The Water Cycle
Here Today, Here Tomorrow

Grade Level: Middle & High School

Time: 2 hours

Generalization: The Hydrologic Cycle is a closed system powered by the sun. The water we use now has been around for millions of years. Since “what goes up, must come down” it is important not to pollute the water we may end up drinking someday.

Objectives: Students will:
1) describe the hydrologic cycle.
2) compare and contrast evaporation and transpiration.
3) describe the different types of precipitation.
4) observe and identify the different parts of the hydrologic cycle.
5) evaluate the consequences of hazardous waste on our water supply.

Materials:
- Two clear bottles or glasses of water; one clean, one dirty
- Transparencies of clean and contaminated hydrologic cycles (transparency masters included at end of lesson plans)
- TV/VCR
- Hydrologic Cycle Crossword Puzzle
- Non-lined 8 1/2 x 11 paper for each student
- Color pencils, markers or crayons

Procedures:
Initiating Activity:
Do: Have a bottle of clean water in your hand and drink from it.

Say: What do we have in common with Socrates, Caesar, Joan of Arc, Abraham Lincoln and Martin Luther King? Believe it or not, it is possible that we are drinking the same water they drank! How can this be true?

Strategies
Show: Visual of hydrologic cycle.

Explain: Water is always on the move. This process is called the hydrologic cycle. How does the cycle work? Water is transported into the air from the ground, trees, lakes and the ocean. To complete the cycle, it finds its way back down to earth in the form of rain, sleet, and snow. This is a continuous cycle that has been going since the formation of our earth. Let’s look more closely at this process.
**Song & Hand Movements:** Now in order to get you used to the terminology you will be using, we are going to do the.....“The Water Cycle Boogie”. Have class stand. (Yes this works with freshman!) For the younger students, you can use the melody of “Wheels on The Bus”. For the older students, you can use a rap or chant. Another option would be to give the terms to the students and let them create their own rap. You could also use this as an evaluation.

**Teach the Song:**

“The Water Cycle Boogie”

Evaporation,
Transpiration,
Condensation,
Precipitation,
Infiltration,

And the water cycle boogie goes ‘round and ‘round,
And the water cycle boogie goes up and down.

(Water Cycle Boogie taken from Water: A Never-Ending Story)

Repeat a couple of times, have a little competition, i.e. odds and evens, left side of room vs. right side. Have fun with it! (You could drop the last two lines with the older students in order to get a faster groove going)

**Activity:** Now, what do these terms all mean? Tell them that activity they are about to begin will help them to make sense of the hydrologic cycle. (This can be an individual or paired activity. Make sure everyone has a textbook or dictionary before you begin. Pass out the crossword puzzles but make sure they are all face down.) Tell them that the first three individuals/pairs to complete the crossword will win a prize, i.e. candy, bookmarks, stickers, homework pass, etc... (May use as homework)

**Discussion:** The terms you have been working with are all significant parts of the hydrologic cycle. Show the Hydrologic Cycle visual. Use the crossword puzzle you have just completed to help you to follow our discussion on the Hydrologic Cycle. You can also use the puzzle to help you answer questions.

Evaporation: The sun’s energy powers the hydrologic cycle. Invisible light rays are absorbed by the earth’s atmosphere and surface and converted into heat. As water heats, it begins to evaporate. What is evaporation? A process in which water goes from a liquid form to a vapor form and lifts into the atmosphere. Where could you find evaporation? Water evaporates from rivers streams, lakes and oceans. Which would evaporate first, the water in a small pool under the shade of a large tree or the water in a small pool out in the open? Explain your answer. Students should respond that the water from the pool out in the open would evaporate first given the fact that it would heat faster than the pool in the shade.

Transpiration: How is transpiration different from evaporation? It is a process by which water is released from plants and animals. That means water that evaporates from our own bodies is part of the Hydrologic Cycle! Can you think of examples?
Evapotranspiration: What does this word mean? The process by which water is evaporating from the ground and transpiring from plants and animals....Evapotranspiration.

Condensation: We said before that the hydrologic cycle is a closed system. What do we mean by this? A process contained entirely within itself. Where does all that water vapor go? It doesn’t go into outer space. The vapor reaches cooler layers of our atmosphere. Then it clings to particles in the air and begins to change. What is condensation? The process of changing vapor into liquid. Think of clouds or fog. Have you ever observed a nice cold bottle of soda? What happens to the outside of your soda bottle? Why?

Precipitation: How does this liquid form of water get back down to us? What is precipitation? The process in which water falls to the Earth. What types of precipitation are there? Precipitation can fall in forms of rain, snow, sleet or hail. What determines what form it will take? The form it will take is based on temperature. Where does the water go once it comes down?

Infiltration: What is infiltration? The process by which water is absorbed into the ground. This water becomes part of our ground water supply. What is it called if the water is not absorbed into the ground? This is called runoff. Can you think of where the water could go from here? Water could go into roots of trees and plants, rivers, streams, oceans, our drinking water. (Bring home the point by drinking from a bottle of clean water.)

Culminating Activity:

Show: Video that demonstrates the Hydrologic Cycle or NASA’s Observatorium Hydrologic Cycle website, observe.ivv.nasa.gov/nasa/earth/hydrocycle/hydro1.htm

Sing/Chant: “The Water Cycle Boogie”

Activity: Have students draw a diagram of the Hydrologic Cycle labeling each step with arrows. Instruct them to make it as detailed as possible. Display their work on the walls.

Concluding Activity:

Do: Have a bottle of dirty water in your hand and start to drink it. Very dramatically, notice that the water is dirty. Ask the students how this could have happened?

Show: Visual of contaminated hydrologic cycle.

Discuss: Discuss all the things that could contaminate the water during the hydrologic process. Since this process is a closed system, where do all the chemicals and waste go that is deposited into our water system? Discuss the impact of mining, farming, sewage, and underground oil drums on our environment. Ask: Did you know that 2/3 of our planet is made of water? But only 1% is drinkable. How can we protect and conserve this most valuable resource?

Evaluation: Have students write a press release or news article using the facts generated in this lesson that highlight the importance of protecting and conserving our water resource. After the students have completed this assignment, have a few students share their papers with the class or have them share their papers in small teams and discuss.
National Geography Standards:
Standard 7: Students know and understand the physical processes that shape the patterns of the Earth’s surface.
Standard 8: Students know and understand the characteristics and spatial distribution of ecosystems on the Earth’s surface.

Sunshine State Standards:
SS.B.2.3.9: Understand how the interaction between physical and human systems affects current conditions on Earth.
SS.B.2.4.4: Understand the global impact of human changes in the physical environment.
SC.D.2.3.2: Knows the positive and negative consequences of human action on the Earth’s systems.
SC.G.2.4.6: Knows the ways in which humans today are placing their environmental support systems at risk.

FCAT: Lesson provides practice in using graphics and in identifying patterns and making predictions, inferences, and valid conclusions.

Resources:
Water Resources Atlas of Florida, Edward A. Fernald & Elizabeth D. Purdum, Chapter 1
Splash, Water Resource Education: Hydro-Cycle Works, Southwest Florida Water Management District
Florida Geology Unearthed Video, Dr. Jonathan D. Arthur, Part 4
(ordering information: Florida Geological Survey, Librarian -Phone: 850-488-9380)

Web Sites:
NASA’s Observatorium Hydrologic Cycle (Fantastic graphics!)
observe.ivv.nasa.gov/nasa/earth/hydrocycle/hydro1.html (Need Flash, download from: www.macromedia.com/shockwave/download)

Water: A Never-Ending Story (grades 4-5)
www-k12.atmos.washington.edu/k12/pilot/water_cycle/teacherpage.html (lots of hands on activities!)

Orcas Watershed Education Alliance (Middle & High School)
www.pacificrim.net/~stop/know.html

Environment Canada: Water - Forever on the Move (Middle & High School)

Southwest Florida Water Management District
www.swfwmd.state.fl.us

Solar Energy, An Encarta Encyclopedia Article
Encarta.msn.com/find/concise.asp?ti=00D1A000
1. A process contained entirely with itself is called a _____ system.
3. Evaporation occurs when the sun's energy _____ the water.
7. A process by which water is absorbed into the ground.
8. The water we drink today has been around for _____ of years.
9. A process by which water is released from plants and animals.
10. Continuous cycle in which water travels is called the _____ cycle.
11. Water that reaches the surface but does not infiltrate the soil is called _____

Across:
2. A process by which water goes from liquid to vapor.
4. Rain is a type of _____
5. Condensation is the process by which water goes from _____ to liquid.
6. Evapotranspiration is the process in which water is evaporating from the ground and transpiring from the _____.
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The Hydrologic Cycle

Down:
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