Today I Learned About Hurricanes

Description:

Hurricanes are a fact of life for millions of Americans each year, and billions more people around the world. What is a hurricane, and how can we prepare for them? Through a model and student-level data, students explore the factors influencing storm frequency and intensity. They also consider the language of storms, as well as steps to resilience.

Skills & Objectives

SWBAT

- Explain that hurricanes are influenced by sea surface temperatures, moisture, wind, and other factors.
- Understand that increased heat in the atmosphere, ocean, and land are changing the frequency and intensity of hurricanes.
- Name a few concepts for hurricane resilience.

Skills

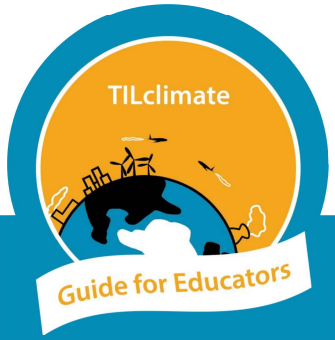
- Modeling
- Graphing
- Discussion

Students Should Already Know That

- Hurricanes are big, dangerous storms that can cause coastal flooding from storm surge, inland flooding from rain, and damage from wind.

Standards Alignment:
HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS3-5 Analyze geoscience data and the results from global climate models.
HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
RST.11-12.9 Synthesize information from a range of sources into a coherent understanding of a process, phenomenon, or concept.
HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

Disciplinary Core Ideas:
ESS2.A Earth Materials and Systems
ESS2.D Weather and Climate
ESS3.D Global Climate Change



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How To Use These Activities:

Pages with the circular "TILclimate Guide for Educators" logo and dark band across the top are intended for educators. Simpler pages without the dark band across the top are meant for students.

Each of the included activities is designed to be used as a standalone, in sequence, or integrated within other curriculum needs. A detailed table of contents, on the next page, explains what students will do in each activity.

A Note About Printing

All student pages are designed to be printable in grayscale.

The worksheets do not leave space for students to answer questions. Students may answer these questions in whatever form is the norm for your classroom – a notebook, online form, or something else. This allows you, the teacher, to define what you consider a complete answer.

A Note About Data

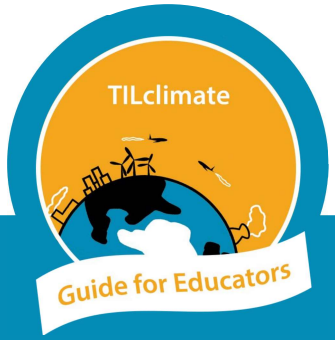
The data on pages 5, 6, and 7 is available for download at https://climate.mit.edu/ed/hurricanedata

Extension Activity

For groups with the time and resources, the role-playing activity "Coastal Flooding and Climate-Related Risks in Launton" (2-3hr, $3 per participant) leads participants through a negotiation among stakeholders in a small beachfront community.

https://www.pon.harvard.edu/shop/coastal-flooding-and-climate-related-risks-in-launton/

Podcasts in the Classroom: Throughout these Guides for Educators, we invite students to think about how they would share their learning with family and friends. One way to do this is to encourage your students to create their own podcasts - they're shareable, creative, and have multiple options for embedded assessment. We would love to hear any podcasts or see any other projects you or your students create! Email us at tilclimate@mit.edu, Tweet us @tilclimate, or tag us on Facebook @climateMIT.



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Detailed Table of Contents

Social-Emotional Learning

All climate change topics have the potential to be overwhelming or scary for students. Students whose lives or family members have been threatened or disrupted by hurricanes may find this topic more difficult to discuss than others. The activities in this Guide do not focus on any particular storm, nor do they focus on traumatic impacts.

For more information on trauma-informed climate education, see pages 6&7 "How to Use TILclimate Educator Guides" (included with this guide or accessible from https://climate.mit.edu/til-about-hurricanes-educator%20guide)

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Hurricanes and Resilience

This Educator Guide includes a model, articles, and student-level data. Educators may pick and choose among the pieces of the Guide, as suits their class needs.

Parts of this Guide may align with the following topics:

- Physical science: The physics of hurricanes, the physics of wind-resistant construction
- Life/environmental science: Coral reefs as hurricane "speedbumps," wetlands ecosystem services
- History/social science: History of hurricane naming and terminology, impact of hurricanes on human migration and policy.
- ELA/literature: Connections to stories about hurricanes
- ELA/nonfiction: Communicating complex scientific and resilience concepts
- Mathematics: Statistical modeling from real-world data

MIT Resources

We recommend the following as resources for your own better understanding of climate change or as depth for student investigations. Specific sections are listed below:

- Climate Science, Risk & Solutions, an interactive introduction to the basics of climate change. https://climateprimer.mit.edu/
  - Chapter 02 The greenhouse effect and us
  - Chapter 06 Predicting climate
  - Chapter 07 Understanding risk
  - Chapter 08 What are the risks?
  - Chapter 10 What can we do?
- MIT Climate Portal Explainers are one-page articles describing a variety of climate topics. New Explainers posted monthly. https://climate.mit.edu/explainers
  - Climate-Resilient Infrastructure
  - Sea Level Rise
  - Coastal Ecosystems and Climate Change
  - Cities and Climate Change
  - Hurricanes
  - Climate Models
  - Greenhouse Gases

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Wrap-Up Discussion Questions

- How do warming ocean and air temperatures affect hurricane formation?
- What are some challenges that might arise from using different words for the same type of storm? (Consider multi-national corporations or international aid organizations.)
- What are some challenges that might arise from using human names for storms, especially across areas that include many countries?
- Given the patterns that you identified in the historical data, what would you expect the next decade's hurricane seasons to look like?
- What other questions do you have about hurricanes? Where might you look for that information?
- Which resilience solutions did you like the best? Why? How do they help a community be resilient to hurricanes?

Climate Solutions

Climate solutions can be thought of as falling into four categories outlined below. Across all categories, solutions at the community, state or federal level are generally more impactful than individual actions. For example, policies that increase the nuclear, solar and wind mix in the electric grid are generally more effective at reducing climate pollution than asking homeowners to install solar panels. For more on talking about climate change in the classroom, see "How to Use This Guide".

- **Energy Shift**
  How do decision-makers make the switch from carbon-producing energy to carbon-neutral and carbon-negative energy?
- **Energy Efficiency**
  What products and technologies exist to increase energy efficiency, especially in heating and cooling buildings?
- **Adaptation**
  How can cities and towns adapt to the impacts of climate change?
- **Talk About It**
  Talking about climate change with friends and family can feel overwhelming. What is one thing you have learned that you could share to start a conversation?

What solutions are the most exciting in your classes? We would love to hear from you or your students! Images, video, or audio of student projects or questions are always welcome. Email us at tilclimate@mit.edu, Tweet us @tilclimate, or tag us on Facebook @climateMIT.