4-H-1023,FG-W

WEATHER AND CLIMATE SCIENCE

FACILITATOR'S GUIDE • LEVEL 1

NOTE

THANK YOU for taking the time to help a young person learn more about weather and climate science. Weather watching is useful on a daily basis and can even be a lifelong hobby. Learning about the earth's climate and climate change is important to understanding and responding to our changing weather.

The 4-H Weather and Climate Science curriculum is for youth who enjoy learning about science, especially weather and climate. Level 1 introduces basic terms and concepts for youth in grades 3–5. Activities focus on understanding the signs of weather. Level 2 activities introduce youth in grades 6–8 to more complex weather topics, understanding climate, and making and using weather instruments. Level 3 activities are divided into two major sections: weather and climate. Level 3 delves deeper into weather and climate science concepts to prepare youth to be well informed and to study these topics at a college or university. Youth are encouraged to supplement their learning by consulting knowledgeable people and current written materials in Level 3 with references from governmental and/or university sources (online extensions *.gov and *.edu).

This Facilitator's Guide answers questions in the youth manual and suggest ways to enhance the activities. It also offers additional information about working with youth.

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NGSS indicates the Next Generation Science Standards for each activity. See www.nextgenscience.org/next-generation-science-standards for more information.

See Purdue Extension's Education Store, www.edustore.purdue.edu, for additional resources on many of the topics covered in the 4-H manuals.

Question: Why might a family have a NOAA (National Oceanic and Atmospheric Administration) Public Alert Weather Radio?

ANSWER:
These radios allow you to quickly learn about dangerous weather conditions. They can be set to broadcast weather alerts when they occur for any U.S. area. They are available with a battery and hand-crank backup.

FLY HIGHER

Create a plan for your family so that you are prepared for a tornado warning and and/or a winter storm warning.

Youth can get help for creating a plan by finding sources on the Internet or calling their county's emergency management office.

LIFE SKILLS

- Weather Skills: Recognizing the difference between warnings, watches, and advisories.
- Indiana standards: 2.2.6
- NGSS: ESS2.D
- Success Indicator: Youth understand how to react to the different weather alerts issued by the NWS.

SUPPLEMENTAL INFORMATION AND RESOURCES

Definitions for watches, warnings, and advisories: www.wrh.noaa.gov/boi/awareness/warningwatchadvisory.php

Definitions for the multiple types of watches, warnings, and advisories: www.erh.noaa.gov/lwx/Defined/

WEATHER OR CLIMATE?

Big Picture: The difference between weather and climate can be confusing. Climate includes all the different types of weather that happen year round and is based on the last 30 years of weather records. Weather is simply what happens at a specific time in the atmosphere. Therefore the temperature today is the weather; the average temperature for today is the climate.

Weather can vary widely in Indiana because of our changing seasons, but the seasons are part of our climate. Climate does not change when the seasons change, but the weather changes with the seasons. The purpose of this activity is to engage youth in thinking of weather vs. climate and related issues and ideas. So "single occurrence" should always be checked when "weather" was checked; and "an average" should be checked when "climate" was checked.

FACILITATING THE ACTIVITY

Help youth identify the difference between weather and climate. They might need help in thinking about climates different than Indiana's climate.

SHARE WHAT HAPPENED

Question: Did you find it difficult to decide in the statements in Table 1 which were about weather and which were about climate?

ANSWER:
Some youth might have difficulty determining where the X's belong, especially if they do not clearly understand that weather is defined over a short time frame, and climate is the average temperatures over 30 years or more.

Question: Are the clothes you wear today determined by the weather or the climate?

ANSWER:
Determined by the weather.

Question: Are the clothes you keep in your closet and dresser determined by the weather or the climate?

ANSWER:
Our clothing choices are based on the weather we expect to have for any season, so they are determined by climate.

	(choose one)		Reason	
Announcer's Statement	**WEATHER**	**CLIMATE**	**Single Occurrence**	**An Average**
Yesterday the high was 55°F and the low was 43°F.	X		X	
Today we are expecting a high of 61°F.	X		X	
That is 10 degrees above the normal high of 51°F for this date.		X		X
We will have clear skies today with no rain forecast for the next three days.	X		X	
We usually would have 4 inches of rain this month.		X		X
Hurricane season is beginning in the tropics.		X		X
There is a tropical storm developing in the Atlantic Ocean.	X		X	
To the north there is a massive snowstorm developing.	X		X	
We do not normally see a snowstorm like this at this time of year.		X		X
Tornado season is upon us and we should be prepared.		X		X
We usually expect four or five tornado outbreaks to occur this month.		X		X
This morning a tornado damaged a building in the plains.	X		X	

Question: Do you have clothes you don't wear very much? If so, why?

ANSWER:
The weather in temperate climates varies a lot over the year, so clothes are needed for hot and cold weather. Sometimes clothes might be needed for very cold temperatures, even though they are not needed very often.

APPLY

Question: Pick another time of year. What clothes would you wear outside at that time of year?

ANSWER:
The clothing items should be appropriate for the time of year.

GENERALIZE TO YOUR LIFE

Question: Would you keep all the same clothes in your closet if you lived in Hawaii? What would be different?

ANSWER:
In Hawaii youth would have more hot-weather clothing and only a few items for cooler weather.

Question: Would you keep all the same clothes in your closet if you lived in Alaska? What would be different?

ANSWER:
In Alaska youth would have more and heavier cold-weather clothing and very little clothing for hot days.

CONNECTIONS

There are many different classification systems for climate. Most climate categories are based on either rainfall/temperature or on plant/animal life. The most popular classification system is the Koppen Climate Classification System.

LIFE SKILLS

- Weather Skills: Determining the difference between weather and climate.
- NGSS: ESS2.D
- Success Indicator: Youth understand that weather is what's happening now, and climate is an average of weather.

WHERE IS THE HEAT?

Big Picture: Many elements like clouds, rain, and the earth's environment affect temperatures, but the driving force is the relationship of the earth to the sun. In the summer the Northern Hemisphere is tilted toward the sun and receives direct, concentrated rays. In the winter the Northern Hemisphere is tilted away from the sun, so the sun's rays are spread over a large area, with the direct concentration hitting the Southern Hemisphere. The tilt of the earth also causes differences in the amount of sunlight received during each season, from over 15 hours of sunlight in the summer, to close to only 9 hours in the winter. The difference in concentration of the sun's rays and seasonal daylight creates differences in temperatures.

Distance from the sun has little to no effect on the heating of the earth. During summer in the Northern Hemisphere the earth is about 3 million miles farther from the sun than in winter. The average distance of the earth from the sun is about 93 million miles, so a 3 million-mile difference is close to insignificant.

FACILITATING THE ACTIVITY

In this activity youth might need your hands for assistance. Youth are capable of completing each section of the activity; however, you might offer to hold the flashlight while they draw or assist with measuring to ensure consistency. Let youth think about how the activity relates to the changing concentration of the incoming sunlight and the time the sun shines during each season. They might also need assistance in calculating daylight times.

SHARE WHAT HAPPENED

Question: What happened to the shape of the light when you moved the flashlight?

ANSWER:
The lighted area became bigger.

Question: How many pennies could you fit in each shape?

ANSWER:
Answers will vary depending on the flashlight used. The angled light should cover a bigger area and therefore fit more pennies.

Question: How will the angle of the light affect the temperature?

ANSWER:
The angled light will not heat as well as the direct light.

WEATHER SKILLS

Question: Which season has the shortest amount of daylight?

ANSWER:
Winter

Question: Which season has the longest amount of daylight?

ANSWER:
Summer

Question: Why would the amount of daylight make a difference in the seasons?

ANSWER:
More daylight gives the sun more time to heat the earth.

Question: Which season had the most direct sunlight?

ANSWER:
Summer