

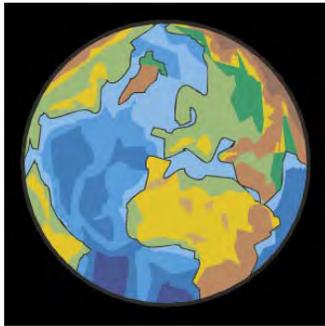


Discovery Lesson

TEACHER ENRICHMENT RESOURCE PACKET

Wild Planet

March 6 - May 23, 2010



From the ocean depths to the highest peak, Earth is a dynamic planet. Discover how earthquakes and volcanoes shape the landscape and explore how strange creatures have adapted to survive in the harshest environments. You're in for a "wild" ride!

Learning Objectives:

Learning objectives provide a broad overall guide to what students will begin to experience and understand through this TERP and through participation in Explorit's "Wild Planet" *Discovery Lesson*.

- Different plants and animals inhabit different kinds of environments and have adaptations that help them survive in different kinds of places
- Organisms reproduce offspring of their own kind and go through predictable life cycles
- Fossils provide evidence about plants and animals that lived long ago
- Changes in weather occur from day to day and across seasons, affecting Earth and its inhabitants
- Some changes on Earth are due to slow processes, such as erosion, and some changes are due to rapid processes such as landslides, volcanic eruptions, and earthquakes
- Most of Earth's water is present as salt water in the oceans, which covers most of Earth's surface

Think it.
Try it.
Explorit.

This resource packet is made possible
by Davis Waste Removal:



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Background Information "Wild Planet"

Thank you for choosing Explorit Science Center's *Discovery Lesson* program to supplement your ongoing science curriculum. Whether you use the program to kick off a new unit, wrap up a nearly completed unit, or purely to excite and interest your students in the wonderful world of science, advance preparation and follow up with your students are critical to achieving the greatest educational benefit from this unique science experience.

Explorit provides two resources to help prepare you and your students for the *Discovery Lesson*. First, simple logistics of the program are detailed in the confirmation letter. Second, this Teacher Enrichment Resource Packet outlines appropriate science content and processes to help you:

- successfully prepare your students prior to visiting Explorit;
- participate fully in the *Discovery Lesson* yourself; and
- follow-up with your students back in the classroom.

We live on the most perfect planet which has the perfect climate, perfect weather, perfect temperature, perfect land and water ratio, perfect seasons, perfect resources to provide for the human race. Surprisingly, amidst the perfection of our planet there are exciting extremes that boggle the mind. Crashing thunder and startling lightning storms brighten the darkened night, monstrous volcanoes and threatening earthquakes terrorize the land, blustering tsunamis and intimidating hurricanes sweep away communities. On the other hand, glorious rainbows color the stormy sky, majestic sequoia redwood trees tower above carpets of wild flowers, and luminous lightening bugs quietly hover in the shadows of the dimming brilliant sunset.

From the tallest mountain to the deepest ocean, there is no end to the amazing discoveries you can find. Plants and animals have found creative strategies to survive in extreme environments and to protect themselves from predation. Scientists have found that by researching these strategies they are able to reproduce strategies into technological solutions to problems that humans face. Biomimetics is technology that mimics nature.





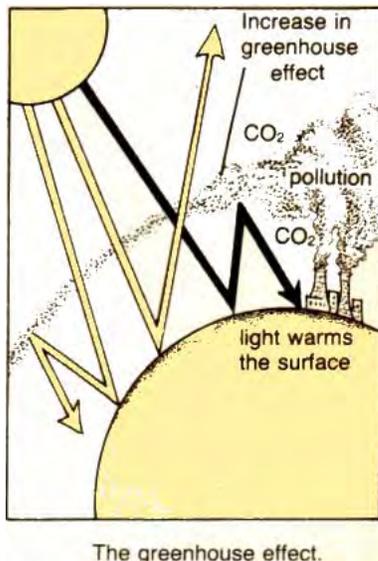
Here are just a few ways that scientists are exploring nature to find technological solutions:

- Scientists are investigating the brains of mice in hopes of developing artificial intelligence.
- Scientists are exploring a colony of ants in the Sahara to try and develop autonomous robot navigation.
- Scientists have found that the bumps on the back of whale fins actually increase efficiency of movement in the water. Scientists are researching ways to put this into effect on airplanes.
- By researching viruses that are able to pinpoint specific cells in a body, scientists hope to develop a strategy for zero-ing in on cancer cells to obliterate them without disturbing the body's natural defenses.
- A Swiss Engineer, Georges des Mestral, observed how a burr stuck to his clothes. By looking at the burr through a microscope he noticed the curved barbs of the sticker and was able to develop the technological miracle of Velcro.
- Scientists are now investigating the feet of geckos to try and develop a material that would clothe a human to allow them the ability to crawl up walls, similar to Spiderman.

Whether you are a medical engineer developing the developing the cure for cancer, or a marine biologist studying deepest cracks in the sea, or a second grader observing a pill bug in his or her backyard, you are open to amazing discoveries. This TERP is designed to provide information and fun experiments that teach known concepts about our Wild Planet.

For additional information on our Wild Planet go to:
National Geographic - www.nationalgeographic.com

Classroom Activity #1



ACTIVITY #1 The Greenhouse Effect In A Jar

This simple experiment serves as an introduction to the greenhouse effect. Students can see for themselves the effects of a greenhouse, and relate this understanding to what occurs in our atmosphere.

The Earth's greenhouse effect is a physical phenomenon. In this activity we will use simple experimentation techniques including: observing and recording data, use of a control, drawing conclusions from results, and use of a model.

Materials: For every group of (about) four students

- 2 Small thermometers
- 1 Jar or other see-through container
- 1 Clock or watch
- 1 Copy of the worksheet
- Sunlamp or access to a sunny area to perform the experiment

Detailed Procedures:

Group the students and distribute the materials. Each group should place their thermometers a few inches apart under the sunlamp or in direct sunlight.

Wait about three minutes so the thermometers will be giving accurate readings, and then have the students record the temperature readings on both thermometers as well as the time. Use the attached worksheet to record their temperatures.

Each group should now place their jar over one of their thermometers, taking care that the jar does not cast a shadow over the uncovered one. If the thermometers are too large to remain horizontal inside the jars, it is fine to stand them against an inner side. Every minute, for ten minutes, the students should record the readings of both thermometers.

Explanation:

The thermometer that is exposed to fresh air will have a circulation of cooler air even if the sun is shining on it. The thermometer in the glass jar does not have access to fresh air, so the air in the jar will continue to increase as long as the sun is shining on it.

A similar process occurs in the Earth's atmosphere called the Greenhouse Effect. Sunlight passes into our earth's atmosphere and warms the surface of our planet. This heat is trapped by the greenhouse gasses that surround our planet, similar to a blanket.

Without this special atmosphere surrounding our planet, it would end up being 0 degrees Fahrenheit. Greenhouse Effect is the warming due to heat-trapping gasses.

* See page 5 for experiment.



The Greenhouse Effect Worksheet

Instructions

- 1) Place the two thermometers in the sunlight for a few minutes to let them get warm.
- 2) Record the readings of both thermometers at the top of the columns.
- 3) Record the time next to the starting temperatures and place the jar over thermometer #1.
- 4) Every minute, record the readings of both thermometers without disturbing them.

Data

Observation Number	Thermometer #1	Thermometer #2
START TIME		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Classroom Activity #2



ACTIVITY #2 The Water Cycle

Run and get a glass of water and put it on the table next to you. Take a good long look at the water. Now -- can you guess how old it is? Can you imagine that the water in your glasses is just as old as our planet is? That water was part of the lakes that Brontosaurus walked through thousands of years ago. Kings and queens, knights and squires drank from wells that your water was a part of. Your glass of water may have come out of the sky a week ago, but before that it was a part of the water that covers the earth.

The Earth has a limited amount of water. From the polar ice caps to the Nimbus clouds to the Coke in your fridge, the amount of water on earth stays constant. Roughly about 326 million trillion gallons of water is found on our planet and in our atmosphere. That water keeps getting recycled in what we call the "Water Cycle."

This cycle is made up of a few main parts:

- evaporation (and transpiration)
- condensation
- precipitation
- collection

Evaporation:

Evaporation is when the sun heats up water in rivers or lakes or the ocean and turns it into vapor or steam. The water vapor or steam leaves the river, lake or ocean and goes into the air.

Experiment: Boil a pot of water and set it in front of a dark background so that the students can see the water vapor (steam) rising from the water.

Condensation:

Water vapor in the air gets cold and changes back into liquid, forming clouds. This is called condensation.

Experiment #1: Pour a glass of ice water into a glass. Water will condense on the outside of the glass. Explain to the students that the water didn't somehow leak through the glass. It actually came from the air. Water vapor in the warm air, turns back into liquid when it touches the cold glass.

Experiment #2: Freeze a text book and hold the cold book over the pot of boiling water. The steam will condense on the surface of the cold book. This explains how evaporated water condenses into cloud formations as it reaches the cooler atmosphere.

Precipitation:

Precipitation occurs when so much water has condensed that the air cannot hold it anymore. The clouds get heavy and water falls back to the earth in the form of rain, hail, sleet or snow.

Experiment: Continue to hold the frozen book above the steam rising from the pot of boiled water. The longer you hold it there the more vapor will condense onto the book. Eventually precipitation will occur where the beads of water forming on the surface of the book will be too large to hold onto it and will fall in droplets, just like rain.

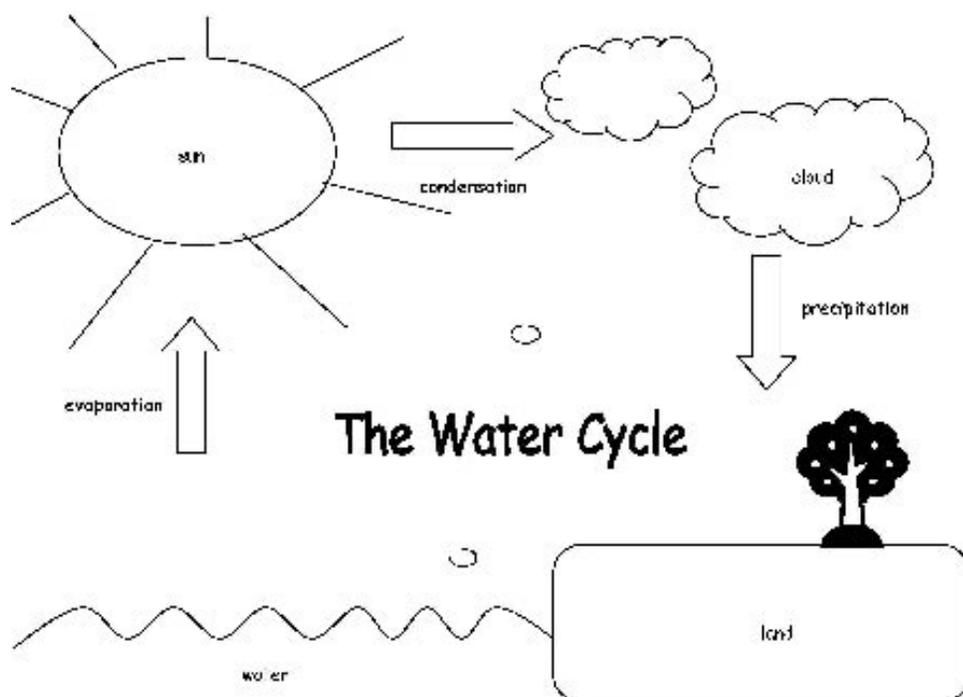
Collection:

When water falls back to Earth as precipitation, it may fall back in the oceans, lakes or rivers or it may end up on land. When it ends up on land, it will either soak into the earth and become part of the “ground water” that plants and animals use to drink or it may run over the soil and collect in the oceans, lakes or rivers where the cycle starts all over again.

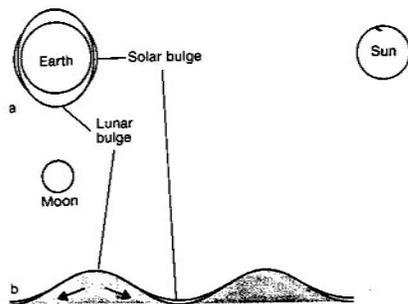
Experiment: Point out to the students that the water that is precipitating back into the pot will begin the cycle all over again. If you could label a molecule of water you would be able to see the circular course it takes from the pot, into the air, onto the book, then back into the pot.

Conclusion

Our planet's water is a precious commodity. Some countries have more of it and some have less of it. Even though the Earth has its own water recycling process in place, let's work together to keep it as clean as possible. What we have currently is all the water we've got and it will most likely be here longer than us.



Classroom Activity #3



Activity #3 Ocean Tides

Since we're on the topic of our planet's special resource of water, it only seems fitting that we discuss the ocean and its mysterious tides. Our planet has only one moon and one sun and the combination of these two external gravitational pulls effect our ocean's tides. If we did not have a sun or moon pulling on our planet, our ocean would be at a constant level. However, since there are two celestial beings pulling on our planet, we have high tide and low tide.

As you can see in this diagram the moon alone provides a strong enough force that causes the earth's oceans to bulge on the side closer and farthest from the moon. The reason it bulges on the opposite side is because earth's gravity is distorted by the moon counter acting force on that side and thus the ocean has less gravity pulling on it.

Within the oblong shape of the oceans, the Earth rotates. The high tides will stay focused on the moon and the earth spins within that shape. Adding in the sun's gravitational pull creates higher and lower tides during certain seasons of the year.

Materials: 6 students and one long rope

Simplified Demonstration: Have six students volunteer for this demonstration. Have one student representing the earth stand in front of the class. Have four students stand in a circle surrounding and facing the earth. Have the 6th student representing the moon stand at a distance from this group of five students.

Wrap a rope around the circle of four students. Have the two students closest and farthest from the moon take four steps away from the earth allowing the rope to lengthen as they move out. Have the other two students take two steps back allowing the rope to lengthen. The rope should take on a shape similar to an oval.

Now have the moon slowly orbit around the earth as the high tides follow the moon. The earth in the middle should rotate quickly in the same direction but at faster rate. The earth spins 29.5 times within one of the moons orbits around the Earth. So by the time the moon gets back to it's original position, the Earth should have spun about 30 times.

Occasionally call out for this process to stop and ask the class at random intervals what tide it would be if they were standing on the nose of the person representing the Earth.

Science Standards

CA STANDARDS

Grade K: 1a 2a,c 3a-c 4a-e

Grade 1: 2a-e 3a-c 4a,b,d,e

Grade 2: 1e 2a-e 3b-e 4a,c,d,f

Grade 3: 1a,b,d,f 3a-e 5a-e

Grade 4: 1b,f 2a-c 3a-d 4a 5a-c 6a,c,d,f

Grade 5: 2e,f,g 3a-d 4a-e 6a,b,c,f,h

Grade 6: 1a-g 2a-d 3a,c 4a-e 5a-e 6a,b 7a,b,c,e,f,g,h

NATIONAL STANDARDS

K-4: A, B, C, D, E, F, G

Explorit Programs for Schools and Groups

At Explorit's Sites

Discovery Lessons & Inquiry Labs
Nature Safaris & Labs

Visit one or more of the Changing Exhibitions throughout the year
Fall and Spring visits to Explorit's outdoor spaces at Mace Ranch Park

Explorit in Your Classroom

Classroom Adventures Science Investigations for Grades K-6
Young Scientist Series Science investigations through multiple visits

For the Whole School

Health in Your World Learn about keeping your body and the world healthy and safe
Science in Your World The ultimate family science night
Science Assembly A multi-media presentation for the whole school

Reservations required.
For information please call
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