

Teacher Tool 42: Explore! Weather Study Guide

Study Guide for Weather 30: Explore! Weather

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Explore! Weather

Original Program Air Date: December 15, 2016

Grade Levels: 3-6

Program Description:

Lighting flash. Thunder crash. Summer breeze. Winter freeze. Misty rain. Hurricane. For this episode of *Explore!* we investigate weather and ask the big picture question, “How is weather created?” Through the course of this energetic and interactive cross-curricular program, students get a chance to answer our big picture question for themselves and listen to the answers of others as they engage in activities related to weather forces, weather forecasting, and weather tools and interact with Wes Browning, Meteorologist in Charge at the National Weather Service Station in St. Louis, MO.

To investigate the program’s theme and big picture question through a cross-curricular approach, each episode of *Explore!* utilizes Who, What, Where, When, Why and How questions:

Who does that? gives students a chance to meet someone who works in the field or does an activity related to the program’s theme.

What do you want to know? guides our segments when we go to questions from participating groups.

Where is that? focuses on a geographic exploration related to the program’s theme.

When did that happen? takes us back in time to people, places, events related to the program’s theme.

How does that work? lets students discover the workings of a machine or concept related to the program’s theme.

Why you ask? delves into more detail/explanation/background on a topic related to the program’s theme.

For this episode, we explore those questions in a number of ways. Students meet, interact with, and ask questions of meteorologist Wes Browning. We explore the atmospheric forces at work that create our weather and the instruments and training that meteorologists use to forecast the weather. We examine the relationship between geography and weather, travel to a few places that exemplify that relationship, and also investigate the impact of environmental events and how they can influence the weather. We take a closer look into the workings of Doppler Radar that has revolutionized weather forecasting and tracking. We take a trip through time as we look at major events in weather history. And we learn even more as Mr. Browning answers student questions.

Program Objectives:

Students will:

1. Engage in critical and creative thinking.
2. Build on their current understanding of, and develop new insights into, weather forces and weather forecasting by engaging in interactive activities and discussion focused on those topics.
3. Build on their current understanding of, and develop new insights into, the relationship between geography and weather and the relationship between environmental events and weather by engaging in interactive activities and discussion focused on those topics.
4. Interact with a professional whose work as a meteorologist for the National Weather Service has him regularly analyzing weather forces and creating weather forecasts.
5. Develop an answer for themselves to the question: "How is weather created?"

Program Format:

Time codes are provided in blue to help you find a specific segment in the archived program.

I. Welcome and Introduction—An overview of the program’s theme and importance of the topic will be presented as student groups are welcomed to the program. (00:00 to 03:39)

A. Big Picture Question for the Program

How is weather created?

B. Overview Information

We provide general information about weather, how it’s created, and how meteorologists forecast it.

C. The Word Is...

As we discuss cool things about weather, we define many the program’s vocabulary words including:

Weather

Climate

Meteorology

Hydrology

II. Weather Across the Curriculum—We look at maps through a variety of curricular lenses. (03:40 to 08:15)

A. When Did That Happen?

We highlight ten events in the history of mapmaking.

B. Where Is That?

We highlight geographic locations related to the topic of weather.

III. Interactive Segment—In this portion of the program students interact with the program host

and meteorologist Wes Browning to learn more about how weather is created and how meteorologists forecast it and follow it.

A. Meet Wes Browning—Meteorologist in Charge, National Weather Service—St. Louis, MO (08:16 to 09:56)

We meet Wes Browning and learn about the geographic area that the National Weather Service Station in St. Louis provides forecasts for. You can learn more about the St. Louis, MO Weather Service Office at <http://www.weather.gov/lx/>.

B. Topics Explored Through Student Questions

Topic 1: Forecast Tools (09:57 to 14:01)

Still images and videos are included as we discuss the various tools meteorologists use to follow and forecast the weather. Vocabulary words that will be included in this segment are:

Student Questions in this Segment: Why does the weather balloon expand as it gets higher? Do multiple forecasters study the same weather and if their forecasts are different how do they decide which one to use?

Topic 2: How Does That Work? Doppler Radar (14:02 to 19:20)

Still images and videos are included as we discuss how Doppler Radar works and how it so helpful to meteorologists and other weather watchers.

Student Question in this Segment: What do the different colors mean on the radar?

Topic 3: Where is That? (19:21 to 22:45)

In this segment, we view images and video as we learn about locations around the world with different and interesting weather events and explore the relationship between geography and weather.

Topic 4: Rain and Lightning (22:46 to 26:13)

Still images and videos are included as we discuss how rain is created, thunderstorms develop, and lightning is formed.

Student Questions in this Segment: How do you calculate how much rain will fall? How does lightning come out of clouds?

Topic 5: Tornadoes and Downbursts (26:14 to 29:01)

Still images and videos are included as we discuss how tornadoes and downbursts are formed and how forecasters follow the storms and warn the public.

Student Questions in this Segment: How do you know when for sure to ring the sirens for the tornado warning? How do you name a tornado?

IV. Summary and Closing—We summarize major concepts learned today, answer final student questions, say thank you and goodbye. (29:02 to 30:00)

Featured National Standards:

The following **Common Core Standards for English/Language Arts and Literacy in History/Social Studies, Science and Technical Subjects** are referenced in this program:

Grades 3-6 College and Career Readiness Anchor Standards for Reading

7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Grades 3-6 College and Career Readiness Anchor Standards for Writing

6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

Grades 3-6 College and Career Readiness Anchor Standards for Speaking and Listening

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Grades 3-6 College and Career Readiness Anchor Standards for Language

6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Featured State Standards:

Missouri Learning Standards in the area of Science

5th Grade

- a. Recognize the atmosphere is composed of a mixture of gases, water, and minute particles
- b. Describe and trace the path of water as it cycles through the hydrosphere, geosphere, and atmosphere (i.e., the water cycle: evaporation, condensation, precipitation, surface run-off/groundwater flow) b. Identify the different forms water can take (e.g., snow, rain, sleet, fog, clouds, dew) as it moves through the water cycle
- c. Identify and use appropriate tools (i.e., thermometer, anemometer, wind vane, rain gauge, satellite images, weather maps) to collect weather data (i.e., temperature, wind speed and direction, precipitation, cloud type and cover.)

- d. Identify and summarize relationships between weather data (e.g., temperature and time of day, cloud cover and temperature, wind direction and temperature) collected over a period of time.

7th Grade

- a. Describe the relationship between temperature and the movement of atmospheric gases (i.e., warm air rises due to expansion of the volume of gas, cool air sinks due to contraction of the volume of gas)
- b. Explain that the amount of matter remains constant while being recycled through the water cycle
- c. Identify solar radiation as the primary source of energy for weather phenomena

Program-Related Activity Suggestions: The learning activities below are designed to get your students thinking more about topics explored in the program. They may be used by an entire class, in small groups, or by individual students.

1. Think About the Hydrologic Cycle—If your students have not previously studied the Hydrologic Cycle, the web resources below will provide them basic information about the cycle. Have students explore the resources to develop questions they’d like to ask our guest meteorologist about how the cycle works.

Web resources to learn about the Hydrologic Cycle

<http://www.srh.noaa.gov/jetstream/atmos/hydro.html>
<http://water.usgs.gov/edu/watercycle.html>
<http://earthobservatory.nasa.gov/Features/Water/page2.php>

2. Think About Weather Forecasting—The purpose of this activity is to get students thinking more about how a weather forecast is made and the tools and instruments meteorologists have at their disposal to make a forecast. To explore the topic share the following resources with your students:

Additional Videos from Educate.Today

Weather 1 “What tools are used to forecast the weather?”

Weather 2 “Why is the weather so difficult to forecast?”

Weather 3 “How do computers create the models that forecasters use?”

Weather 4 “What instruments and tools do you use to create the forecast maps we see on TV?”

Weather 5 “How long does it take to create a weather forecast?”

Web resources to learn about the tools meteorologists use to forecast the weather

<http://www.learner.org/interactives/weather/forecasting2.html>
<http://www.weatherwizkids.com/weather-instruments.htm>
http://www.ussartf.org/predicting_weather.htm

3. Think About Doppler Radar—This activity focuses on one specific tool that students see meteorologists use all the time—Doppler Radar. The purpose of this activity is to give students the opportunity to think more about Doppler Radar works and how a meteorologist interprets the data that Doppler Radar is providing. To explore the topic, share the following resources with your students:

Additional Videos from Educate.Today

Weather 6 “How do you interpret the radar to find a tornado?”

Weather 8 “The Doppler Radar Tower”

Weather 7 “Do the radars have to be in an enclosed area?”

Web resources to learn about Doppler Radar

<http://www.srh.noaa.gov/jetstream/doppler/how.html>

<http://www.weatherworksinc.com/how-radar-works>

<https://www.youtube.com/watch?v=sHib8j9B0Ok>

<http://science.howstuffworks.com/radar.htm>

4. Think About Being a Meteorologist—This activity gives students the opportunity to hear directly from meteorologists about why they decided to become one, the type of study and training it took for them to become qualified, and the different kinds of jobs they get to do. To explore the topic share the following resources with your students:

Additional Videos from Educate.Today

Weather 9 “Why I Became a Meteorologist”

Weather 10 “Being an Aviation Meteorologist”

Weather 27 “Favorite Part of Being a Meteorologist or Storm Chaser”

Web resources to learn about Types of Meteorologists

<http://www.e->

[missions.net/HurricaneAlert/?cat=72&sid=2&pid=105&page=Types%20of%20Meteorologists](http://www.e-missions.net/HurricaneAlert/?cat=72&sid=2&pid=105&page=Types%20of%20Meteorologists)

<http://www.nssl.noaa.gov/people/jobs/careers.php>

<https://www.ametsoc.org/ams/index.cfm/education-careers/career-guides-tools/all-about-careers-in-meteorology/>

5. Think About Geography and Weather—This activity provides more information about how geography, both location and topography, affect weather. To explore the topic share the following resources with your students:

Additional Videos from Educate.Today

Weather 11 “Why does one side of a mountain range get more rain than the other side?”

6. Think About Weather Phenomena—This activity focuses on some unique weather phenomena that were asked about during our live programs. To explore the topic, share the following resources with your students:

Additional Videos from Educate.Today

Weather 12 “What is turbulence and how does it make a plane drop like that?”

Weather 13 “What is a front?”

Weather 14 “What is a polar vortex?”

Weather 15 “Lightning and Rain”

7. Think About Different Types of Severe Weather and How It Forms—This activity gives students the chance to learn more about what causes different types of severe weather and examples of those events. To explore the topic share the following resources with your students:

Vi Additional Videos from Educate.Today

Weather 16 “How do hurricanes form?”

Weather 17 “What causes a tornado to form?”

Weather 18 “How fast can the winds get in a hurricane or tornado?”

Weather 19 “Why does a tornado get smaller as it goes down?”

Weather 20 “How can you protect yourself in a tornado with no basement?”

Weather 21 “Would dry ice weaken a tornado?”

8. Create Your Own Weather Instruments—If your students are in the process of studying weather maybe they’d like to create their own weather instruments. Resources to help are provided below:

Web Resources for Activities Creating Your Own Weather Instruments:

http://teacher.scholastic.com/activities/wwatch/gather_data/

<http://www.earthsciweek.org/classroom-activities/build-your-own-weather-station>

9. National Weather Service Online Weather School—You can find numerous activities for students at the Jetstream—The National Weather Service’s Online School for Weather.

<http://www.srh.noaa.gov/jetstream/>

Vocabulary:

The following terms and their definitions will be highlighted in the program and/or in the program’s related curriculum materials and learning activities:

Air Mass

Anemometer

Atmospheric Pressure

Barometer

Climate

Front

Isotherm

Hydrology

Hygrometer

Humidity

Meteorology

Turbulence

Weather

Supplemental Resources:

There are numerous Internet resources with excellent weather activities for you to consider using with your students. Some of them are included below:

National Weather Service’s “Weather Education” website:

<http://www.nws.noaa.gov/os/edures.shtml>

National Weather Service webpage with links to weather science content for parents and teachers:

http://www.weather.gov/owlie/science_tp

NOAA’s Online School for Weather: <http://www.srh.noaa.gov/jetstream/>

The History of Weather Instruments:

<http://inventors.about.com/od/wstartinventions/a/Weather.htm>

Weather Tools of the Trade lesson plans from Utah Education Network:

<http://www.uen.org/Lessonplan/preview.cgi?LPid=18979>

Wonderful World of Weather lesson plans from CIESE:

<http://www.ciese.org/curriculum/weatherproj2/en/guidelessons.shtml>

Measuring Tools with Weather--lesson plan from National Geographic Society:

<http://nationalgeographic.org/activity/measuring-weather-with-tools/>

Weather Instruments lesson plan from Canadian Network for the Detection of Atmospheric Change: [http://www.candac.ca/candac/Outreach/Educational_Resources/grade_4-](http://www.candac.ca/candac/Outreach/Educational_Resources/grade_4-5_weather_instruments.php)

[5_weather_instruments.php](http://www.candac.ca/candac/Outreach/Educational_Resources/grade_4-5_weather_instruments.php)

Lesson plans shared by teachers on Promethean Planet website:

<http://www.prometheanplanet.com/en/Search/resources/?Keywords=weather+instruments>

Weather related lesson plans available at SMART exchange website:

<http://exchange.smarttech.com/search.html?q=%20weather%20instruments>

Discovery Education lesson plans on weather maps:

<http://www.discoveryeducation.com/search/page/-/lesson-plan/weather/index.cfm>

Try Engineering lesson plan on creating a hygrometer:

<http://tryengineering.org/lesson-plans/making-sense-sensors>

How does a hurricane form?

<http://spaceplace.nasa.gov/hurricanes/en/>

How do tornadoes form?

https://www.youtube.com/watch?v=lmWh9jV_1ac and

<http://www.cnn.com/videos/tv/2015/04/02/orig-how-tornadoes-form.cnn/video/playlists/tornados/>