

5E LESSON PLAN

TITLE

Investigating weather and climate through data and El Nino

GRADE LEVEL

9th

NGSS AND COMMON CORE STANDARDS

HS-ESS2-4 Earth's Systems- Use a model to describe how variations in the flow of energy into and out of the Earth's systems result in changes in climate.

CCSS.ELA-LITERACY.RL.9-10.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

SET UP: PLACE AND TIME

All parts of this lesson take place in a science classroom and should take between 4 to five 50 minute class periods depending on student prior knowledge.

BACKGROUND

The Earth's oceans are vital resource for coastal communities and can be drastically altered by climate change. This lesson engages students in the phenomena of climate and weather using the engaging context of El Nino. Students will also meet ELA standards by being able to cite and recognize credible sources of information about climate and weather phenomena.

JUSTIFICATION

This lesson directly relates to students' lives making it authentic. The phenomena of El Nino change the weather patterns across North America, and here on the west coast of the United States drastically changes environmental patterns such as the following: tropical ocean organisms migrating further north into temperate waters, decreased precipitation, and increased temperatures throughout the seasons, and declining native shell fish and fish stocks. These environmental changes provide opportunities for discussion about various siting of tropical species along the Pacific Northwest coast along with daily discussions about weather patterns that the students find different than usual. Further, these daily observations allow for teachable moments about the difference between climate change versus weather. Finally, this lesson allows for students to use authentic data to explore the phenomena of weather, climate, and El Nino.

OBJECTIVES

- Describe the changes that occur during El Nino weather events

- Explain the process of a thermohaline and its effects on upwelling along coast lines
- Examine information & data for changes, patterns, authenticity
- Design and use authentic data investigation

MATERIALS

Computers & Internet access for data analysis

Demonstration materials: 400mL beaker, two small bottles, small weighted platform, food coloring, hot water, salt water 50ppt, small aquarium tank.

Classroom wide media projector or screen

[Link to visual of demonstration materials](#)

ENGAGE

Students will be engaged with a [video from PBS Learning Media](#). After the video, a class discussion will be led by the teacher covering the following questions:

- What is El Niño?
- Discuss the factors that generate an El Niño.
- Describe some of the effects of El Niño on various parts of the planet.
- Discuss what the narrator means by "natural air-conditioning."
- Describe how satellite technology helps scientists predict the probable occurrence of an El Niño.

EXPLORE

Thermohaline Demonstration: Students will observe a demonstration of a thermohaline demonstration and predict what will happen during the activity. A student inquiry form will be provided to each student that they will fill out as the activity happens. This activity will be used as a way for students to explore the topic of El Nino and the associated phenomena of thermohaline.

EXPLAIN

Students will be directed to the [NOAA Data in the Classroom](#) website. During this explaining portion of the lesson students will complete the Introduction through Level 3 portion of the website. Giving them an opportunity to demonstrate their knowledge of El Nino and thermohaline phenomena. Embedded formative assessments will be with the website will be used as evidence of student work.

ELABORATE/EXTEND

During this portion of the lesson students will be given the opportunity to extend their understanding of El Nino by completing [Level 4 of the NOAA Data in the Classroom](#)

activity. Embedded formative assessments with the website will be used as evidence of student work combined with teacher interactions during this portion of the lesson.

EVALUATE

A student designed investigation will assess student knowledge of objectives. During this portion of the lesson students will first design an investigation of El Nino using authentic data from the [NOAA Data in the Classroom](#) (Level 5) website. A teacher designed rubric will be used to evaluate student work.

Category	Expert-4	Proficient-3	Apprentice-2	Novice-1
Content	Covers topic in depth with details and examples; subject knowledge is excellent; focuses on an important concept.	Includes essential knowledge about the topic. Subject knowledge is good; focuses on an important concept.	Includes essential information about the topic but there are 1-2 factual errors; focus may be unclear.	Content is minimal OR there are several factual errors; focus is unclear.
Effort	Product shows a great amount of time spent and very careful, neat work.	Product shows a good amount of time spent and careful, neat work.	Product shows some amount of time spent and is slightly lacking neatness.	Product shows a minimal amount of time spent and is lacking neatness.
Originality	Product shows a large amount of original thought and critical thinking. Ideas are creative and inventive.	Product shows some original thought and critical thinking. Work shows new ideas and insights.	Uses other people's ideas (giving them credit), but there is little evidence of original thought or critical thinking.	Uses other people's ideas but does not give them credit.
Appearance	Makes excellent use of color, graphics, effects, etc. to enhance the presentation.	Makes good use of color, graphics, effects, etc. to enhance the presentation.	Makes some use of color, graphics, effects, etc. to enhance the presentation, but occasionally these detract from the content.	Use of minimal color, graphics, effects, etc. to enhance the presentation. Often, these detract from the content.

REFERENCES

The NOAA National Environmental Satellite, Data, and Information Service (NESDIS). [El Nino, sea temperature, ocean productivity data sets and classroom inquiry documents]. NOAA Data in the Classroom: El Nino. Retrieved from <https://dataintheclassroom.noaa.gov/content/el-nino>

PBS Learning Media. 2018. (WGBH). Earth System: El Nino. Podcast retrieved from <https://opb.pbslearningmedia.org/resource/ess05.sci.ess.watcyc.eselnino/earth-system-el-nintildeo/>