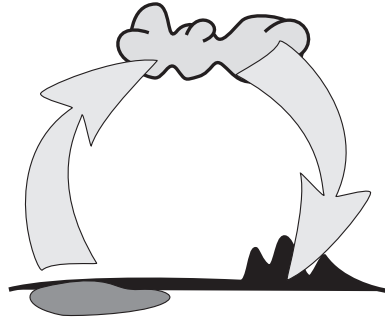


OVERVIEW

WATER PLANET



CONTENT GOALS

The **Water Planet Module** consists of four sequential investigations, each designed to introduce or reinforce concepts in earth science. The investigations start with Earth in the solar system, and then focus on the dynamics of weather and water cycling in Earth’s atmosphere.

FOSS EXPECTS STUDENTS TO

- Learn the composition and organization of the solar system.
- Learn that gravity keeps solar-system bodies in orbit.
- Design and describe controlled experiments.
- Use graphing conventions to display data for analysis.
- Investigate and analyze the effects of temperature and surface area on evaporation.
- Investigate and analyze how temperature affects the formation of dew and frost.
- Observe differential heating of water and soil.
- Describe how uneven heating results in convection currents.
- Understand that air is a mixture of gases that can be compressed.
- Learn that the weight of Earth’s atmosphere is pressure, which pushes equally in all directions and decreases with elevation.
- Learn how water is distributed worldwide.
- Understand the mechanism of the water cycle and the myriad ways it is expressed worldwide.
- Understand weather as the condition of the atmosphere in terms of three variables: heat, motion, and moisture.
- Learn the causes and effects of severe weather.
- Know the kinds of information that appears on weather maps.

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FOSS AND NATIONAL STANDARDS

The **Water Planet Module** encourages students to develop the skills of investigation and experimentation to build explanations based on knowledge and evidence. This module supports the following National Science Education Standards.*

SCIENCE AS INQUIRY

Develop students' abilities to do scientific inquiry.

- Design and conduct a scientific investigation.
- Use appropriate tools and techniques to gather, analyze, and interpret data.
- Think critically and logically to make the relationships between evidence and explanations.
- Communicate scientific procedures and explanations.
- Use mathematics in all aspects of scientific inquiry.

CONTENT: EARTH SCIENCE

Develop students' understanding of the structure of the earth system.

- Water, which covers the majority of Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from Earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.
- The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations.
- Clouds, formed by the condensation of water vapor, affect weather and climate.
- Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

*National Science Education Standards (Washington, DC: National Academy Press, 1996).

**National Science Education Standards (Washington, DC: National Academy Press, 1996), page 159.

*"Direct observation and satellite data allow students to conclude that Earth is a moving, spherical planet, having unique features that distinguish it from other planets in the solar system...energy from the Sun transferred by light and other radiation is the primary energy source for processes on Earth's surface and in its hydrosphere, atmosphere, and biosphere." ***

Develop students' understanding of Earth in the solar system.

- Earth is the third planet from the Sun in a system that includes the Moon, the Sun, eight other planets, and their moons, and smaller objects such as asteroids and comets. The Sun, an average star, is the central and largest body in the solar system.
- Gravity is the force that keeps planets in orbit around the Sun and governs the rest of the motion in the solar system. Gravity alone holds us to Earth's surface.
- The Sun is a major source of energy for changes on Earth's surface, including winds, ocean currents, and the water cycle.

SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES


Develop students' understanding of natural hazards.

- Internal and external processes of the earth system cause natural hazards, events that change or destroy human and wildlife habitats, damage property, and harm or kill humans. Natural hazards include landslides, floods, storms, and even possible impacts of asteroids.

SCIENCE AS A HUMAN ENDEAVOR

Develop students' understanding of science as a human endeavor.

- Women and men of various social and ethnic backgrounds—and with diverse interests, talents, qualities, and motivations—engage in the activities of science and engineering.



*“The instructional activities of a scientific inquiry should involve students in establishing and refining the methods, materials, and data they will collect. As students conduct investigations and make observations, they should consider questions such as ‘What data will answer the question?’ and ‘What are the best observations or measurements to make?’ Students should be encouraged to repeat data-collection procedures and to share data among groups.”**

*National Science Education Standards (Washington, DC: National Academy Press, 1996), page 144.

WATER PLANET MODULE MATRIX

SYNOPSIS	SCIENCE CONTENT	THINKING PROCESSES
1. SOLAR SYSTEM Students use solar system cards to organize the Sun and other bodies into a representation of the system and categorize the bodies in different ways, based on their properties. Students learn how gravity keeps planets in orbit.	<ul style="list-style-type: none">• The solar system comprises eight planets and various other bodies orbiting the Sun, a typical star composed mostly of hydrogen and helium.• Solar-system bodies can be put into categories, such as gas giants, terrestrial planets, and satellites.• Gravity is a pulling force that constantly changes the direction of travel of planets to maintain them in orbits around the Sun.	<ul style="list-style-type: none">• Use print resources to gather information about components of the solar system.• Compare properties of solar-system objects, and use these properties to sort and organize the objects.• Organize information using graphic representations such as charts.
2. WATER VAPOR Students experiment with water to determine how temperature and surface area affect evaporation. They also investigate the conditions that produce liquid condensation and frost.	<ul style="list-style-type: none">• Evaporation is the process by which liquid water changes into water vapor, a gas.• Temperature and surface area affect the rate of evaporation.• Condensation occurs when water vapor touches a cool surface and changes into liquid.• Evaporation and condensation contribute to the movement of water through the water cycle.	<ul style="list-style-type: none">• Plan and conduct an investigation to study the effect of surface area and air temperature on evaporation.• Conduct an investigation to study the effect of temperature on condensation.• Use appropriate tools to measure mass and volume in an experiment.• Use mathematics to analyze investigation results.• Organize and communicate findings using charts and graphs.
3. HEATING EARTH Students learn about uneven heating by monitoring the temperature of water and soil in the sunshine. They discover how uneven heating can cause convection currents. Students use syringes to investigate air pressure.	<ul style="list-style-type: none">• The different energy-absorbing properties of earth materials can lead to uneven heating of Earth's surface.• Cold fluids are denser than warm fluids.• Convection currents result from uneven heating of Earth's surface.• Compressed air exerts pressure equally in all directions.• Earth's atmospheric pressure decreases with distance above Earth's surface.	<ul style="list-style-type: none">• Design and conduct an investigation to study the effect of solar energy on different kinds of earth materials.• Use appropriate tools to measure mass and volume in an experiment.• Use mathematics to analyze investigation results.• Organize and communicate findings using charts, graphs, and diagrams.
4. WEATHER Students inventory Earth's water and learn that the water cycle redistributes water worldwide. They investigate weather, learning the causes and effects of severe weather, and learn how to make weather maps and use them to forecast weather.	<ul style="list-style-type: none">• Most of Earth's water (97%) is salt water.• Weather is the condition of the atmosphere at a given place and time: the amount of heat, moisture, pressure, and movement.• Solar energy drives weather.• Severe weather occurs when one or more variables is extreme, resulting in conditions that are dangerous or destructive.• Weather maps display weather conditions and can be used to forecast weather.	<ul style="list-style-type: none">• Interpret information from a weather map.• Consider the strengths and limitations of models and simulations.

READING AND WRITING

- *A Tour of the Solar System*
- *Ramon E. Lopez*
- *Why Doesn't Earth Fly Off into Space?*
- *Mae Jemison: Astronaut*
- *Summary: Solar System*
- Science Notebook: Students record and organize information about the solar system.

- *Drying Up*
- *Evaporation*
- *Surface-Area Experiment*
- *Condensation*
- *Summary: Water Vapor*
- Science Notebook: Students record and analyze evaporation and condensation data.

- *Uneven Heating*
- *Wind!*
- *The Pressure Is On!*
- *Summary: Heating Earth*
- Science Notebook: Students write an experimental plan, record data, and analyze and display those data. They make labeled diagrams of convection currents and write explanations of the observable effects of atmospheric pressure.

- *Where Is Earth's Water?*
- *Earth's Water*
- *The Water Cycle*
- *Severe Weather*
- *Weather Maps*
- *Summary: Weather*
- Science Notebook: Students write causes and effects of severe weather.

EXTENSIONS

Math Extension

- Problem of the week.

Science Extension

- Visit a planetarium.

Language Extension

- Create a travel brochure.
- Study planet myths and legends.

Social Studies Extension

- Create a space-exploration timeline.
- Find out about the International Space Station.
- Plan a space journey.

Math Extensions

- Problem of the week.

Science Extension

- Find the condensation temperature.

Language Extension

- Research recycling water.

Social Studies Extension

- Research water storage and delivery systems.

Math Extensions

- Problem of the week.

Science Extension

- Investigate other earth materials that have other properties.

Language Extension

- List the effects of heat.

Social Studies Extension

- Find out about Eratosthenes.

Science Extension

- Look for severe weather now.

Language Extension

- Write to a TV meteorologist.

Social Studies Extension

- Research temperatures around the world.

ASSESSMENT

Survey

Embedded Assessment

- Science Notebook

Benchmark Assessment

- I-Check 1

Embedded Assessment

- Response Sheet
- Science Notebook

Benchmark Assessment

- I-Check 2

Embedded Assessment

- Science Notebook
- Response Sheet

Benchmark Assessment

- I-Check 3

Embedded Assessment

- Quick Write
- Science Notebook

Benchmark Assessment

- I-Check 4

Posttest