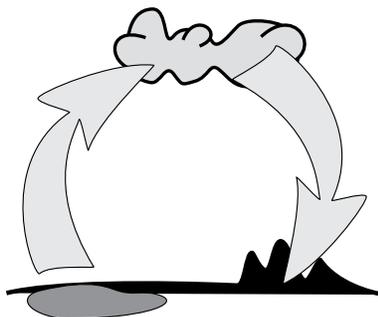


OVERVIEW

WATER PLANET



CONTENT AND GOALS

The **Water Planet Module** consists of five 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 how to read weather maps to make forecasts.

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FOSS AND CALIFORNIA STANDARDS

The **Water Planet Module** supports the following Earth Sciences Content Standards for grade 5.*

EARTH SCIENCES

ES3 *Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept:*

- ES3a Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface.
- ES3b Students know when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.
- ES3c Students know water vapor in the air moves from one place to another and can form fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, sleet, or snow.
- ES3d Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.
- ES3e Students know the origin of the water used by their local communities.

ES4 *Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. As a basis for understanding this concept:*

- ES4a Students know uneven heating of Earth causes air movements (convection currents).
- ES4b Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.
- ES4c Students know the causes and effects of different types of severe weather.
- ES4d Students know how to use weather maps and data to predict local weather and know that weather forecasts depend on many variables.
- ES4e Students know that the Earth's atmosphere exerts a pressure that decreases with distance above Earth's surface and that at any point it exerts this pressure equally in all directions.

**Science Content Standards for California Public Schools: Kindergarten through Grade Twelve (Sacramento: California Department of Education, 2000).*

ES5 *The solar system consists of planets and other bodies that orbit the Sun in predictable paths. As a basis for understanding this concept:*

- ES5a Students know the Sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.
- ES5b Students know the solar system includes the planet Earth, the Moon, the Sun, eight other planets and their satellites, and smaller objects, such as asteroids and comets.
- ES5c Students know the path of a planet around the Sun is due to the gravitational attraction between the Sun and the planet.

The **Water Planet Module** supports the following Investigation and Experimentation Content Standards for grade 5.*

INVESTIGATION AND EXPERIMENTATION

I&E6 *Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:*

- I&E6a Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.
- I&E6b Develop a testable question.
- I&E6c Plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.
- I&E6d Identify the dependent and controlled variables in an investigation.
- I&E6e Identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.
- I&E6f Select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
- I&E6g Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.
- I&E6h Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.
- I&E6i Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions.

**Science Content Standards for California Public Schools: Kindergarten through Grade Twelve (Sacramento: California Department of Education, 2000).*

WATER PLANET MODULE MATRIX

SYNOPSIS

CA SCIENCE CONTENT STANDARDS

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.

- ES5a Students know the Sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.
- ES5b Students know the solar system includes the planet Earth, the Moon, the Sun, eight other planets and their satellites, and smaller objects, such as asteroids and comets.
- ES5c Students know the path of a planet around the Sun is due to the gravitational attraction between the Sun and the planet.
- I&E6a Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.
- I&E6g Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.

2. SWINGERS

Students experiment with pendulums to learn the basics of controlled experimentation, and learn to identify independent, dependent, and controlled variables. They represent data with a two-coordinate graph.

- I&E6d Identify the dependent and controlled variables in an investigation.
- I&E6e Identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.
- I&E6g Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.

3. 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.

- ES3b Students know when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.
- I&E6d Identify the dependent and controlled variables in an investigation.
- I&E6e Identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.
- I&E6f Select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
- I&E6g Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.

4. 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.

- ES4a Students know uneven heating of Earth causes air movements (convection currents).
- ES4e Students know that the Earth's atmosphere exerts a pressure that decreases with distance above Earth's surface and that at any point it exerts this pressure equally in all directions.
- I&E6c Plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.
- I&E6d Identify the dependent and controlled variables in an investigation.
- I&E6f Select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
- I&E6g Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.
- I&E6h Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.

5. 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.

- ES3a Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface.
- ES3c Students know water vapor in the air moves from one place to another and can form fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, sleet, or snow.
- ES3d Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.
- ES3e Students know the origin of the water used by their local communities.
- ES4b Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.
- ES4c Students know the causes and effects of different types of severe weather.
- ES4d Students know how to use weather maps and data to predict local weather and know that weather forecasts depend on many variables.

- 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.

- *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.

Pretest

Embedded Assessment

- Science notebook

Benchmark Assessment

- I-Check 1

- A pendulum is a mass that is free to swing around a point.
- A variable is anything that you can change in an experiment that might affect the outcome.
- In a controlled experiment the independent variable is changed in order to determine how that variable affects the outcome of the experiment. All other variables are controlled.

- *Galileo*
- *Graphing Data*
- *Summary: Swingers*
- Science Notebook: Students record, organize, and display pendulum data using conventional graphing language and methods.

Embedded Assessment

- Teacher observation
- Response sheet

Benchmark Assessment

- I-Check 2

- 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.

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

Embedded Assessment

- Response sheet
- Science notebook

Benchmark Assessment

- I-Check 3

- 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.

- *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.

Embedded Assessment

- Science notebook
- Response sheet

Benchmark Assessment

- I-Check 4

- 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.

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

Embedded Assessment

- Quick write
- Science notebook

Benchmark Assessment

- I-Check 5

Posttest

SAFETY IN THE CLASSROOM

Following the procedures described in each investigation will make for a very safe experience with earth science in the classroom. You should also review your district safety guidelines and make sure that everything that you do is consistent with those guidelines.



Look for the safety-note icon in the Getting Ready section, which will alert you to safety concerns throughout the module.

Materials Safety Data Sheets (MSDS) for materials used in the FOSS program can be found on the Delta Education website (<http://www.delta-education.com/msds.shtml>). If you have questions regarding any MSDS, call Delta Education toll free at 800-258-1302 (Monday–Friday 8 a.m. to 6 p.m. EST).

General classroom safety rules to share with students include

1. Listen carefully to all instructions. Follow all directions. Ask questions if you don't know what to do.
2. Tell your teacher if you have any allergies.
3. Never put any materials in your mouth. Do not taste anything unless your teacher tells you to do so.
4. Never smell any unknown material. If your teacher asks you to smell a material, wave your hand over the material to draw the smell toward your nose.
5. Do not touch your face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.

6. Always protect your eyes. Wear safety goggles when necessary. Tell your teacher if you wear contact lenses.
7. Always wash your hands with soap and warm water after working with chemicals, plants, or animals.
8. Never mix any chemicals unless your teacher tells you to do so.
9. Report all spills, accidents, and injuries to your teacher.
10. Treat animals with respect, caution, and consideration.
11. Clean up your work space after each investigation.
12. Act responsibly during science investigations.

These rules are provided for your class on the FOSS safety poster and are in the *Science Resources* book for each student.



SCHEDULING THE MODULE

For comprehensive teaching of the science standards at grade 5, with multiple exposures, science should be taught every day. Active-investigation sessions (including wrap-up) and reading sessions might be 40–45 minutes, I-Check and assessment-review sessions 20–25 minutes.

Active-investigation (A) sessions include hands-on work with materials, active thinking about the concrete experiences, small-group discussion, writing in science notebooks, learning new vocabulary in context, and completing written embedded assessments to inform instruction.

Wrap-up (W) sessions are teacher-directed vocabulary reinforcement and science content review.

Reading (R) sessions (*Science Resources* book) include individual and interactive reading, answering review questions, and discussing the reading to ensure that students integrate the information.

I-Checks are short summative assessments. Students respond to written prompts. The next day, after you have scored the assessments, students review their written responses to reflect on and improve their understanding.

Week	Day 1	Day 2	Day 3	Day 4	Day 5
	Pretest				
1	START Inv. 1 Part 1 A	A/W	R	START Inv. 1 Part 2 A	A
2	A/W	R	R	I-Check 1	Review
3	START Inv. 2 Part 1 A/W	START Inv. 2 Part 2 A	A/W	R	START Inv. 2 Part 3 A
4	A/W	R	R	I-Check 2	Review
5	START Inv. 3 Part 1 A	A/W/R		START Inv. 3 Part 2 A	
6	A/W/R	START Inv. 3 Part 3 A	2–4 days A/W	R	START Inv. 3 Part 4 A
7	A/W	R	R	I-Check 3	Review
8	START Inv. 4 Part 1 A	A	A/W/R	START Inv. 4 Part 2 A/W	R
9	START Inv. 4 Part 3 A	A/W	R	R/I-Check 4	Review
10	START Inv. 5 Part 1 A	A/W	R	R	START Inv. 5 Part 2 R
11	R	START Inv. 5 Part 3 A/W	R/I-Check 5	Review	START Inv. 5 Part 4 A
12	R			Posttest	



SCOPE AND SEQUENCE FOR FOSS CALIFORNIA 2007 EDITION

GRADE	PHYSICAL SCIENCES	LIFE SCIENCES	EARTH SCIENCES
5	Mixtures and Solutions	Living Systems	Water Planet
4	Magnetism and Electricity	Environments	Solid Earth
3	Matter and Energy	Structures of Life	Sun, Moon, and Stars
2	Balance and Motion	Insects and Plants	Pebbles, Sand, and Silt
1	Solids and Liquids	Plants and Animals	Air and Weather
K	Wood and Paper	Animals Two by Two Trees	Wood and Paper Trees

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**Full Option
Science System** 

Lawrence Hall of Science
University of California
Berkeley, CA 94720
510-642-8941