

The Parched Plains

Weather and Climate

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Grade Level	6th – 8th Grade	**Time Frame**	2-3 class period(s)
Subject	Science	**Duration**	120 minutes

Essential Question

How do scientists use meteorological data to predict weather events such as droughts, and how are these related to climate?

Summary

Students will explore meteorological data as well as news articles in order to learn about droughts both in the present and throughout history. Students will determine the weather and climate events that can cause drought and that are indicators used to predict future droughts.

Snapshot

Engage

Students view a short video showcasing drought in Oklahoma and some of its impacts. Through a teacher-facilitated discussion, students create a list of the characteristics of a drought and the impacts of prolonged drought. Students produce a class definition for drought and compare this with an official definition.

Explore

Students analyze meteorological data from multiple sources to determine the key factors that lead up to drought and how these factors can affect the length and severity of a drought.

Explain

Students create a poster to present their findings and the relationships they found. Students participate in a Gallery Walk to compare their findings with those of their classmates.

Extend

Students read articles relating to a recent drought and other droughts throughout Oklahoma's history and compile a set of recommendations for dealing with a drought.

Evaluate

Students create a public service announcement regarding drought in Oklahoma and the resulting impacts and present methods to mitigate the effects of drought on water resources, agriculture, tourism, etc. Local experts can be invited to the class to provide feedback on student PSAs.

Standards

Next Generation Science Standards (Grades 6, 7, 8)

MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

Oklahoma Academic Standards (6th Grade)

6.ESS2.5 : Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

Attachments

- 2001-2002 Atmospheric Pressure vs Drought—The Parched Plains - Spanish.docx
- 2001-2002 Atmospheric Pressure vs Drought—The Parched Plains - Spanish.pdf
- 2001-2002 Atmospheric Pressure vs Drought—The Parched Plains.docx
- 2001-2002 Atmospheric Pressure vs Drought—The Parched Plains.pdf
- 2011-2013 Atmospheric Pressure vs Drought—The Parched Plains - Spanish.docx
- 2011-2013 Atmospheric Pressure vs Drought—The Parched Plains - Spanish.pdf
- 2011-2013 Atmospheric Pressure vs Drought—The Parched Plains.docx
- 2011-2013 Atmospheric Pressure vs Drought—The Parched Plains.pdf
- Drought Patterns KWL Chart—The Parched Plains - Spanish.docx
- Drought Patterns KWL Chart—The Parched Plains - Spanish.pdf
- Drought Patterns KWL Chart—The Parched Plains.docx
- Drought Patterns KWL Chart—The Parched Plains.pdf
- Drought T-Chart—The Parched Plains - Spanish.docx
- Drought T-Chart—The Parched Plains - Spanish.pdf
- Drought T-Chart—The Parched Plains.docx
- Drought T-Chart—The Parched Plains.pdf
- Lesson Slides—The Parched Plains.pptx
- PSA Rubric—The Parched Plains - Spanish.docx
- PSA Rubric—The Parched Plains - Spanish.pdf
- PSA Rubric—The Parched Plains.docx
- PSA Rubric—The Parched Plains.pdf

Materials

- Lesson slides (attached)
- Oklahoma annual temperature data and precipitation data graphs (from Oklahoma Climatological Survey) (links provided below)
- Drought Patterns KWL Chart handouts (attached; one per student)
- Drought T-Chart handouts (attached; one per student)
- 2001-2002 and 2010-2013 Atmospheric Pressure vs. Drought maps (attached; one per group)
- PSA Rubric (attached; one per group)
- Articles related to drought in Oklahoma (suggestions provided in the Extend section of the lesson)
- Devices for recording audio/video (if available)
- Markers or colored pencils
- Small sticky notes
- Giant sticky notes or butcher paper for posters

Engage

Use the attached **Lesson Slides** to guide the activities. Go to **slide 4** and pass out copies of the Drought T-Chart handout to each student. Have students work with an Elbow Partner to fill out the T-chart so that one side lists the characteristics and the other side the effects of drought. Once students have filled out the charts, have each pair share out one item at a time. Copy the student responses onto the board to create a class list.

Go to **slide 5**. When the list is complete, have each set of elbow partners write their own definition for drought. Show students the video Oklahoma Drought-A New Generation.

Embedded video
https://www.youtube.com/watch?v=oRSFMLByat0

Go to **slide 6**. Read aloud the definition for drought from the NOAA: "Drought is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal, recurrent feature of climate that occurs in virtually all climate zones, from very wet to very dry." Ask students how their definitions compare with this “official” definition. Invite students to take a few minutes to modify their definitions based on the new information.

Explore

Go to **slide 7**. Ask students what kind of information they might want to look at if they were trying to determine the cause of drought or predict the onset of a future drought (e.g., temperature and/or rainfall).

Go to **slide 8** and have students for groups of 3–5 students based on whatever criteria best fits your classroom. Tell students they will be looking at different types of meteorological data and presenting their findings to the class via posters. Give groups a copy of the Oklahoma annual temperature and precipitation data from the Oklahoma Climatological Survey and a copy of the Drought Patterns KWL Chart handout. Have students compare the data sets to see if they can find any patterns, similarities, or differences and record what they discover using the KWL chart.

Go to **slide 9**. After a few minutes, when you see that the students have discussed most of the patterns within their groups, have them share out their findings with the class one group at a time.

Student Responses: Interpreting The Data

The patterns should reveal that during periods of higher temperatures, Oklahoma entered dry periods as well. The students should also have identified the major dry periods in Oklahoma's history. Ask clarifying questions to clear up any misconceptions students may have concerning the relationships in the data.

Go to **slide 10**. Ask students when the major droughts occurred in Oklahoma according to the data (1855–1905, 1910s, 1930s, 1950–1957, 1960s, 1975–1982, 2001–2002, 2011–2013). Tell students that they will now be focusing on two recent drought episodes: 2001–2002 and 2011–2013. Students will compare atmospheric pressure data with drought monitor map data to find a relationship.

Provide each group of students with a copy of the 2001–2002 and 2011–2013 atmospheric pressure vs. drought data sets as well as a copy of or link to the What Is the U.S. Drought Monitor? document. Again, ask the students to analyze the data and to record and summarize their findings. Circulate among the groups, and help the students by asking guiding questions and pointing out some of the patterns if needed.

Student Responses: High And Low Pressure

You might need to review with the students the effects of high and low pressure. High pressure = sinking air, low humidity, and clear skies, while low pressure = rising air, higher humidity, and cloudy skies.

Explain

Go to **slide 11**. Give each group of students a large poster-sized sticky note or a piece of butcher paper. Have the students summarize all of their findings (i.e., temperature, precipitation, pressure, and drought index relationships) from their analysis of the data. Have them include relationships between the various data. Give them a choice of using visual graphics (graphs and/or pictures), writing, and/or other possible modes. Give students a time limit, which might vary depending on the class.

Go to **slide 12**. Once groups have completed their posters, have them participate in a Gallery Walk to review other groups' posters. Have them give feedback on the others' work, specifically about what they might not understand on the posters. They should make at least one comment per poster using a sticky note. Once the Gallery Walk is completed, have the students make corrections to their posters, and then have groups present their findings to the class. Use this presentation time to direct the discussion of the data.

Student Responses: Relationship Among Temperature, Pressure, And Precipitation

Make sure that students understand that temperature is connected to atmospheric pressure, and atmospheric pressure is connected to precipitation. Solar energy heats Earth's surface unevenly, causing warmer areas and areas of high and low atmospheric pressure. High-pressure areas are associated with hot and dry conditions due to the sinking air. As air sinks in a high-pressure area, it becomes hotter and drier. Low-pressure areas are associated with cooler moister air due to the rising air. As air rises, it cools off, and moisture condenses, which causes precipitation.

Discussion can be facilitated using some of the following questions:

- What did you notice about the data?
- Did you find any relationships between the data sets?
- What occurred to the temperature data when the climate was dry in Oklahoma?
- How did pressure relate to the drought index?

Teacher's Note: Gaps In Understanding

Be sure to address partial or missed relationships among the data.

After the class discussion, have students revisit the KWL Chart from earlier and add relevant information.

Extend

Go to **slide 13**. Invite students to use a Jigsaw strategy within their groups to read articles covering the 2011–2013 drought in Oklahoma. During a Jigsaw activity, each student in a group reads a different article and then shares the main ideas from that article with the group. Have students use an analytical reading strategy like CUS and Discuss or Stop and Jot to read the articles closely. Choose articles that cover different aspects of the drought in Oklahoma (e.g., drought effects, public water policies, drought history). Some potential article sources include:

- http://stateimpact.npr.org/oklahoma/tag/drought/
- https://www.drought.gov/drought/
- http://newsok.com/oklahoma-rainfall-records-show-a-history-of-long-droughts/article/3614753
- http://www.owrb.ok.gov/supply/drought/pdf_dro/DroughtFactSheet2011.pdf

Remind students to pay close attention as they read and discuss the articles, as they might be able to use the information to help with the public service announcements that they will create next.

Evaluate

Go to **slide 14**. Have students create a 2–3 minute public service announcement or commercial highlighting the causes and effects of drought in Oklahoma. Their PSAs should also include proposed solutions (e.g., water rationing in large cities) to help mitigate the effects of drought. The PSA can be done as a video project or as an audio project. (If devices with video or audio recording capability are not available, students can act out, read, or present their PSAs in front of the class.) Be sure students cite information from their data analysis, article research, and any additional research. Give each group a copy of the PSA Rubric before they begin working.

Optional: Expert Feedback

As an optional enhancement, invite one or more local experts (weather person, tourism or agricultural official, etc.) to visit the class while the students present their PSAs to give authentic feedback.

Resources

- K20 Center. (n.d.). CUS and Discuss. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5073969
- K20 Center. (n.d.). Elbow Partners. Strategies. https://learn.k20center.ou.edu/strategy/ccc07ea2d6099763c2dbc9d05b00c4b4
- K20 Center. (n.d.). Gallery Walk / Carousel. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505a54d
- K20 Center. (n.d.). Jigsaw. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f507c1b8
- K20 Center. (n.d.). KWHL Graphic Organizer. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505dd47
- K20 Center. (n.d.). Stop and Jot. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5077921
- Knittle, A. (2011, Oct. 19). Oklahoma rainfall records show a history of long droughts. The Oklahoman. https://oklahoman.com/article/3614753/oklahoma-rainfall-records-show-a-history-of-long-droughts
- National Integrated Drought Information System. (n.d.). U.S. Drought Portal. https://www.drought.gov/drought/
- National Weather Service. (2006, August). Drought public fact sheet. https://www.esrl.noaa.gov/gmd/obop/mlo/educationcenter/students/brochures%20and%20diagrams/noaa%20publications/Drought%20Fact%20Sheet.pdf
- NPR. (n.d.). Drought. State Impact. https://stateimpact.npr.org/oklahoma/tag/drought/
- Oklahoma Climatological Survey. (n.d.). Precipitation history - annual, statewide. Climate Trends. https://climate.ok.gov/index.php/climate/climate_trends/precipitation_history_annual_statewide/CD00/prcp/Annual/oklahoma_climate
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- Oklahoma Water Resources Board. (2012). Hydrologic drought of water year 2011: A historic perspective. http://www.owrb.ok.gov/supply/drought/pdf_dro/DroughtFactSheet2011.pdf
- Sunup TV. (2011, August 26). Oklahoma drought: A new generation - What is drought? [Video file]. YouTube. https://www.youtube.com/watch?v=oRSFMLByat0