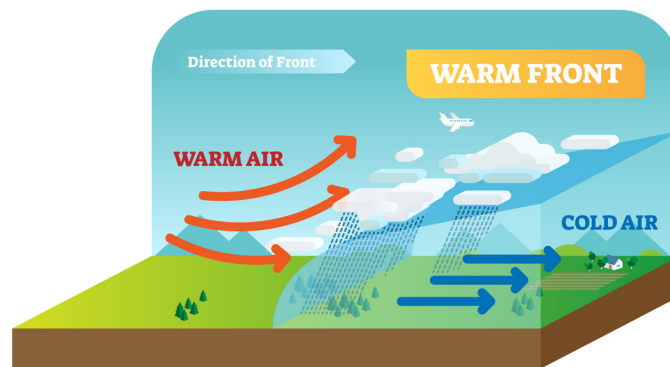
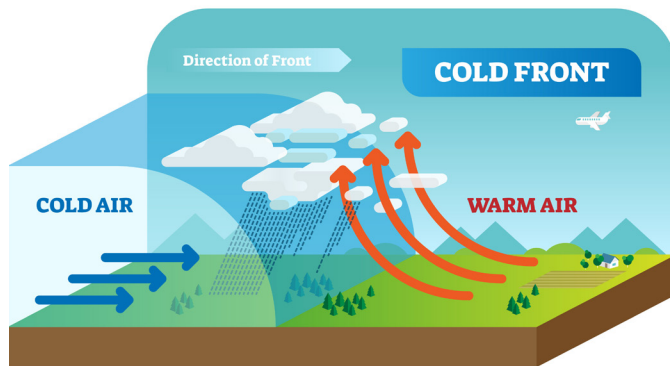
1. Warm air close to Earth’s surface, which can hold a lot of water vapor, rises.
2. As the air rises, it begins to cool.
3. Cool air cannot hold as much water vapor as warm air. As a result, the water vapor collects on dust particles in the air and turns back into microdroplets as the air cools. When many water microdroplets come together, they form a cloud.



## Weather Fronts

**Read to the children:** Characteristics, such as wind, temperature, and humidity, can be used to describe air masses. A **weather front** is a boundary separating air masses with differing characteristics.

If a mass of cold, dense air pushes under a mass of warm air, the front is cold and often creates cumulus clouds. If a mass of warm, not dense air pushes up and over a mass of cold, dense air, the front is warm. Many different clouds are made this way, including altocumulus, altostratus, stratus, and stratocumulus.



## Science Wall: Vocabulary Word



Place the vocabulary card WEATHER FRONT on your science wall. Read and discuss the word and definition.



## Misty Mystery



Have the children turn to the “Misty Mystery” page in Lesson 8 of their student journals and follow the directions in the next column to complete the page.



1. Place the piles of “Misty Mystery Clues” on the table.
2. Pick a color to start.
3. Starting with Clue #1 on top of the pile, have the children read the clue and circle the correct answer in the corresponding colored number box in their student journals. For example, if the card reads “High in the sky” and has a light-blue “1” by it, they would circle “high” in the light-blue box on the journal page.
4. Cross out any types of clouds that the clue doesn’t match under “type” at the top of the box. The children may use their “Cloud Viewer” to help identify the different types of clouds if needed.
5. Choose another color and continue reading each clue in numeric order. Complete the boxes on the journal page until the children are able to identify each cloud type, circle the cloud type, and draw the shape of the cloud at the bottom of the box. Look at the photographs of each type of cloud on the Clue Cards for a hint.

## Lesson 8 Extension



Have children grades 7–8 complete the self-directed Lesson 8 extension titled “Unusual Cloud Formations” in their student journals.





# RAIN AND RAINBOWS

## Objective

Help the children understand how rain develops, how rainbows are created, and what rainbows teach us about color.



## Preparation:

☐ None

## Activity Supplies:

- wide-mouthed glass jar (the wider, the better)
- very hot water
- blue food dye (optional)
- a metal pie pan
- ice cubes
- clock or watch
- empty 2-liter plastic bottle with straight sides, if possible (optional)
- scissors (optional)
- permanent marker (optional)
- ruler (optional)
- 1 or 2 handfuls of small stones (optional)
- 2 binder clips (optional)

## ☐ What Is Precipitation?

**Read to the children:** I'm going to describe a beautiful scene in nature to you. Close your eyes. Imagine you are outside on a warm summer day. It's midafternoon, and the air begins to feel heavy and sticky. You notice many puffy clouds in the sky, gray and full, all coming together, making it hard to tell where one ends and another begins. You're called inside to help with something. While cleaning up you hear (**tap fingers on the table slowly then quickly to sound like the pitter-patter of rain**)—it is raining. (**Continue the pitter-patter for a moment.**) The rain eventually ends, and you go back outside. Everything is wet, and the air smells different—almost sweet. The whole world seems to glisten as the sun begins to peek out from behind the parting clouds. Open your eyes. Not all rainy days

are exactly like the one I described. Tell me about a rainy day that you remember. What did the air feel like? What sounds do you remember? What did it look like? What smells did you notice?

Any liquid or frozen water that comes from a cloud is **precipitation**. Some common types of precipitation are rain, snow, sleet, and hail. In this lesson we are going to focus on one type of precipitation: rain. What do you know about rain?

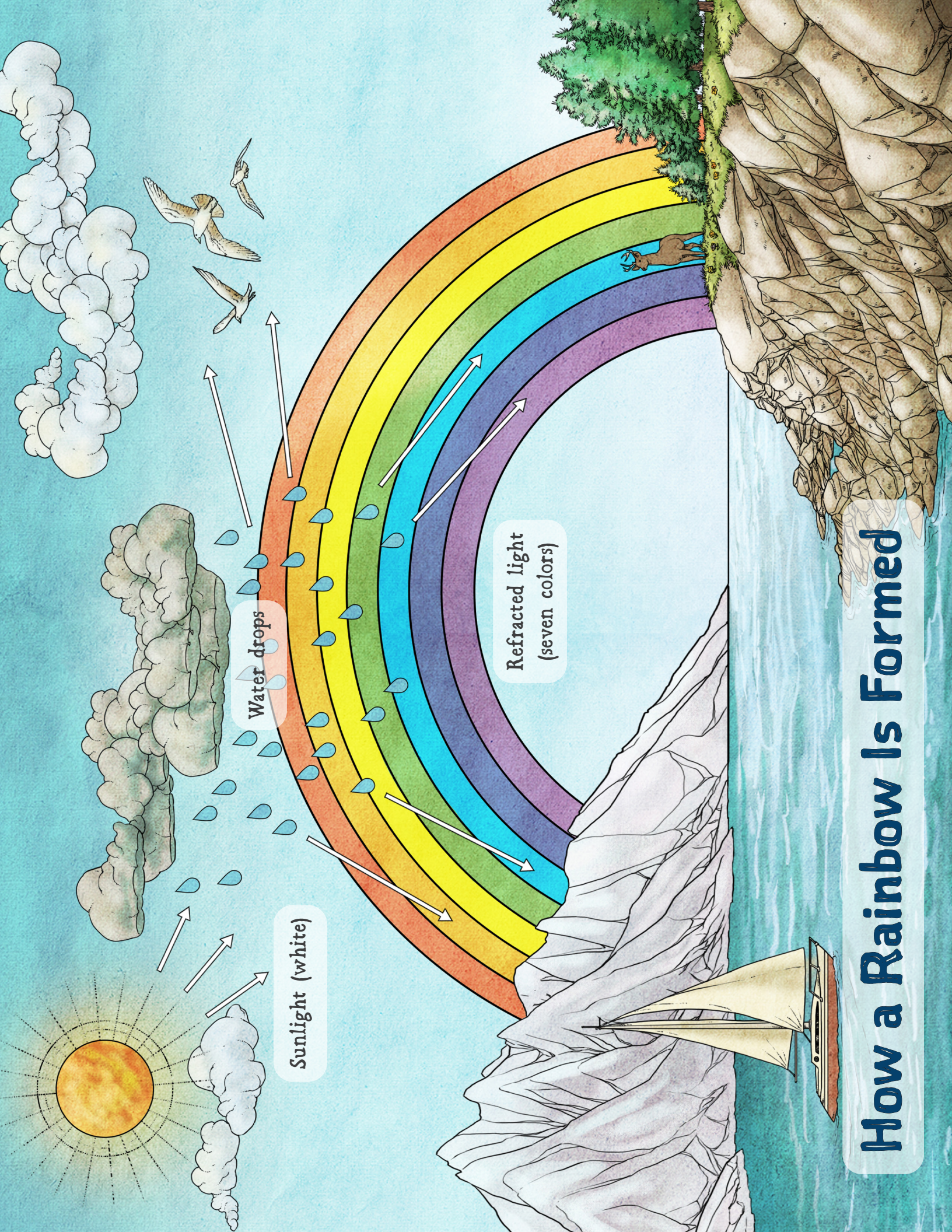
## ☐ Making Rain Experiment



Have the children turn to the “Making Rain Experiment” page in Lesson 9 of their student journals and have them complete each section when prompted. Have the children follow the steps below to complete the experiment or watch the video titled “Making Rain Experiment” at [goodandbeautiful.com/sciencevideos](http://goodandbeautiful.com/sciencevideos) or on the Good and Beautiful Homeschool app.







# How a Rainbow Is Formed



# SNOW, SLEET, HAIL, AND FREEZING RAIN

## Objective

Help the children gain an understanding of snow, sleet, hail, and freezing rain.



## Preparation:

- ☐ Cut out the “Precipitation Match” cards in each child’s student journal. Keep the key at the end of the lesson out of view from the children.

## Activity Supplies:

- blank sheets of paper
- scissors

## ☐ Optional Read Aloud



At any point in the lesson, you may read one of the books from the optional Read-Aloud Book Pack. Longer books may be split into more than one reading session. *The*

*Schoolhouse Blizzard* by Shannen Yaeger is suggested for this lesson.

## ☐ Beautiful Snow

Show the children the snowflakes to the right.

Read to the children:

These incredible photographs were all taken by Wilson Bentley, a pioneer in meteorology and photography.

He spent two years fine-tuning a photography technique that captured the beauty and details of a snowflake. In 1885, at the age of 19 years old, he made the world’s first photomicrograph of a snowflake. He went on to capture thousands and thousands of photomicrographs, improving his technique with each one. His photomicrographs were



so well done that they are still referenced today to study ice crystal formation. **Ask the children which snowflakes are their favorites.**





Snow is formed similarly to rain but forms only when the air temperature is consistently below freezing. Water vapor freezes around dust particles and forms an ice crystal. The tiny ice crystal moves through the air and collides with other tiny ice crystals, causing them to stick together. This process continues until the crystals become too large and heavy and fall from the sky as snow.

**Have the children look at the painting below.** Where in this painting do you see snow? Do you think it is still snowing?



## □ Make a Snowflake



**Have the children turn to the “Make a Paper Snowflake” page in Lesson 10 of their student journals and, using the blank pieces of paper, follow the instructions to make a snowflake.**



## □ Precipitation Match



**Read to the children:** Sleet, hail, and freezing rain are unique forms of precipitation that occur only in particular geographic areas and only at specific times of the year, so many people never have the chance to see or experience one or more of them. We are going to play a matching game to learn about these amazing types of precipitation. **Have the children race to see who can match their cards fastest. When a child matches the three cards for a type of precipitation (one image and two descriptions), have the child read, or read for him or**

**her, the descriptions. If only one child is completing the lesson, have him or her race a 5-minute timer to match all the cards and then read the descriptions.**

## □ Weather Observation

**Read to the children:** We are going to take a few moments to observe weather firsthand. We will be going outside, or observing from a window, to really notice the weather.

**Once outside, ask the children what they are seeing and hearing using these questions or any of your own.** Is there any precipitation falling, or has any fallen recently? Can you feel or see any signs of wind? If so, what do you notice about the wind speed?

## □ Winter Poem

**Read the poem in the blue box to the children. After you have read it, ask the children what types of precipitation they heard about in the poem and if this poem makes it seem like snow would be an enjoyable type of precipitation to experience.**

### Winter

By Dorothy Aldis

The street cars are like frosted cakes—  
All covered up with cold snowflakes.

The horses' hoofs scrunch on the street;  
Their eyelashes are white with sleet.

And everywhere the people go—  
With faces tickled by the snow.

## □ Lesson 10 Extension



**Have children grades 7–8 complete the self-directed Lesson 10 extension titled “Snowflake Bentley” in their student journals.**





# LIGHTNING AND THUNDER







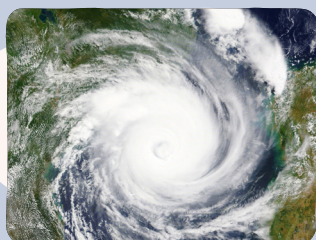
Have you ever seen a streak of lightning flash across the sky and heard the rumbling thunder to accompany it? This awe-inspiring spectacle is incredible. Let's see how lightning and thunder are created.



# SEVERE WEATHER: TORNADOES AND TROPICAL CYCLONES

## Objective

Give children an overview of tornadoes and tropical cyclones, how they are formed, and their impact on the world.



## Preparation:

☐ None

## Activity Supplies:

- plastic water bottle
- dish soap
- glitter or food dye (optional)

## ☐ Severe Weather Video



Have the children watch the “Severe Weather Video” at [goodandbeautiful.com/sciencevideos](http://goodandbeautiful.com/sciencevideos) or from the Good and Beautiful Homeschool app.

## ☐ What Is Severe Weather?

**Read to the children:** Weather, though incredibly beautiful, can sometimes be overwhelming and have the potential to cause damage and disruption to day-to-day life. This is what is known as severe weather. We’ll discuss two common types of severe weather today: **tornadoes** and **tropical cyclones**.



## ☐ Tornado in a Bottle Activity



Have the children turn to the “Tornado in a Bottle” page in Lesson 12 of their student journals. They will complete the page after creating a tornado in a bottle. An answer key can be found at the end of the lesson.



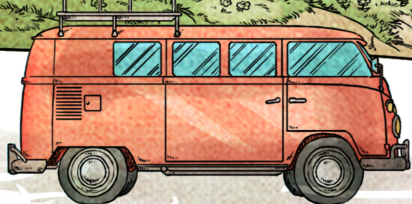
Fill the plastic water bottle  $\frac{3}{4}$  full with water. Add two squirts of dish soap into the bottle. If desired, add the glitter or food dye (which will help the children see the tornado). Replace the cap. While holding the bottom of the bottle, swirl the tip in a circle until the water is spinning inside. Have the children take turns swirling the bottle and observing the “tornado” that is created.





Work together to help the Raindrop family get home safely as they navigate some wild weather and learn about the incredible tools and equipment used to track and predict the weather!

# Wild Weather



Start

Everyone, share what your favorite season is and why.

The family drives through a sunny valley. Advance 1 space.

A rainbow emerges after the storm. Advance 1 space to enjoy it.

A sudden hailstorm begins. Draw a card and read the information out loud as the family waits for it to end.

Answer this riddle: What type of bow cannot be tied?

Snow has started falling heavily. As the family is driving more carefully, draw a card.

The snow has stopped, and the family is back on the road. Advance 1 space.





# Road Trip Game

A thunderstorm forms quickly around the family. As they wait the storm out, draw a card and read the information aloud.

Work together to list the 3 states of water. If you're able to list all 3 correctly, move forward 2 spaces.

The family is stuck in a heavy rainstorm. Lose a turn.

A tornado warning has been issued over the radio. Draw a card as the family seeks shelter.

The family chooses an excellent shelter location during the tornado. Advance 1 space.

Strong gusts of wind make driving unsafe. Draw a card as the family stops until it is safe to drive again.

As a group, name the 4 stages of the water cycle.

**Congratulations!**

You got the family home safely!

Riddle Answer:  
a rainbow