The Water Cycle

Lesson Plans and Activities

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WATER QUALITY EXTENSION

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Introduction

This manual includes experiential lesson plans and activities about water and the water cycle for students in grades K-6. Lessons and activities cover the relative distribution of water on earth, how that water cycles around the earth, and water conservation.

These lessons include journaling opportunities as well as STEM discipline activities (calculating percentages, graphing). Each lesson is aligned to the Utah Core Curriculum for grades K-6. The lessons do not require expensive materials and most materials are easily available.

Appendices following the lesson plans include an alignment to Utah's core curriculum, discussion questions, sample handouts and other visual aids, and a glossary.

These lessons were developed as a complete unit on the water cycle, but can be easily used individually to meet the teachers' needs.

The Water Cycle

Water cannot be created or destroyed. The water on the earth today is the same water that existed thousands of years ago and will continue to exist years in the future. Water is constantly being recycled in a process known as the water cycle. The sun's energy powers this cycle. This energy causes water to evaporate and rise in the form of water vapor. Once the vapor begins to cool it condenses into water droplets. Gravity is the driving force that pulls the water back down to earth as precipitation. Water can fall on land or directly into rivers, lakes or the ocean. After water has returned to the earth's surface, energy from the sun causes water to evaporate, thus completing the cycle.

Since the water cycle is ongoing and therefore does not have a beginning or end, there is no correct starting point when teaching the water cycle. Water can take various paths to reach the same point in the water cycle. For example, water can be evaporated from the ocean and then return directly to the ocean as precipitation, or water can evaporate from the ocean and move across the landscape before falling on a mountain top several thousand miles away. This same water could eventually return to the ocean via streams and rivers. However, because oceans cover approximately three-fourths of the earth and contain most of earth's water, it is often easiest to begin with the ocean to illustrate the water cycle.

Water from the surface of the ocean is warmed by energy from the sun and evaporates (turns from a liquid to a gas, often called water vapor) into the atmosphere. This water vapor lifts, cools, and condenses (turns from a gas to a liquid). As the vapor condenses, water droplets are

formed in the atmosphere. Gravity pulls these water droplets back to the ground as precipitation. Precipitation can fall as rain, hail, dew, snow, or sleet. Once on the earth, water can follow various paths. Some water will fall directly into a water body (river, lake, ocean, etc.) Some water will soak into the ground and saturate the soil. Once the soil is saturated water will run over the ground in the form of runoff. Water can also slowly percolate or infiltrate through the ground and be stored in an aquifer. This groundwater can move through spaces and cracks in the soil. Some of this water will resurface at rivers to maintain and replenish them during dry periods. Eventually these rivers wind back to oceans, where the process continues.

Although approximately 75% of the earth is covered in water, only about .00003% of that water is uncontaminated freshwater and can be used by humans. We rely on water for not only drinking, but for industry, recreation, washing, food production and more. Land use can affect the quality of water. Riparian vegetation (plant life along bodies of water) is often taken out for easier access to rivers, construction of housing and commercial developments, and for logging or mining purposes. This excavation can cause unstable banks that are more erosive. Also, the loss of vegetation increases the amount of sun that reaches the water's surface. Many organisms, including coldwater fish, can only survive in cold water. Fertilizer, pesticides, oil, personal care products, and other materials can be washed down storm drains and end up polluting rivers or streams.

Available Resources:

USU Water Quality Extension-extension.usu.edu/waterquality-lesson plans and activities.

Division of Water Resources Water Education-www.watereducation.utah.gov/-teacher resources and games.

Environmental Protection Agency - www.epa.gov/ogwdw/kids/flash/flash_watercycle.html-interactive water cycle.

www.suite101.com/content/what-causes-snow-sleet-and-freezing-rain-a78751-information on what causes different types of precipitation.

www.waterencyclopedia.com/Po-Re/Precipitation-Global-Distribution-of.html-information on precipitation distribution.

A Drop in the Bucket

Grade Level
K-6th Grade

Subject Areas
Science
Math

Duration
15-25 minutes

Setting
Classroom
Outdoors

SUMMARY:
Through a visual presentation, the students will learn the different sources of freshwater, and the relative ratios of these water sources on the earth.

BACKGROUND:
Approximately 75% of the earth is covered with water. Sources of water are oceans, icecaps and glaciers, groundwater, freshwater lakes, inland seas and salt lakes, the atmosphere, and rivers. Although the earth appears to have a plentiful supply of water, it is important to realize that fresh water is a limited resource. See the table below for the percentage of each water source in relation to the total amount, and the appropriate measurement for each source.

Not all of the freshwater is available for humans to use. Water in the atmosphere and in the icecaps and glaciers is not available for humans to use. We also cannot access all the groundwater. Therefore, only the water in rivers, freshwater lakes and a portion of groundwater can be used by humans. The percentage of usable freshwater is reduced by pollution and contamination. Therefore, the actual amount of water that is useable by humans is very small (approximately .00003 %).

Water Source	% of the Total Amount	Measurement
Oceans	97.2%	All water left in bucket
Icecaps/Glaciers	2.0%	1 Cup
Groundwater	0.62%	1/3 Cup
Freshwater Lakes	0.009%	1/8 teaspoon
Inland Seas/Salt Lake	0.008%	1/8 teaspoon
Atmosphere	0.001%	One drop
Rivers	0.0001%	One flick

MATERIALS:

- Map of world or globe
- 5-gallon water container
- Measuring cups
- Eye dropper
- 5 gallons of water
- Small, clear container
- Water distribution worksheet (see appendix page 32)

PROCEDURE:

1. Show students the globe or map of the world and ask them what the blue represents (water). Ask them what percentage is covered by water (75%). Ask the students if all the water is available for humans to use.

2. Show the students the 5 gallons of water in the container. Explain that the 5 gallons represents all the water on the earth.

3. Ask the students to think about the different places we find water. In what area do we find the majority of the water on earth (oceans). Tell them that because the majority of the water is in the ocean, we will leave that water in the bucket. We will be taking out all the water that is from a source other than the ocean.

4. Ask students to name sources of water. As they give you answers, remove the correct amount of water for the area (refer to chart in the background section), and place it into the clear container.

5. After you have removed all the different water sources (other than oceans), ask the students if all the water you have removed is usable by humans.

6. Discuss the sources, and put the water back into the bucket with the ocean water if it is not usable by humans (icecaps/glaciers, some of the groundwater, inland seas/salt lakes and the atmosphere). Show the students the small amount of water that is left for humans to use.

WRAP-UP:
Review the sources of freshwater on the earth, and how little water is available for human use. Discuss ways students can conserve water in their homes, schools, and communities.

- Don't leave the water running while brushing your teeth.
- Limit your showers to 10 minutes or less.
- Look around your house for leaky faucets and ask your parents to fix them.
- Keep a pitcher of water in the refrigerator so you don't have to run the faucet and wait for the water to cool.
- Clean your sidewalks with a broom, not a hose.

- Wash your car or dog on the lawn instead of the driveway, this way your lawn gets watered too.
- Only wash full loads of dishes and laundry.
- Discuss ways students can help reduce pollution to the already small amount of water available to humans.
- Don't use excessive amounts of fertilizers or pesticides around your house. They can wash into the storm drains and end up in a stream.
- Never put something down a storm drain that may hurt a fish.
- Don't be a litterbug. Always dispose of trash in a proper container, not in the water.
- Make sure that your family car doesn't leak oil or antifreeze. This can wash into the water and be dangerous for fish, birds, even cats and dogs.
- Walk only on existing trails when near the water to help reduce erosion.

EXTENSIONS:

- Hand out copies of the worksheet to have students fill in the percentage they think is in each location before going through it as a class. They can work in groups or individually.
- Ask the students if we can make more water. Discuss the water cycle (this can lead into the Incredible Journey lesson).
- Talk about how pollutants or contaminants would affect our water supply (this can lead into the Water Quality and Aquatic Macroinvertebrates lesson found at www.extension.usu.edu/waterqualtiy).

*Adapted from the "Drop in a Bucket" lesson found in Project WET (www.projectwet.org/).

The Incredible Journey

Grade Level
K-6th Grade

Subject Areas
Science
English

Duration
30-45 minutes

Setting
Classroom
Outdoors

SUMMARY:
Students become water molecules as they simulate the movement of water through the water cycle.

BACKGROUND:
While water does circulate from one point or state to another in the water cycle, the paths it can take are variable.

Heat energy directly influences the rate of motion of water molecules. When the motion of the molecule increases because of an increase in heat energy, water will change from solid to liquid to gas. With each change in state, physical movement from one location to another usually follows. Glaciers melt to pools which overflow to streams, where water may evaporate into the atmosphere.

Gravity further influences the ability of water to travel over, under, and above the surface of the earth. Water as a solid, liquid or gas has mass and is subject to gravitational force. Snow on mountaintops melts and descends through watersheds to the oceans of the world.

One of the most visible states in which water moves is the liquid form. Water is seen flowing in streams and rivers and tumbling in ocean waves. Water travels slowly underground, seeping and filtering through particles of soil and pores within rocks.

Although unseen, water's most dramatic movements take place during its gaseous phase. Water is constantly evaporating, changing from a liquid to a gas. Evaporation occurs when water from the ground or bodies of water move into the atmosphere. Plants give off water vapor through transpiration. The combination of evaporation and transpiration is referred to as evapotranspiration. As a vapor, water can travel through the atmosphere over the earth's surface. In fact, water vapor surrounds us all the time. Where it condenses and returns to earth depends upon loss of heat energy, gravity, and the structure of the earth's surface.

Water condensation can be seen as dew on plants or water droplets on the outside of a glass of cold water. In clouds, water molecules collect on tiny dust particles. Eventually, the water droplets become too heavy and gravity pulls the water to the earth.

Living organisms also help move water. Humans and other animals carry water within their bodies, transporting it from one location to another. Water is either directly consumed by animals or is removed from foods during digestion. Water is excreted as a liquid or leaves as a gas, usually through respiration. When water is present on the skin of an animal (for example, as perspiration), evaporation may occur.

MATERIALS:

- 7 large pieces of paper labeled with each station name (see appendix pages 42-48)
- Marking pens
- 7 boxes, about 6 inches on each side (Boxes are used to make dice for the game. Gift boxes used for coffee mugs are a good size or inquire at your local mailing outlet). There will be one die [or box] per station of the water cycle. For labels for the dice see appendix pages 35-41. These labels represent the options for pathways that water can follow.
- Copies of student worksheet (see appendix pages 33 and 34)
- A bell, whistle, buzzer, or some sound maker.

CONNECTIONS TO "DROP IN A BUCKET":

Ask students to recall where water is located on the earth (oceans, rivers, ground, etc.). Ask if they recall where the most water is located (Oceans). Ask students if they know how water moves from one location to the next. Tell them this lesson will discuss how water moves between each location.

PROCEDURE:

1. Place the station labels around the room in different locations.

2. Ask students to identify the different places water can go as it moves through and around the earth. Write their responses on the board.

3. Tell students that they are going to become water molecules moving through the water cycle.

4. Categorize the places water can move through into seven stations: Mountain, Groundwater, Stream, Ocean, Animal, Cloud, and Plant.

5. Assign an even number of students to each station. (The cloud station can have an uneven number.) Have students identify the different places water can go from their station in the water cycle. Discuss the conditions that cause the water to move. Explain that water movement depends on energy from the sun, electromagnetic energy, and gravity. Sometimes water will not go anywhere. After students have come up with lists, have each group share their work. The die for each station can be handed to that group and they can check to see if they covered all the places water can go. The die labels provides an explanation of water movements from each station.

6. Students should discuss the form in which water moves from one location to another. Most of the movement from one station to another will take place when water is in its liquid form. However, any time water moves to the clouds, it is in the form of water vapor, with molecules moving rapidly and apart from each other.

7. Tell the students they will be demonstrating water's movement from one location to another. When they move as liquid water, they will move in pairs, representing many water molecules together in a water drop. When they move to the clouds (evaporate), they will separate from their partners and move alone as individual water molecules. When water rains from the clouds (condenses), the students will grab a partner and move to the next location.

8. In this game, a roll of the die determines where water will go. Students line up behind the die at their station. (At the cloud station they will line up in single file; at the rest of the stations they should line up in pairs.) Students roll the die and go to the location indicated by the label facing up. If they roll stay, they move to the back of the line. When students arrive at the next station, they get in line. When they reach the front of the line, they roll the die and move to the next station (or proceed to the back of the line if they roll stay). In the clouds, students roll the die individually, but if they leave the clouds they grab a partner (the person immediately behind them) and move to the next station; the partner does not roll the die.

9. Students should keep track of their movements. This can be done using the Incredible Journey Worksheet. Having them keep a journal or notepad to record each move they make, including stays, can also do it. (See extensions for other ideas) Another approach is to have half the class play the game while the other half watches. Onlookers can be assigned to track the movements of their classmates. In the next round the onlookers will play the game, and the other half of the class can record their movements).

10. Tell students the game will begin and end with the sound of a bell (or buzzer or whistle). Begin the game! (Approximately 10 minutes for a class of 25 students is sufficient for students to understand the concepts of the water cycle)

WRAP UP:

Ask students about their journey. Did anyone get frustrated because they spent most of their time at one or two stations? Do you think that water molecules often get trapped in one location (oceans or atmosphere)? Discuss the water cycle with students and help them understand that it is not a well defined cycle, but a series of pathways. Water does not always complete the full cycle, but can follow a multitude of pathways.

EXTENSIONS:

- Remind students about how pollutants or contaminants would affect our water supply and ask students how they think pollution affects the water cycle. Does pollution travel through the water cycle? Is there any point where pollution would be deposited or left behind?
- Discuss with students how water becomes polluted and is cleaned as it travels through the water cycle.
- Have the students make bracelets as they travel through the water cycle. Fill seven small containers with beads (one container for each station). Each station should have a specific color of bead. Give the students thread or a cord long enough for a bracelet and have them collect one bead every time the visit a station.
- Have students use their bracelets or travel records to write a story about their journey through the water cycle. If a water molecule could think and talk, how would it tell its story?

*Adapted from the "The Incredible Journey" lesson found in Project WET (www.projectwet.org/).

Water Cycle Relay Race

Grade Level
K-6th Grade

Subject Areas:
Science

Duration
15-20 minutes

Setting
Classroom
Outdoors

SUMMARY:
Students will review the water cycle through a relay race vocabulary game.

BACKGROUND:
Water doesn't disappear with our use of it for irrigation, manufacturing, and other sources of consumption. The water we have today is the same water we had at the beginning of time. Water forms, dissipates, and forms again in a cycle called the hydrologic or water cycle.

The water cycle is a gigantic circulation system operating in the atmosphere and on the earth's lands and oceans. Being a cycle, there is no beginning or ending, but for illustration, let's begin with waters of the oceans which cover about three-fourths of the earth.

Water from the surface of the ocean **EVAPORATES** into the atmosphere. The evaporation from the ground and bodies of water combined with the **TRANSPIRATION** of plants is **EVAPOTRANSPIRATION**. That moisture is lifted, eventually is **CONDENSED**, and falls back to the earth's surface as **PRECIPITATION**.

Precipitation that falls as rain, hail, sleet, or snow is important to people and agriculture. After wetting the plants and the ground, some of the precipitation **RUNS OFF** into **STREAMS** and other waterways. This is the water that often causes erosion and is the main contributor to floods. Not all of the precipitation runs off. Some soaks into the ground and is available for evaporation. Some of it **PERCOLATES** (or **INFILTRATES**) through the ground and resurfaces at **SPRINGS**. Some seeps to maintain and replenish streams during dry periods. The streams eventually lead back to oceans, where the water is again evaporated into the atmosphere.

MATERIALS:
- 1 tray (or more) of cubed ice (or marbles) per team
- 1 set of vocabulary words per team with tape or Velcro on the back (bold words in background section above)
- 1 set of riddle cards (see appendix page 49)
- 1 spoon with tape (or Velcro) on the bottom (per team)
- 1 bucket
- large poster of the water cycle with Velcro on the areas corresponding to the vocabulary words

PROCEDURE:

1. Review the water cycle, paying particular attention to the following vocabulary words: evaporation, transpiration, condensation, precipitation, runoff, percolation (or infiltration), evapotranspiration, springs and streams.

2. Divide the class into teams of about nine students. Show the class a water cycle poster, pointing out that there are areas for a word to tape onto the poster. Explain that they will identify the areas with the missing words in the course of the water cycle relay race.

3. Have each group form a single file line. Pass the spoon and tray of ice cubes (or marbles) to each team and have them place these at the end of the line. As part of the relay, each team will place an ice cube on the spoon and pass both from the back of the line to the front of the line.

4. Give each team a set of the nine vocabulary words written on slips of paper. Have the teams attach a piece of tape to each slip of paper. Ask the teams to discuss the words, review their meanings and decide where they are located on the water cycle poster.

5. Before beginning the race, review the rules for the relay: 1) No one may touch the ice cube after it has been placed on the spoon until it reaches the bucket. 2) If the ice cube falls off the spoon, the back person must put another ice cube on the spoon and the process starts again.

6. Read a water cycle riddle to the class. The students must quietly decide among their team which word best fits the riddle. The last person in line tapes the vocabulary word to the bottom of the spoon and places the ice cube in the spoon. He or she then passes the spoon and ice cube to the person in front of him or her, and so on to the front of the line. The person at the head of the line walks quickly to the poster (at the front of the room) with the spoon and ice cube, places the ice cube in the bucket under the water cycle poster, takes the word from the spoon, tapes it to the poster, and returns to the end of the line. The first group to put its word on the poster receives points. The race continues with another riddle until all the riddles have been read.

7. Invite the students to help decide how points should be awarded and keep track of the scores. Ask them to decide the number of points to be given to the team that finished first, the team(s) that select(s) the correct vocabulary word, and the team(s) the correctly place(s) the word on the poster.

8. The team with the most points wins.

EXTENSIONS:

- Discuss with the students what would happen if pollutants were introduced into the water cycle.

*Adapted from activity I-3 Water Cycle Relay Race in the manual Water Conservation and Non-point Source Pollution by Dr. Kitt Farrell-Poe.

Water Cycle Drama

Grade Level
K-6th Grade

Subject Areas
Science

Duration
15-20 minutes

Setting
Classroom
Outdoors

SUMMARY:
Students will learn the different parts of the water cycle by acting them out. They will play a game similar to charades.

BACKGROUND:
Water does not disappear with our use of it in irrigation, manufacturing, or consumption. The water we have now is the water we had at the beginning of time. Water forms, dissipates, and forms again in a cycle called the hydrologic or water cycle.

The water cycle is a gigantic circulation system operating in the atmosphere and on the earth's lands and oceans. Being a cycle, there is no beginning or ending, but for illustration, let's begin with the waters of the ocean, which cover about three-fourths of the earth.

Water from the surface of the ocean **EVAPORATES**, while water given off by plants **TRANSPIRATES**. This combined water is referred to as **EVAPOTRANSPIRATION**. Here the water enters into the atmosphere and in turn cools and **CONDENSES** into clouds, and falls back to the earth's surface as **PRECIPITATION**.

Precipitation that falls as rain, hail, dew, snow, or sleet is important to all living things. After wetting the foliage and the ground, some of the precipitation **RUNS OFF** into streams and other waterways. This is the water that often causes erosion and is the main contributor to floods. Not all of the precipitation runs off. Some of it pools and becomes available for evaporation. Some of it slowly **PERCOLATES** or **INFILTRATES** (soaks in) through the ground. Some of it resurfaces at **SPRINGS**, while some seeps to maintain and replenish streams during dry periods. Streams eventually lead back to the oceans, where the water is again evaporated into the atmosphere.

MATERIALS:
- "Note cards" (see appendix on pages 50-52). Copy and cut out cards so that there are enough cards for each student in the class to have one.

PROCEDURE:
1. Explain to the students that they are going to "act out" or pantomime the water cycle.

2. Have the students blindly pick a note card.

3. Have the students begin to act out the word on their card. Without talking to anyone, they are to group themselves with students they think have the same card (they will know this by watching the actions of the rest of the group). When everyone has found a group, have the students sit down.

4. One at a time, have the groups stand and show the rest of the class their action. Have the other students guess what their word was.

5. Have the students in each group choose a leader. The leader from each group will then dramatize the entire water cycle. Suggestions: 1) the water cycle is not linear, so the students should not be standing in a line, 2) the water cycle is not two dimensional, encourage up and down variations, and 3) there is no proper beginning or ending – it's a cycle.

EXTENSIONS:

- Have each group draw their water cycle element on a large sheet of butcher paper. Fill in the cycle with homes, schools, mountains, highways, industries, construction sites, etc., and discuss how each area affects the water cycle.

WRAP-UP:
Discuss the water cycle with the students. Ask them how they chose the action for each part of the water cycle. Were some actions easier to figure out than others? Did all the people in the individual groups have the same actions? Remind the students of this activity at a later time. Can they still remember the water cycle?

Activities

These activities can be used to enhance or reinforce concepts and vocabulary words learned in the preceding lessons.

Drip's journey ……..18

Word search ……20

Song ……..21

Cross word……23

Read the following story to your students and then have them use clues from the story to construct a water cycle diagram.

Drip's Journey

One day a water droplet named Drip was swimming lazily in the ocean.

As the sun rose, he began to feel warm and noticed he was floating up toward the sky. His friend Drop looked at him and said, "Yeah! We are evaporating!" They rose high up into the sky. "What a great view," he thought.

Soon, he began to get cold. "Hey Drop," he shouted, "Why is it getting so cold?" "We are condensing," said Drop, "Soon we will form a cloud."

The cloud grew heavy as many drips and drops came together. They began to fall to the earth as precipitation. "Precipitation is water falling to the earth in the form of rain, snow, hail, or sleet," Drop explained.

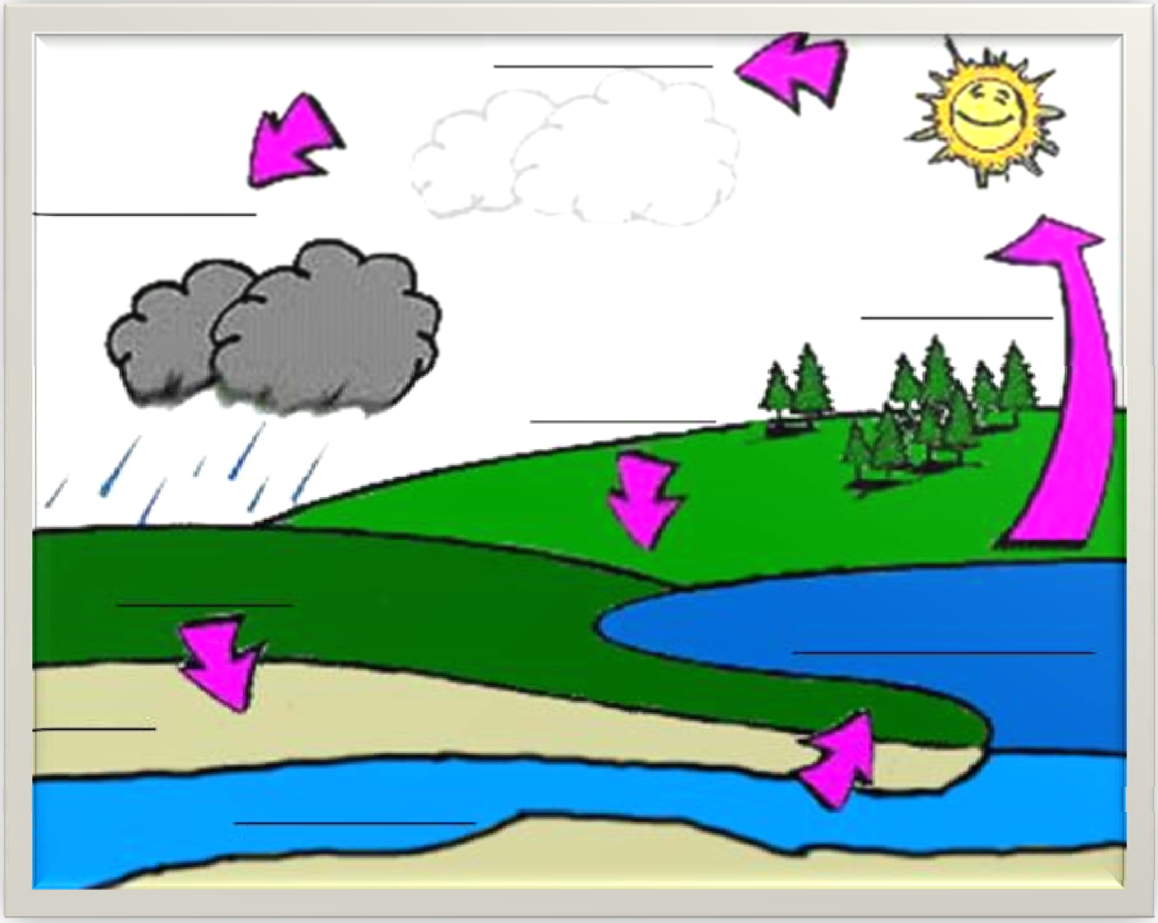
It was Drip's turn to fall. SPLAT! He landed in a stream. Some of his friends infiltrated into the ground and became groundwater. Others fell on concrete and stayed in puddles until the sun came out and evaporated them again. Some even became runoff, flowing downhill over the surface of the earth directly to a stream.

Soon, Drip was moving slower, and everything was salty. "It seems like I have been here before," Drip thought. "Of course you have," said a familiar voice. It was Drop! "We are always traveling through the water cycle, and now we are back in the ocean. It could be a while before we evaporate again, but when we do, it will be a great adventure!"

After reading about Drip's journey through the water cycle, fill out the places he went and the things he did in the picture using the words below.

Precipitation **Condensation** **Evaporation**

Infiltration **Runoff** **Lakes & Streams** **Groundwater**



Water Cycle Word Search

Find and circle all the hidden words in this word search. Words can be diagonal, up, down, and even backwards.

C O R K T G V V I Z Q Y P G N
C O S E L T H L N Z A Z A E O
Z O N T T T R K F I Y U V L I
G J N D B A S B I J D A E U T
J J S C E T W P L N P M M Z U
H E N Z R N Z M T O C B E S L
F G N E A E S T R F P I N U L
D B A E T W T A A O F Q T N O
A M C J F F T E T Y T O X Y P
S O C E E I E V I I W S N T N
N R Q E O V D M O P O Y A U C
I S C N J V E Y N M O N B L R
A T X X R E T A W D N U O R G
R W A T E R S H E D R I V E R
D I V Q C E L D D U P Z U I K

City
Concrete
Condensation
Drain
Evaporation
Groundwater
Infiltration
Ocean
Pavement
Pollution
Puddle
River
Runoff
Stormwater
Streams
Sun
Watershed

Water Cycle Song

[G] My sister had a house with a nice big lawn
She [A] waters her lawn every day at dawn
The [D7] water, it seems to disappear in [G] seconds.
The water soaks in, as it should **(Infiltrate)**
It [A] makes her lawn look nice and good.
[D7] What happened to my sister's [G] water?

(Chorus)
Did it-
[C] Evaporate, infiltrate,
[G] Precipitate, condensate,
[D] Runoff, streams,
What do you know?
[C] Where did my ---------- [G] go?

My daddy had a house up on a hill
He climbed that hill and he lives there still
But he could never get his crops to grow **(Runoff)**
The water you see runs over the ground
The bottom of the hill is where it is found
What happened to my daddy's water?

Chorus

My brother used to dream that he could fly
He would fly so high way up in the sky
He noticed that the clouds were made of water **(Condensate)**
He saw that they soon formed a drop
They go bigger and they wouldn't stop
What happened to my brother's water?

Chorus

My mom used to swim in a lake so blue
It was the biggest lake I ever knew
But over the years the water began to disappear **(Evaporate)**
The sun would shine on the lake each day
Taking that water all away
What happened to my mother's water?
Chorus

Well I had a little doggie and my oh my
One day some water hit him right in the eye

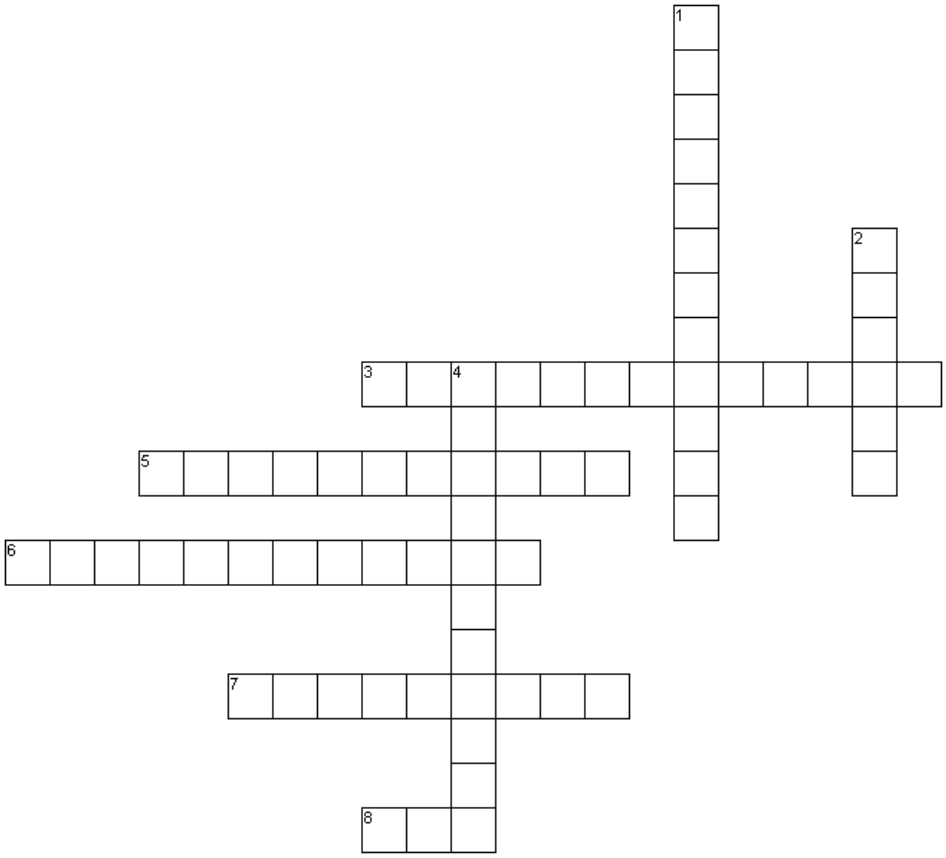
He couldn't understand how the water came from up above **(Precipitate)**
The drops came down and hit the ground
My poor scared doggie ran all around
What happened to my doggie's water?

Chorus

Well, my sister's water, my daddy's water, my doggie's water too
The day they got together it seemed they grew
When they came together they were set in motion **(Stream)**
On their way down to the ocean
What happened to my family's water?

Chorus

Water Cycle Cross Word



Can you fill in the puzzle using the clues below?

Across:
3. Rain, snow, sleet, or hail
5. Water that is found under the ground
6. When water seeps down into the soil
7. Something that gets into the water that isn't supposed to be there
8. This causes the water to heat up and evaporate

Down:
1. When a gas turns to a liquid
2. Water that doesn't soak into the ground
4. When a liquid turns to a gas

Appendix A: Links to the Utah Core Curriculum

State of Utah Core Curriculum Standards for Kindergarten

			A Drop in the Bucket	Incredible Journey	Relay Race	Drama
Science	**Standard 1: ILO**	Objective 1	x			
		Objective 2		x	x	x
		Objective 3				
	Standard 2: Earth and Space	Objective 1				
		Objective 2				
		Objective 3		x		
	Standard 3: Physical Science	No Correlations				
	Standard 4: Life Science	No Correlations				
Language Arts	**Standard 1**	Objective 1	x	x	x	x
		Objective 2		x		
	Standard 2	No Correlations				
	Standard 3	No Correlations				
	Standard 4	No Correlations				
	Standard 5	No Correlations				
	Standard 6	Objective 1	x	x	x	x
		Objective 2				
		Objective 3				
	Standard 7	No Correlations				
	Standard 8	Objective 1				
		Objective 2				
		Objective 3				
		Objective 4				
		Objective 5				
		Objective 6		x		

State of Utah Core Curriculum Standards for 1st Grade

			A Drop in the Bucket	Incredible Journey	Relay Race	Drama
Science	**Standard 1: ILO**	Objective 1	x			
		Objective 2		x	x	x
		Objective 3				
	Standard 2: Earth and Space	Objective 1				
		Objective 2				
		Objective 3		x		
	Standard 3: Physical Science	No Correlations				
	Standard 4: Life Science	No Correlations				
Language Arts	**Standard 1**	Objective 1	x	x	x	x
		Objective 2		x		
	Standard 2	No Correlations				
	Standard 3	No Correlations				
	Standard 4	No Correlations				
	Standard 5	No Correlations				
	Standard 6	Objective 1	x	x	x	x
		Objective 2				
		Objective 3				
	Standard 7	No Correlations				
	Standard 8	Objective 1				
		Objective 2				
		Objective 3				
		Objective 4				
		Objective 5				
		Objective 6		x		

State of Utah Core Curriculum Standards for 2nd Grade

			A Drop in the Bucket	Incredible Journey	Relay Race	Drama
Science	**Standard 1: ILO**	Objective 1	x			
		Objective 2		x	x	x
		Objective 3				
	Standard 2: Earth and Space	Objective 1				
		Objective 2				
		Objective 3		x		
	Standard 3: Physical Science	No Correlations				
	Standard 4: Life Science	No Correlations				
Language Arts	**Standard 1**	Objective 1	x	x	x	x
		Objective 2		x		
	Standard 2	No Correlations				
	Standard 3	No Correlations				
	Standard 4	No Correlations				
	Standard 5	No Correlations				
	Standard 6	Objective 1	x	x	x	x
		Objective 2				
		Objective 3				
	Standard 7	No Correlations				
	Standard 8	Objective 1				
		Objective 2				
		Objective 3				
		Objective 4				
		Objective 5				
		Objective 6		x		

State of Utah Core Curriculum Standards for 3rd Grade

				A Drop in the Bucket	Increase Journey	Relay Race	Drama
Science	**ILO**	Use science process and thinking skills	a		x		
			b				
			c	x			
			d	x	x		
			e	x			
			f				
			g				
			h		x		
		Manifest scientific attitudes and interests	a	x	x	x	x
			b				
			c	x	x	x	x
		Understand science concepts and principles	a				
			b				
			c		x		
		Communicate effectively using science language and reasoning	a	x			
			b		x		
			c	x	x	x	x
			d				
Math	**Number and Operations-Fractions**	Develop understanding of fractions as numbers		x			
	Measurement and Data	Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects		x			
Language Arts	**Standard 1**	Objective 1		x	x	x	x
		Objective 2			x		
	Standard 2	No Correlations					
	Standard 3	No Correlations					
	Standard 4	No Correlations					
	Standard 5	No Correlations					
	Standard 6	Objective 1		x	x	x	x
		Objective 2					
		Objective 3					
	Standard 7	No Correlations					
	Standard 8	Objective 1					
		Objective 2					
		Objective 3					
		Objective 4					
		Objective 5					
		Objective 6			x		

State of Utah Core Curriculum Standards for 4th Grade

				A Drop in the Bucket	Incredible Journey	Relay Race	Drama
Science	Standard 1	Objective 1		x	x	x	x
		Objective 2		x	x	x	x
	Standard 2	No Correlation					
	Standard 3	No Correlation					
	Standard 4	No Correlation					
	Standard 5	No Correlation					
	ILO	Use science process and thinking skills	a		x		
			b				
			c	x			
			d	x	x		
			e	x			
			f				
			g				
			h		x		
		Manifest scientific attitudes and interests	a	x	x	x	x
			b				
			c	x	x	x	x
		Understand science concepts and principles	a	x	x	x	x
			b				
			c		x		
		Communicate effectively using science language and reasoning	a	x			
			b		x		
			c	x	x	x	x
			d				
Language Arts	Standard 1	Objective 1		x	x	x	x
		Objective 2			x		
	Standard 2	No Correlations					
	Standard 3	No Correlations					
	Standard 4	No Correlations					
	Standard 5	No Correlations					
	Standard 6	Objective 1		x	x	x	x
		Objective 2					
		Objective 3					
	Standard 7	No Correlations					
	Standard 8	Objective 1					
		Objective 2					
		Objective 3					
		Objective 4					
		Objective 5					
		Objective 6			x		

State of Utah Core Curriculum Standards for 6th Grade

				A Drop in the Bucket	Incredible Journey	Relay Race	Drama
Science	**Standards 1-5**	No Correlation					
	ILO	Use science process and thinking skills	a		x		
			b				
			c	x			
			d	x	x		
			e	x			
			f				
			g				
			h		x		
			i				
		Manifest scientific attitudes and interests	a	x	x	x	x
			b				
			c	x	x	x	x
			d				
			e				
			f				
		Understand science concepts and principles	a				
			b				
			c		x		
		Communicate effectively using science language and reasoning	a	x			
			b		x		
			c	x	x	x	x
			d				
			e	x			
		Demonstrate awareness of social and historical aspects of science	a				
			b				
		Understand the nature of science	a				
			b				
			c				

State of Utah Core Curriculum Standards for 6th Grade

Math	**Measurement and Data**	Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit		x			
Language Arts	**Standard 1**	Objective 1		x	x	x	x
		Objective 2			x		
	Standards 2-5	No Correlations					
	Standard 6	Objective 1		x	x	x	x
		Objective 2					
		Objective 3					
	Standard 7	No Correlations					
	Standard 8	Objective 1-5 No Correlations					
		Objective 6			x		

Appendix B. Hand Outs and Visual Aids

These hand outs and visual aids correspond with the preceding lessons.

Water Distribution Worksheet……32
My Incredible Journey Worksheet..……33
Incredible Journey Dice Labels ……..42
Incredible Journey Station Labels ……..42
Water Cycle Relay Race Riddle Cards……....49
Water Cycle Drama Note Cards ...……..50

Water Distribution Worksheet

Name: _____

Estimate the percentage and measurement of water in each reservoir. (Remember that the total amount is 5 gallons).

Reservoir	Approximate % of the total amount	Measurement
Oceans		All water left in bucket
Icecaps/Glacier		
Groundwater		
Freshwater Lakes		
Inland Seas/Salt Lakes		
Atmosphere		
Rivers		

As your teacher demonstrates the true percentages and measurements found in each source, record the data below.

Reservoir	Approximate % of the total amount	Measurement
Oceans		All water left in bucket
Icecaps/Glacier		
Groundwater		
Freshwater Lakes		
Inland Seas/Salt Lakes		
Atmosphere		
Rivers		

My Incredible Journey

Take a journey through the water cycle as a water drop! Where do you think you will go? How will you get there? What will happen along the way?

Station	What happened?	Where are you going?
Example: Cloud	I fell as rain onto a mountain	Mountain
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Write a story about your water cycle journey…

Animal – Incredible Journey Dice Labels

After using you to process food, the animal pees and you end up on the ground. **Go to Mountain.**

After using you to process food, the animal pees and you end up on the ground. **Go to Mountain.**

You are exhaled from the animal's lungs into the air as vapor. **Go to Cloud.**

You are exhaled from the animal's lungs into the air as vapor. **Go to Cloud.**

After using you to process food, the animal pees and you end up on the ground near a stream. **Go to Stream.**

Roll again.

Cloud – Incredible Journey Dice Labels

You fall as rain onto a mountain. **Go to Mountain.**

You fall as snow onto a mountain. **Go to Mountain.**

You fall as rain into a stream. **Go to Stream.**

You fall as rain onto a parking lot and make your way to a stream. **Go to stream.**

You fall as rain into the ocean. **Go to ocean.**

You fall as snow into the ocean. **Go to ocean.**

Groundwater – Incredible Journey Dice Labels

You move slowly underground and eventually flow into the ocean. **Go to Ocean.**

You move slowly underground and eventually flow into the ocean. **Go to Ocean.**

You move slowly underground between grains of sediment and eventually flow downward into a wetland and from there into a stream.

Go to Stream.

You move slowly underground between grains of sediment and eventually flow downward into a wetland and from there into a stream.

Go to Stream.

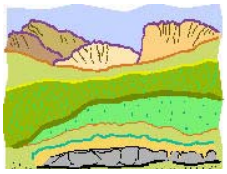
A plant takes you in through its roots. **Go to plant.**

You are pumped out of the ground from a well to irrigate a farmer's corn. **Go to plant.**

Mountain – Incredible Journey Dice Labels

You evaporate into the air. **Go to Cloud.**

You soak into the ground and become part of the groundwater. **Go to Groundwater.**



You soak into the ground and get absorbed by a plant's roots. **Go to Plant.**

You roll downhill and become part of a stream. **Go to stream.**

You roll downhill and become part of a stream. **Go to stream.**

You get frozen in ice and trapped until you thaw. **Stay at Mountain.**

Ocean – Incredible Journey Dice Labels

You are one of the countless water molecules in the ocean and you stay there. **Stay at ocean.** 	You are one of the countless water molecules in the ocean and you stay there. **Stay at ocean.** 
You evaporate into the air. **Go to Cloud.** 	You evaporate into the air. **Go to Cloud.** 
A kelp plant takes you in, releases you through its leaf, and transpires you into the air. **Go to Cloud.** 	A kelp plant takes you in. **Go to Plant.** 

Plant – Incredible Journey Dice Labels

The plant uses you to grow. **Stay at Plant.**

The plant transpires you through its leaves and you evaporate into the air **Go to Cloud.**

The plant transpires you through its leaves into the air as vapor. **Go to Cloud.**

The plant transpires you through its leaves and you evaporate into the air **Go to Cloud.**

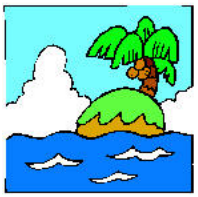
The plant stores you in its edible fruit, and a bear eats you. **Go to Animal.**

Roll again.

Stream – Incredible Journey Dice Labels

An animal comes to the stream and licks you up. **Go to Animal**

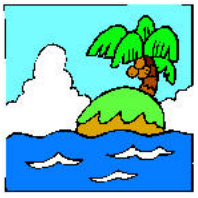
You continue rolling downhill and become part of the ocean. **Go to Ocean.**



You evaporate into the air. **Go to Cloud.**

You evaporate into the air. **Go to Cloud.**

You continue rolling downhill and become part of the ocean. **Go to Ocean.**



Roll again.

MOUNTAIN

GROUND WATER

STREAM

OCEAN

ANIMAL

CLOUD

PLANT

Water Cycle Relay Race – Riddle Cards

Below the surface of the earth
In between particles of dirt
That's where this water is found
Saturating everything deep underground

Groundwater

In between and all around
Through the soil without a sound
Water seeping down, down, down
Slowly moving underground

Percolation

Heat from the sun makes water rise
Up as vapor to the skies

Evaporation

Once a gas but then it's changed
Into a liquid to be seen again

Condensation

Down is the direction this water falls
As crystal, drips, or even balls

Precipitation

Cumulus, stratus, cirrus, too
Water vapor visible in skies of blue

Cloud

From the pores of plants
Water vapor escapes
Into the air without a trace

Evapotranspiration

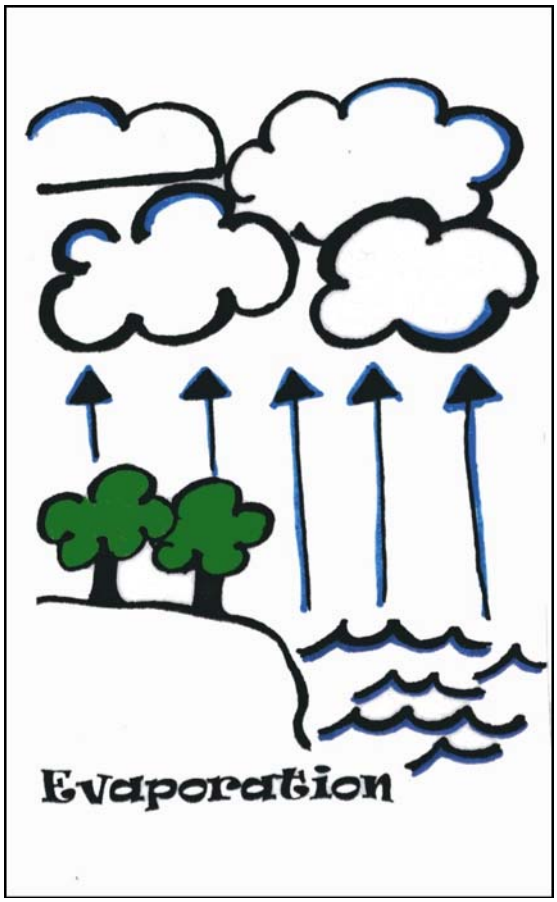
I start as a trickle and then I grow
Picking up speed as down I go
Over the surface of the land to the sea
Obeying the laws of gravity

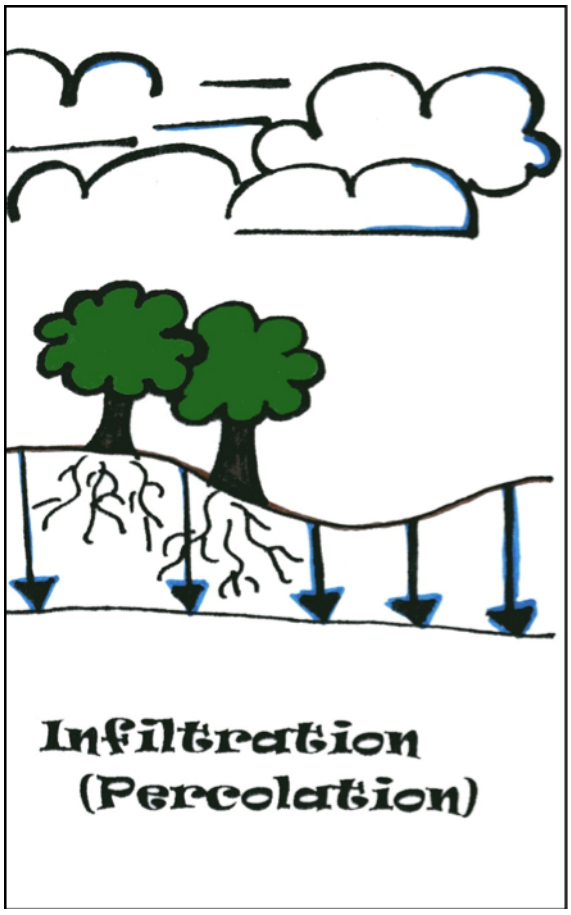
River

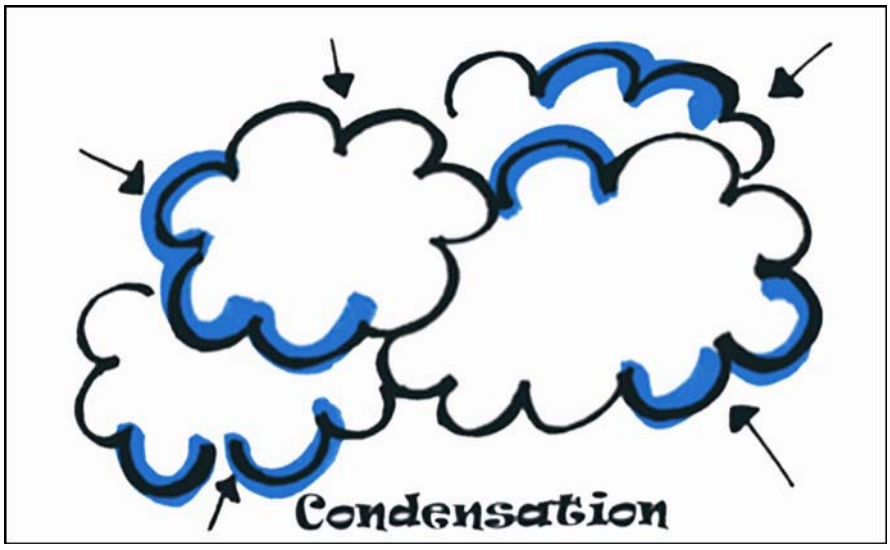
Water going round and round
Changing form but not the amount

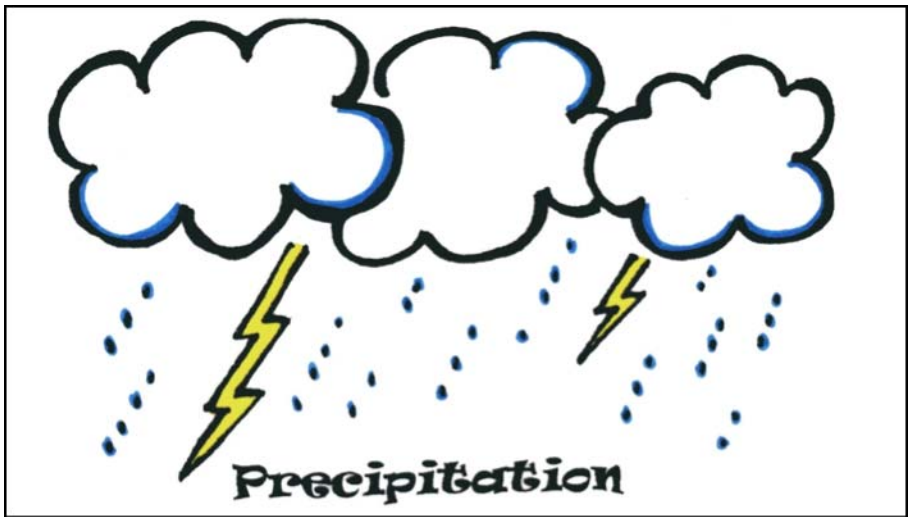
Water Cycle

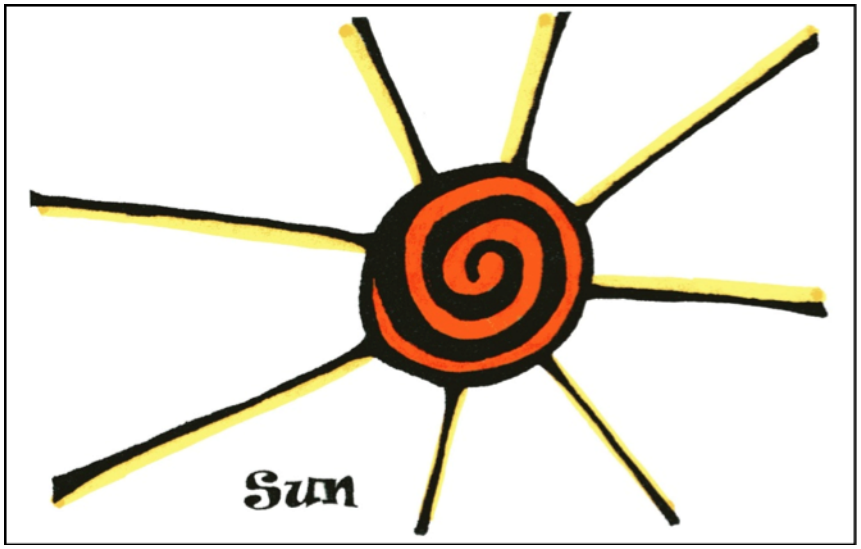
Water Cycle Drama - Note Cards






Condensation


Precipitation


Sun


Run-off

Appendix C: Discussion Questions

What are the water cycle zones?

The water cycle occurs everywhere that water is found. These areas can be broken down into three water cycle zones, atmosphere, water surface, and underground. The atmosphere consists of all the water in the thin layer of gas surrounding the earth. Surface water includes all of the water in water bodies (oceans, rivers, streams, lakes, reservoirs, and wetlands), organisms (plants and animals), surface layers of soil, and ice (glaciers and polar ice caps). Water below the surface layer of soil (groundwater) is in the underground zone.

How does the water cycle affect water quality?

Water is known as the universal solvent. This means that more materials (solids, liquids, and gases) dissolve in water more than any other substance. Water is constantly picking up pollutants in various states. Because water is constantly moving through a cycle pollutants can be carried far from their source. For example fertilizer on lawns and motor oil on roads can be carried by runoff into rivers or streams and be transported far away. However, nature can filter some pollutants from water. As water percolates through the ground, soil particles can filter out some pollutants. When water evaporates individual water molecules break apart and leave pollutants behind. This is known as distillation. Even though the water can be free of pollutants through this process, the pollutants remain in the environment.

What affects precipitation patterns in different geographical regions i.e. why does it rain more in Oregon than in Arizona?

The general circulation of the atmosphere, topography, and proximity to large bodies of water all influence precipitation patterns. The earth's atmosphere has large regions of rising and descending air. The wettest areas are found in the rising air regions (primarily in the mid latitudes and equator) while the driest areas are found in the descending air regions (subtropical deserts and poles). Mountains are a type of topography that affects precipitation. When moving air encounters a mountain it is forced to rise. Rising air cools and condenses so precipitation is likely to occur on the upwind side of a mountain. On the downwind side the opposite occurs, the air descends, warms, and less precipitation occurs. Large bodies of water with warm surface temperatures evaporate tremendous amounts of water into the atmosphere. Cold oceans or lakes, on the other hand, have less water evaporating.

What causes precipitation to fall in different forms? Why does it rain sometimes and snow other times?

The atmosphere is variable and is rarely evenly cold or warm. Temperatures above the surface of the earth and the mid-levels of the atmosphere play a large role in determining what type of

precipitation will fall. Snow is the simplest and most common form of precipitation. Snow forms when temperatures are at or below freezing at all points in the atmosphere. Sleet (partially melted snow) forms when temperatures near the cloud layer are below freezing, closer to the surface they are barely above freezing for a short period, and then below freezing again at the earth's surface. Rain forms when temperature is above freezing. If temperatures are warm and the air is compressed, precipitation can evaporate before reaching the surface of the earth. This is known as virga.

How does human development change the water cycle?

The development of roads, parking lots, houses, and other buildings, along with the removal of soil and vegetation can affect the water cycle. Removal of vegetation and soil can shorten the runoff time from rainfall and snowmelt into streams and rivers. The vegetation and soil act as a sponge that soaks up water and releases it slowly. When vegetation is taken out or the soil is covered by impervious surfaces (e.g., roads, parking lots, buildings) less water can infiltrate into the ground and more water runs off into streams and rivers.

Appendix D: Glossary

Condensation: The process by which a vapor becomes a liquid; the opposite of evaporation.

Erosion: The wearing down or washing away of the soil and land surface by the action of water, wind or ice.

Evaporation: The conversion of a liquid (e.g., water) into a vapor (a gaseous state) usually through the application of heat energy; the opposite of condensation.

Evapotranspiration: The loss of water from the soil through both evaporation and transpiration from plants.

Infiltration: The process by which water on the ground surface enters the soil.

Nonpoint source pollution: Refers to pollution sources that are diffuse and do not have a single point of origin. Run-off from agriculture, forestry and construction sites are examples.

Point source pollution: Refers to pollution resulting from discharges into receiving waters from any discernible, confined, and discrete conveyance such as a pipe, ditch, or sewer.

Percolation: Describes the action of water as it moves through spaces in the soil and rock.

Precipitation: Water falling, in a liquid or solid state, from the atmosphere to Earth (e.g., rain, snow).

Riparian vegetation: The vegetation growing in the riparian area. Healthy riparian vegetation consists of native, hydrophilic (water loving) plants that help stabilize the stream banks and control flood waters from inundating adjacent lands.

Runoff: Precipitation that flows overland to surface streams, rivers, and lakes.

Transpiration: The process by which water absorbed by plants (usually through the roots) is evaporated into the atmosphere from the plant surface (principally from the leaves).

Water cycle: The paths water takes through its various states-vapor, liquid, and solid-as it moves throughout Earth's systems (oceans, atmosphere, groundwater, streams, etc.). Also known as the hydrologic cycle.

Watershed: An area of land from which all the water drains to the same location such as a stream, pond, lake, river, wetland, or estuary.