

Ocean Literacy

Principle #3

The Ocean as a Major Influence on Weather and Climate

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Principle #3 The ocean is a major influencer on weather and climate

The interaction of oceanic atmospheric processes controls weather and climate by dominating earth's energy system

Elementary School Georgia Standards of Excellence:

Earth and Space Science

S1E1. Obtain, evaluate, and communicate weather data to identify weather patterns.

- a. Represent data in tables and/or graphs to identify and describe different types of weather and the characteristics of each type.
- b. Ask questions to identify forms of precipitation such as rain, snow, sleet, and hailstones as either solid (ice) or liquid (water).
- c. Plan and carry out investigations on current weather conditions by observing, measuring with simple weather instruments (thermometer, wind vane, rain gauge), and recording weather data (temperature, precipitation, sky conditions, and weather events) in a periodic journal, on a calendar, and graphically.
- d. Analyze data to identify seasonal patterns of change. (Clarification statement: Examples could include temperature, rainfall/snowfall, and changes to the environment.)

S4E4. Obtain, evaluate, and communicate information to predict weather events and infer weather patterns using weather charts/maps and collected weather data.

- a. Construct an explanation of how weather instruments (thermometer, rain gauge, barometer, wind vane, and anemometer) are used in gathering weather data and making forecasts.
- b. Interpret data from weather maps, including fronts (warm, cold, and stationary), temperature, pressure, and precipitation to make an informed prediction about tomorrow's weather.
- c. Ask questions and use observations of cloud types (cirrus, stratus, and cumulus) and data of weather conditions to predict weather events.
- d. Construct an explanation based on research to communicate the difference between weather and climate

Middle School Georgia Standards of Excellence

Earth Science

- S6E3: Obtain, evaluate, and communicate information to recognize the significant role of water in Earth processes.
- b. Plan and carry out an investigation to illustrate the role of the sun's energy in atmospheric conditions that lead to the cycling of water.
- S6E4. Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather.
- b. Plan and carry out an investigation to demonstrate how energy from the sun transfers heat to air, land and water at different rates.
 - e. Analyze and interpret weather data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes.
- S6E6. Obtain, evaluate, and communicate information about the uses and conservation of various natural resources and how they impact the Earth.
- c. Construct an argument evaluating contributions to the rise in global temperatures over the past century.

High School Georgia Standards of Excellence

Oceanography

- SO4. Obtain, evaluate, and communicate information that describes the complex relationships between weather, climate and the oceans.
- a. Develop a model to explain the effects of tilt of the earth, solar energy inputs, and heat capacity of land and oceans on the resulting patterns of weather and climate.
 - b. Ask questions to investigate and provide explanations about the influence of the Coriolis Effect on winds, ocean currents, and climate.
 - c. Analyze and interpret data to develop models for global patterns of atmospheric and oceanic circulation. (Clarification statement: Include the role of deep water currents in oceanic circulation.)
 - d. Construct an explanation for variations in global weather patterns such as El Nino, hurricanes, and monsoons and design solutions to minimize the impact of these systems on human populations.
 - e. Use mathematics and computational thinking to explain how climate change influences the ocean. (Clarification statement: Emphasis is on sea level rise and ocean acidification.)

Environmental Science

- SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.
- Analyze and interpret data related to short-term and long-term natural cyclic fluctuations associated with climate change. (Clarification statement: Short-term examples include but are not limited to El Niño and volcanism. Long-term examples include but are not limited to variations in Earth's orbit such as Milankovitch cycles.)
 - Analyze and interpret data to determine how changes in atmospheric chemistry (carbon dioxide and methane) impact the greenhouse effect.
- SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.
- Design, evaluate, and refine solutions to reduce human impact on the environment including, but not limited to, smog, ozone depletion, urbanization, and ocean acidification.
- SEV5. Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems.
- Construct explanations about the relationship between the quality of life and human impact on the environment in terms of population growth, education, and gross national product.
 - Analyze and interpret data on global patterns of population growth (fertility and mortality rates) and demographic transitions in developing and developed countries.
 - Construct an argument from evidence regarding the ecological effects of human innovations (Agricultural, Industrial, Medical, and Technological Revolutions) on global ecosystems.
 - Design and defend a sustainability plan to reduce your individual contribution to environmental impacts, taking into account how market forces and societal demands (including political, legal, social, and economic) influence personal choices.

Let's look at the water cycle...
and make it rain!

Oh...And let's add a cloud to that!!!



How to make it rain in a jar!

1. Read all of the instructions **before** you begin.
2. Add hot water to the bottom of your jar. (This is already done for you today.)
 - a. To speed up the process, fill the whole jar with hot water, wait 20 seconds, and then pour out the excess leaving about an inch in the bottom.
3. Quickly cover the mouth of your jar with plastic wrap
4. Have your partner strike a match.
5. Lift the plastic wrap enough to drop the burning match into the water.
6. Replace the plastic wrap and secure quickly while being mindful of safety.
 - a. You can replace the burning match with a squirt of most any type of aerosol such as hair spray.
7. Make certain that your plastic wrap is secure enough for the next step. It is ok for it to sag some:)
8. Arrange ice chunks on top of the plastic wrap and wait for the magic to happen!

Can we make a
bigger cloud right
here?

Right now?????

<https://www.youtube.com/watch?v=Aiw4sp0dqkl>



How do hurricanes form?

<https://www.txstate-epdc.net/how-hurricanes-form/>



[Convection current video](#)

Look closely
and you just
may see
something that
looks like a
convection
current

[Alka Seltzer Option](#) - I only use $\frac{1}{3}$ of the alka seltzer drop down
the side of jar so that it falls one one side of the jar. [Baking](#)

[Soda Option](#)



How can we
connect these
water
convection
demonstrations
to our “Rain in a
Jar” activity?



Let's investigate:

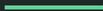
ocean temperature

heat transfer

atmospheric circulation

changes in season

- How can these events impact the formation of hurricanes?
- Can climate change potentially affect the intensity of future weather events?



Let's head back to
the ocean literacy
principle #3 and
some amazing
resources from...

What parts of principle #3 (pg. 35)
can we link to today's activities?

How can we use this principle to
spark curiosity and encourage
engagement with our student, our
children, our grandchildren?????

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**Principle 3:
Grades 6-8**

**Principle 3:
The ocean is a major influence on weather and climate.**

