

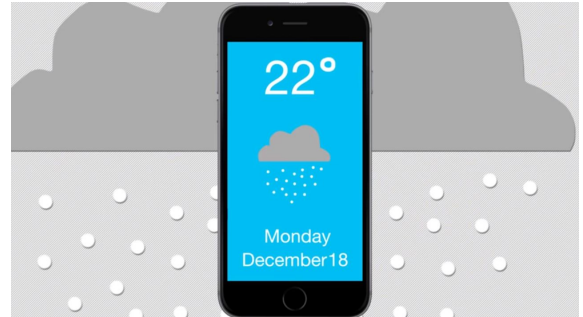
Lesson Plan: Does Climate Change Cause Extreme Weather?

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Featured Resources

Above the Noise: [Does Climate Change Cause Extreme Weather?](#)

The Lowdown: [Is Climate Change to Blame for Hurricane Harvey and Other Extreme Weather?](#)



Opening Quick-Write Prompt

Have you experienced an extreme weather event, like a drought, heat wave, severe storm (usually extreme rainfall or snowfall), tornado or hurricane? What was it like? (Or, think about a recent extreme weather event you have heard about like Hurricane Harvey or Hurricane Irma.) What stood out to you about it?

A quick write allows students to write down their thoughts before discussing the opening question in order to increase participation and make the discussion more accessible to English Language Learners.

Objective

- Students will analyze the role of climate change in extreme weather events, and how climate models are being used by scientists to determine its influence.
- Students will evaluate the evidence and write a response to the issue.

Essential Question and Lesson Context

What role does climate change play in extreme weather events?

Extreme weather events are defined as “lying in the outermost (‘most unusual’) 10 percent of a place’s history” ([NOAA](#)). And although extreme weather events are nothing new, they have been on the [rise](#). Many people are pointing to climate change as the culprit. But is climate change really to blame? There is a lot that climate scientists still don't know about the relationship between climate change and extreme weather events like hurricanes, tornadoes, heat waves, droughts, and major rain and snow storms. Scientists are using climate models in order to figure out the role that climate change plays in extreme weather events.

Key Vocabulary

Pre-teach key vocabulary before students do the activity, especially if you have English Language Learners. After going over the simple definition, consider providing a visual aid or having students draw one. More ideas for how to pre-teach vocabulary can be found [here](#).

Word	Simple definition
Attribution (n.)	The act of assigning a source or cause to something <i>Attribution for rapid climate change over the past century has overwhelmingly been given to the burning of fossil fuels.</i>
Conservative (adj.)	Cautiously low <i>A temperature increase of two degrees Celsius by 2100 is a conservative estimate.</i>
Drought (n.)	A long period of time with an unusually low amount of rain <i>The recent drought caused many farms to produce fewer crops.</i>
Fossil fuel (n.)	Fuel, such as coal, oil or natural gas, that formed over millions of years from the remains of plants or animals <i>The burning of fossil fuels releases carbon dioxide into the atmosphere, contributing to climate change.</i>
Model (n.)	A representation of an object, process or system <i>She drew a scientific model of how greenhouse gases trap heat.</i>
Phenomenon (n.)	A fact or event that is observable <i>A storm as destructive as Hurricane Harvey is a rare phenomenon.</i>
Probability (n.)	The likelihood that something will happen <i>The probability that California will experience another drought is very high.</i>
Radiation (n.)	Energy transmitted in the form of waves or particles <i>Some of the radiation from the sun, or solar radiation, is absorbed by surface of the Earth. This causes the surface of the Earth to warm.</i>
Severe (adj.)	Intense or harsh <i>California's recent drought was severe.</i>

Investigate

- Discuss the quick-write prompt to gauge what students think about this issue.
 - o **NOTE:** The quick-write prompt is designed to begin the conversation and prepare students to write more detailed responses later in the lesson.

- Ask students if they have heard any discussion in the news about whether or not climate change is to blame for all of the recent extreme weather events that have occurred recently.
- Discuss what students may have heard or read, and what they know about the relationship between weather and climate.
- Have students watch the [Above the Noise episode](#) as a class or in small groups.
 - **Stop the video at 1:08 and ask:** What is the difference between global warming and climate change? Why do you think there are two different terms to describe this phenomenon?
 - **Stop at 1:26:** Review the difference between weather and climate.
 - **Stop at 3:09:** How would you define the term “attribution science”?
 - **Stop at 3:37:** What are climate models?
 - **Stop at 4:04:** How do scientists use attribution science and climate models to study the relationship between climate change and extreme weather events?
 - **Stop at 4:28:** What do climate models currently indicate about the relationship between climate change and extreme weather events?
- For more information on extreme weather events, including Hurricane Harvey, students can read [The Lowdown post](#).
- **Transition to the Make and Share:** Tell students they will have a chance to share their response to this issue in the comments section of The Lowdown. The first time they comment, students must sign in to [Disqus](#), a free discussion app embedded in The Lowdown.
 - To sign in to [Disqus](#), click the “Comments” button at the bottom of The Lowdown.
 - Click the blue “Get Started” button in the gray “Welcome to Disqus” box.
 - Students will need to enter a username. We recommend first name, last initial.
 - After signing in for the first time, students must verify their email address before commenting. A verification email will appear in their inbox once they sign in to Disqus.

Make and Share

- Individually or in small groups, students post responses in the comments section about how concerned they are about extreme weather, and whether we should focus on slowing climate change or finding ways to deal with more extreme weather in the future (or both).
 - Responses should be supported by evidence from the Above the Noise episode, The Lowdown post, or other research on the topic. (See Source list)

- o Encourage students to reply to other comments after posting their response. Remind them to use evidence to support their claims and respectful language when replying to others.
- Students can create their own response or use the following questions as a starting point:
 - o **Make your case:** What do you think the government or your community should do to prepare for extreme weather events? What do you think leaders, scientists and ordinary citizens should do to communicate about extreme weather?
 - o **Dive into research:** Choose an extreme weather event that has occurred in this century. Do some research to find out how different it was from average weather for that region. Create a chart or infographic comparing the two.
 - o **Share out:** Have you experienced an extreme weather event? How did it change your daily activities? Share your story.
 - o **Share out:** How concerned are you about climate change? Would an increase in the number or severity of extreme weather events, like heatwaves, droughts, heavy rainfalls, tornadoes or hurricanes, make you more concerned?
 - o **Get creative:** Share your own image (or link to an image online) of an extreme weather event or its aftermath. Explain what happened during the event and what about it was considered “extreme.”

Assessment/Reflection

- Students reflect on what they have learned either through a class discussion or in writing:
 - o What have you learned about the connection between climate change and extreme weather? Did your understanding of the effect that climate change may or may not have on extreme weather change?
 - o What was it like to post your responses publically and reply to other posts? What did you learn from other students? What do you hope they learned from you? What will you do the next time you post a comment in response to The Lowdown?

[Circle chats](#), small-group discussions and [think-pair-share](#) provide a safer space for students to practice speaking and listening, and also boost participation during whole-class discussions.

Extension/Homework

Write/speak locally: Students turn their response to this issue into a letter, short speech or presentation, then research ways to make their voice heard in their community. (Example: Speaking during the public comment section of a city council meeting, posting in an online forum, etc.) For a list of how to contact local officials in your area, check out [KQED Learning's Local Election Toolkit](#).

Common Core Standards and NGSS

CCSS.ELA-Literacy.CCR.A.R.1	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
CCSS.ELA-Literacy.CCR.A.R.7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
CCSS.ELA-Literacy.W.1	Write arguments to support claims with clear reasons and relevant evidence.
NGSS.DCI.ESS2.D	Weather and Climate
NGSS.DCI.ESS3.D	Global Climate Change
NGSS.SEP.7	Engaging in argument from evidence
NGSS.SEP.8	Obtaining, evaluating and communicating information
NGSS.CCC.2	Cause and effect: Mechanism and explanation
NGSS.CCC.4	Systems and system models
NGSS.CCC.2	Stability and change