

My Watershed: an early elementary curriculum
exploring local hydrology

Approved:

Dr. Heather C. Galloway
Director, Mitte Honors Program

Approved:

Dr. Susan Schwinning
Professor of Biology
Supervising Professor

My Watershed: an early elementary curriculum
exploring local hydrology

HONORS THESIS

Presented to the Honors Committee of Texas State University- San Marcos

in Partial Fulfillment of

the Requirements

For Graduation in the Mitte Honors Program

By

Vera R. Wood

San Marcos, Texas

August 2007

ACKNOWLEDGEMENTS

I would like to thank Diann McCabe for introducing me to Kenneth Koch's inspirational approach to teaching poetry in the classroom that was part of my motivation for approaching geographic education in a unique and unconventional manner. Through her honors course "Teaching Poetry to Children" I was able to gain hands on experience in the classroom, and I was able to see how quickly my students warmed up to this approach. It was a joy to return to the classroom week after week and see the children excited to learn and create.

Many thanks to Dr. Susan Schwinning for all of her time and effort put forth in such a very short amount of time. I am grateful for your crash course in academic writing; hopefully graduate school will be a bit of a more gradual transition and prepare me fully for my master's thesis.

I would also like to thank the Theatre and Dance department here at Texas State for offering the course Rhythm and Movement Activities which introduced me to philosophy of Anne Green Gilbert whose curriculum through motion has inspired me to engage in a kinesthetic movement based water resource curriculum to make learning occur effectively through fun energetic "play".

I can't give enough gratitude to my loving partner, CJ who has been endlessly supportive and understanding through the creation of this project. The extra hours with our young daughter and overall help and support has certainly allowed this concept to become concrete.

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ABSTRACT

MY WATERSHED: AN EARLY ELEMENTARY CURRICULUM EXPLORING LOCAL HYDROLOGY

By

Vera R. Wood

Texas State University- San Marcos

August 2007

SUPERVISING PROFESSOR:

Dr. Susan Schwinning

Professor of Biology

The following environmental education curriculum utilizes interactive and kinesthetic learning to teach children about basic hydrology and their watershed. I explain the approach and its potential value to science education in Chapter I. The following chapters describe a curriculum designed for informal education, as may be conducted to mixed age groups in nature education centers. The curriculum spans a range of competency levels from kindergarten to fifth grade and is divided into three main parts. The first lesson (Chapter II) conveys basic principles of water transport and state transitions in the hydrologic cycle. The second lesson (Chapter III) introduces the concept of the watershed and focuses on pollution sources and transport in watersheds. In

Chapter IV, I discuss my experience implementing these two lesson plans at the San Marcos Nature Center. Based on this experience, I concluded that a third lesson is needed to complete the curriculum, dealing with mitigation and the practical application of the principles learned in first two sections, which I propose in the final chapter V.

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CHAPTER I

INTRODUCTION

Developing an appreciation and understanding for how human activities affect the water supply is one of the first steps in the preservation water resources for a healthy, viable future. In this contribution, I chose watershed education for children of kindergarten age through grade six, with the purpose of giving children a sense of place through understanding issues in their community and to teach them that their actions can make a difference in the real world and help to solve problems. The lesson plan was designed to work with children of various ages simultaneously in a non-academic (field trips and summer day camps) atmosphere where more time can be allotted to activities and activities can be more flexible than in traditional classroom settings.

Although the plan was not designed to conform to Texas Essential Knowledge and Skills (TEKS) standards, many of the science and language arts standards are met, for example, students participate in rhymes, songs, conversations and discussions (K-3); students listen to stories being read aloud (K-1); students observe and describe properties of rocks, soil, and water; and give examples of ways that rocks, soil and water are useful. (TEA 2007). The skills of inquiry, context knowledge and unifying concepts also comply with “The National Science Education Standards” specifically the concept of systems, crucial to the understanding of watersheds (NRC 1996).

I utilized a teaching concept developed by Kenneth Koch for teaching children poetry (Koch 1973), which entertains the notion that complex subject matters need not be removed from children’s education but that educators can find ways of teaching such

matters in a manner to which children can relate. Koch had great success with primary school students exploring poetry ideas in William Blake, D.H. Lawrence, Shakespeare and others and stresses the importance of maintaining “as free and inspiring a classroom atmosphere” and “with a good deal of praise and encouragement... students in grades one through six came to love writing poetry” (Koch 1973). Other educators following Koch’s methodology had “student poets [who] went well beyond any expectations [the educators] had had for their writing” (Linaberger 2004). I used the same principles in approaching my first graders with the scientific terms in the hydrologic cycle lesson. The same way Koch would use adult poetry and explain the underlying ideas of the poem, I used professional terminology but explained the underlying concept in a fun and inspiring way. The purpose was not for first graders to retain terms such as condensation and incorporate them in their vocabulary, but to initiate the concept e.g. of state transitions and so pave the way for future learning.

I also incorporated music and dance in the lesson plan, based on the theory of kinesthetic intelligence (Gilbert 1992) and Gardner’s concept of multiple intelligences (Gardner 1999). Gardner postulates that creativity and the intelligences (including spatial, kinesthetic, linguistic...) are essential to the development of cognitive skills in children’s learning (Armstrong 1994). The aim of merging the multiple intelligences with an authentic challenge and keeping the atmosphere positive, creative and energetic is learning that is enjoyable, entertaining and culminates in a sense of achievement.

CHAPTER II

LESSON I- THE HYDROLOGIC CYCLE

Subject: Science

Time: 60 minutes

Materials:

Glass with water

Dish with ice cubes

Dish with wet paper towel

Poster board

Markers/drawing utensils

Vocabulary/background:

Hydro- the Greek root meaning water

Condensation- the transformation of a gas or water vapor into liquid form

Freezing – the transformation of a liquid into a solid form

Precipitation- liquid or solid water falling from the sky to the ground

Evaporation- the transformation of a liquid to a gas usually under the influence of heat

Transpiration- evaporation from leaf surfaces

Collection- accumulation of water from precipitation into a larger body of water

Infiltration- the absorption of liquid water into soil or rock

Runoff- the flow of water across the soil by water not absorbed by soil

Introduction/motivation: (15 minutes)

Water and Ice (AAAS 2003)

Have a half full glass of water, a dish with ice cubes and a dish with a wet paper towel.

Begin by drawing attention to the glass of water. Ask questions such as:

- What is in this glass?
- What is water? What does it look or feel like?
- Is water a solid, a liquid, or a gas?
- Where can you find water? Where does it come from?
- How old is this water? Do you think it is possible a dinosaur drank this very water?

Guide the class in establishing that water is a liquid that both falls from the sky in the form of rain and can be found in abundance in oceans, lakes, streams, and underground.

Next, pick up the dish with the ice cube and show it to the class. Ask questions such as these:

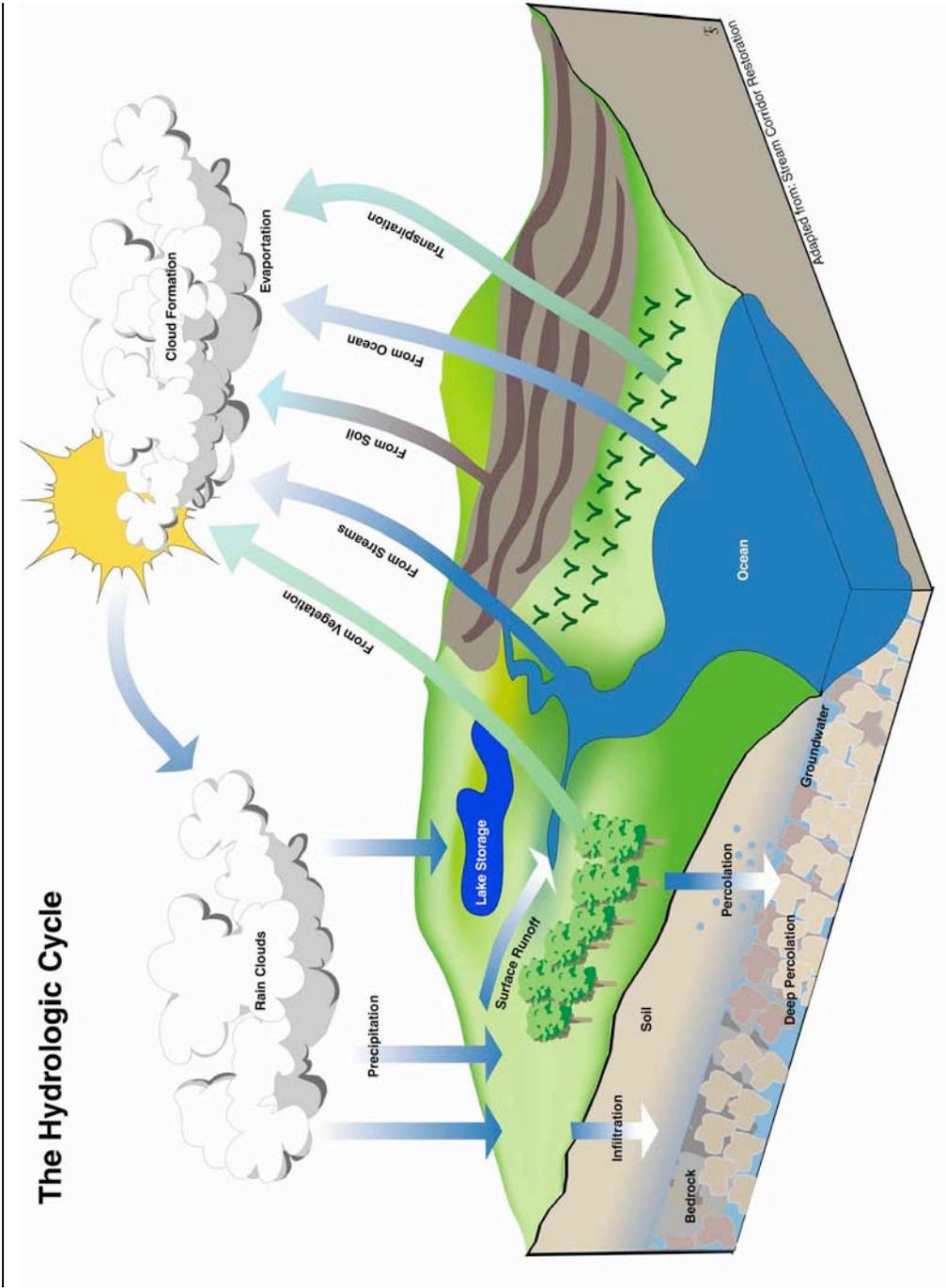
- What is in this dish?
- Describe ice. What does it look or feel like?
- Is ice a solid, a liquid, or a gas?
- What is ice made of? How is it made?
- If I left the ice in the room for a few hours, what would happen to it?

Help the class to see that ice is water that has been frozen into a solid because it has been exposed to very low temperatures. Make sure they understand that when ice is allowed to warm up, it returns to liquid water.

Next, show the students the wet paper towel, asking questions like these:

- What is this?
- What would happen if I left it out for a few hours?
- Why would it dry out?
- Besides paper towels, what are some other examples of wet things that dry out over time? (Examples could include wet clothes, watered plants, glasses of water, and puddles.)
- What if I put this wet paper towel outside during the winter? What might happen to it? Why?

At this point, students should understand that when water is exposed to warm temperatures, it disappears or evaporates, becoming a gas, while under colder conditions it can freeze into ice, becoming a solid. It is important to emphasize that the three water samples they have seen represent the three states, or forms, that water takes on as temperature and other conditions change.



Presentation: (25 minutes)

The Water Cycle (USEPA 2006)

Ask if students are familiar with the concept of the water cycle. Explain the earth has a limited amount of water and ask what the word *cycle* might imply. As a class come up with other words with the word *cycle* (bicycle, tricycle, motorcycle, unicycle, recycle). Determine that cycle must mean something that goes round and round and the water cycle is how water on earth goes round and round. Explain the word *hydro* and how the hydrologic cycle may be used interchangeably with the water cycle.

Go over vocabulary terms. First ask if they are familiar with any of the terms and then have them try to figure out what they might mean by analyzing word morphology before you go over them in a way your pupils will understand:

Evaporation- Ask if they have ever seen the water level go down in a small pool or even a glass of water left in the sun. The sun heats up water in lakes, rivers or the ocean and turns it into vapor or steam. The water vapor or steam leaves the lake, river or ocean and goes up into the air (USGS 2007).

Transpiration- Ask you students “Do plants sweat?” in a silly way and let them giggle and give you their thoughts. You can tell them they do- sort of. People perspire (sweat)

while plants transpire. Transpiration is the process in which plants lose water from their leaves. Transpiration is the evaporation that occurs from leaves instead of on the ground.

Condensation- Water vapor from the air gets cold high up in the atmosphere and changes back into liquid, forming clouds. This is condensation.

Precipitation- Happens when condensation drops become so big and heavy they begin to fall. Clouds are made up of droplets too light to fall. Droplets can freeze on the way down and become hail, sleet or snow.

Infiltration- Process of water on the ground entering the soil.

Collection- When water falls back to the earth it may fall back into the rivers, lakes and oceans or it may end up on the land. When it ends up on the land, it will either end up soaking into the earth (**infiltration**) and becoming part of the ground water which people pump from the ground and use for consumption and irrigation or moisture in the ground, or it may run over the soil (**runoff**) and wash into the rivers, lakes or the ocean where the cycle starts **all over again**.

Sing the water cycle song (with hand motions). After your students have learned the water cycle song, the teacher elaborates upon this and make up their own movements that spread across space, in essence turning the water cycle song into a water cycle dance.

This makes the activity much more memorable and allows the children to release extra energy. Allow the children to compose their own movements that make sense to them.

Sung to the tune of She'll Be Coming 'round the Mountain

Water travels in a cycle, yes it does

(use pointer finger to make a big circle)

Water travels in a cycle, yes it does

(repeat finger circle)

It goes up as evaporation

(moves hands up to the sky)

Forms clouds as condensation

(make a cloud overhead with arms)

Then comes down as precipitation, yes it does!

(sprinkle with fingers while bringing arms down in front of you)

She'll be Coming round the Mountain

Traditional
arr. A.L.C.

LYRICS TO WATER CYCLE SONG

1. WATER TRAVELS IN A CYCLE YES IT DOES!!
2. IT GOES UP AS EVAPORATION
3. FORMS CLOUDS AS CONDENSATION
4. AND COMES DOWN AS PRECIPITATION YES IT DOES

Primo

wa - TER TRA - VELS IN A CY - CLE YES IT DOES

Secondo

The first system of music is in G major and 4/4 time. The Primo part (treble clef) has a melody starting on G4, moving to A4, B4, and C5. The Secondo part (bass clef) provides a harmonic accompaniment with chords on G2, B2, and D3. The lyrics are written below the Primo staff.

I

II

The second system continues the musical notation. The Primo part (treble clef) has a melody starting on D5, moving to E5, F5, and G5. The Secondo part (bass clef) provides a harmonic accompaniment with chords on G2, B2, and D3.

I

II

7

~WHISC

~WHISC

The third system continues the musical notation. The Primo part (treble clef) has a melody starting on A5, moving to B5, C6, and D6. The Secondo part (bass clef) provides a harmonic accompaniment with chords on G2, B2, and D3. The system ends with a double bar line and repeat dots. The lyrics '~WHISC' are written below the Primo and Secondo staves.

Closure/questions: (5 minutes)

Does the earth have more or less water than it did 1,000 years ago? If it's the very same water that has been here all along changing shape and form (TVA 1993), do you think that a dinosaur may have possibly drunk some of the very same water you do (hold up glass of water from motivation/states of water)?

Evaluation: (15 minutes)

Divide the class into five groups and give each group a poster board and colors. Assign each group a vocabulary word (evaporation, transpiration, condensation, precipitation, collection) and ask them to illustrate the process.

After the students have illustrated their term have them line up in a group in front of the class and share their pictures. Once they have shared ask what might be a logical next occurrence and ask that group then to present their poster. Continue until everyone has shared.

Optional activities:

- Build a class terrarium (all grade levels)
- My life as a drip- Imagine they are a drop of water and write or illustrate a story of where they came from and where they have been (suggested grades 2-4)
- Have the class choreograph a water cycle dance as an elaboration of the water cycle song (all grade levels)
- A journey with H₂O coloring book (suggested grades K-3) available:
http://water.usgs.gov/H2O_ColoringBook.pdf
- Poem- Recycled (suggested grades 4 & 5)
- Handout- Around and Around We Go (suggested grades 3 & 4)

Recycled!¹

The glass of water you're about to drink
Deserves a second thought, I think
For Avogadro, oceans and those you follow
Are all involved in every swallow.

The molecules of water in a single glass
In number, at least five times, outclass
The glasses of water in stream and sea,
Or wherever else that water can be.

The water in you is between and betwixt,
And having traversed is thoroughly mixed,
So someone quenching a future thirst
Could easily drink what you drank first!

The water you are about to taste
No doubt represents a bit of the waste
From prehistoric beast and bird -
A notion you may find absurd.

The fountain spraying in the park
Could well spout bits from Joan of Arc,
Or Adam, Eve, and all their kin;
You'd be surprised where our drink has been!

Just think! The water you cannot retain
Will some day hence return as rain,
Or be beheld as the purest dew,
Though long ago it passed through you!

Verne N. Rockcastle²

¹Water Resources Education Kit, 4-H Youth Development, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY
²Professor Emeritus, Outdoor Education, College of Agriculture and Life Sciences, Cornell University

Around and Around We Go

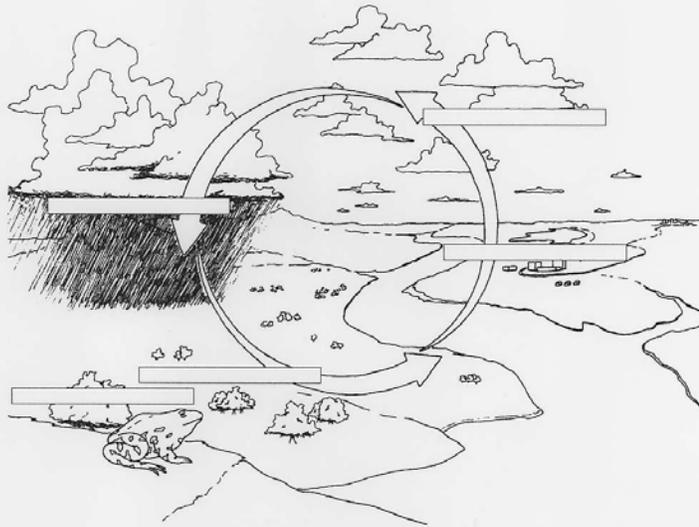


One mature oak tree may transpire 100 to 1,000 gallons of water each day during its growing season, or about 6,000 to 60,000 gallons each year!

Word Bank

condensation precipitation transpiration
evaporation respiration

Directions: Label the water cycle diagram with the words from the Word Bank, showing whether the water is moving into the atmosphere, being deposited on the surface or entering the groundwater. Discuss how the cycle works and the history of the water we are using today



(EPA 2006)

CHAPTER III
WHAT IS A WATERSHED?

Subject: Science

Time: 80 minutes

Materials:

EnviroScape® **or**

Brown paper bag

Spray bottle

Newspapers

Food coloring

Paper towels

Peanut Butter

Saltine crackers

Napkins

100 pennies

Clear jar

3-D or aerial map of local watershed

Paper

Crayons

Vocabulary/background:

Watershed- the land from which surface runoff drains into a stream channel, lake or other body of water

Pollution:

Point-source pollution- pollution that can be traced to a single point source such as a pipe

Non-point-source pollution- pollution that can not be traced to a specific point, because it comes from many places over a wide area (e.g., farmer's field)

Water budget- the distribution of precipitation into storage, runoff, drainage, evaporation and transpiration

Herbicide- a substance that kills plants

Pesticide- a substance that kills plants or animal pests

Sediment- insoluble (can not be dissolved) material suspended in water that consists of particles from rocks, soil and organic matter; a major non-point source pollutant

Water pollution- any human-caused pollution that impacts water's usefulness to humans and other organisms

Introduction/motivation: (25 minutes)

Exactly how much water is fresh water? (Peixoto 1973)

Recall from the hydrologic cycle lesson that the water we have is the only water we will ever have. The same water gets recycled to end up as the fresh water in our glass. To

assist with the visualization of the distribution of water take a clear jar with 100 pennies.

Explain that over 97 percent of the earth's water is found in the oceans as salt water.

Explain that about 2 percent is frozen in glaciers and ice caps and that only one percent of water is available for us to use at any given time. Now hold up the jar with 100 pennies in it and remove three pennies, explain that those pennies represent all the fresh water on earth. Put two back because they are in frozen form and hold up one penny next to the jar and explain that at any given time that that single penny represent the amount of fresh water available to us at any given time.

Discuss the importance of water in our day to day routines and list some of the activities on the board. After the students have listed several direct uses (shower/bath, brushing teeth, washing hands, swimming, etc.) be sure guide them in the direction of indirect uses (growing food, food preparation, manufacturing). Now have the students pick one of the activities listed on the board and have them draw themselves engaging in that activity.

While the students are drawing, spread peanut butter on saltine crackers and pass one out to each student. Wait until they ask for a drink of water. After the students have quenched their thirst with some fresh water you can hold up the jar of pennies and remind them how much fresh water is available at any given time and why it is so important to keep that water clean.

Have students gather around the 3D or aerial map of your local watershed and point out our recognizable features and talk about all the activities, industry and recreation that take place in your watershed. List these on the board to be referred to while the students create

their own paper watersheds or to compare what is the same or different between their watershed and the EnviroScape®.

The EnviroScape® is an interactive educational tool that helps demonstrate water pollution and prevention. It allows students to visually understand water quality problems and how they can be part of the solution.

Presentation: (25 minutes)

Do you know your phone number and address? Why? To help you get home safe if you get lost. Do you know your watershed address? Your watershed address is where you live, it's the water you drink and all of the activities that take place around you that impact water quality. Do you think you should know your watershed address?

If you're using an EnviroScape® have all necessary materials set up in advance (spray bottle, chocolate syrup, cocoa powder, colored fruit drink as pollutants). If an EnviroScape® is unavailable you can have your students make their own watershed models by crumpling a paper bag drawing in land uses (farming, construction, residential, roads) and use the food coloring to represent types of pollution.

If possible, involve the children in the set up of the EnviroScape®, if not possible, due to the group size or age group, at least have the children engaged and actively participating while you place materials on the EnviroScape®. For instance, as you sprinkle dirt (cocoa powder) on the hill sides/farm/construction site engage the children by talking about each site and where in their watershed they may find that particular land use/ activity.

Set up oil (diluted chocolate syrup) on the roads, and engage in a scene of day to day life. Have the students suggest what kinds of activities might take place on the farm and what the farmers might place on their fields to assist in the production of their crops (herbicides and pesticides). The EnviroScape® is ideal for showing point and non-point source pollution due to the wells/drainage tubing provided.

Next you make a thunderstorm. You can make a game out of making a thunderstorm coming over your EnviroScape® or homemade watershed model by creating a class thunderstorm by building on sounds using body parts (rubbing hands together, snapping, irregular clapping, clapping your thigh, stomping feet and as a crescendo you can have someone blink the classroom lights before going in reverse order). The instructor begins and gives the cue to the next person via direct eye contact and it continues until everyone is part of the thunderstorm. Through the same eye contact on the last round people are slowly eliminated until only one person is left rubbing hands together. For very young children the class can use the same concept but simplify, like building sounds by going around in a circle (if everyone is standing around the EnviroScape® or group by group if you've made your own watershed models).

While discussing point and non point source pollution and having the children guess what will happen and where things will go as the storm (water from spray bottle) now rolls over your watershed. Have students take turns spraying rain on the watershed while encouraging comments and observations of what is happening. Encourage students to recite vocabulary and processes from the hydrologic cycle lesson plan.

Closure/questions: (15 min)

If you made your own watersheds pick out one feature from each watershed to discuss pollution sources, erosion spots etc. Have the children answer what happens to a watershed when people pollute? Where does all the water in their watershed drain? Have the students name as many pollutants as they can name (list them on the board). Have students discuss how their watershed is the same or different than that of the EnviroScape® or the watershed they created.

Evaluation: (15 minutes)

Have the students draw a scene of the finished product after the pollutants have been added to the EnviroScape® or watershed. Would it be fun to go boating on that lake? What would the beach look like after all the activities that took place in their watershed?

Optional activities:

- I spy- take a class walk, have each student take a notebook and spy point and non-point source pollutants (all grade levels)
- Construct a play doh model of your local watershed (all grade levels)

- USGS has a wonderful series of water posters. They offer a “water quality-potential sources of pollution” poster, an excellent compliment to this lesson available from <http://water.usgs.gov/outreach/OutReach.html> (all grade levels)

CHAPTER IV

IMPLIMENTATION AND OBSERVATIONS

My experience in watershed education has been through primary school children visiting the San Marcos Nature Center over the course of my internship. On a single day in March 2007, I led sixteen twenty-minute lessons centered on a physical watershed model. Each activity was attended by about ten students. I opened my lesson with a brief introduction of what was to come at my station and previewed some of the activities at other stations in which the children would soon engage. Since my station was relatively abstract compared to other stations that involved petting snakes, making birdfeeders or catching tadpoles with a net, I made sure to keep the spirit fun and lively. My station was set up under a shade arbor outside which instantly helped break the academic atmosphere and I found the EnviroScape® to be very complimentary to learning about watersheds in a fun way with chocolate syrup “oil”, miniature cars, tractors and roadways, cocoa powder “dirt” and real water “precipitation” the students could take turns assisting the “storm” we created with audible sounds and a misting water bottle.

The six, seven and eight year old children had a surprisingly high level of competency about the hydrologic cycle. They enjoyed learning about the hydrological terminology, when presented as a challenge. Since the terms were cumbersome I made it a game to reiterate and use them at every chance. If during the hydrologic dance a vocabulary term became too difficult I exchanged it for a simpler lay term.

Since we were using a generic watershed model, the one size fits all EnviroScape® I wanted to be sure to have the children point out the similarities and

differences between the EnviroScape® and the local watershed. I asked whether there were farms in our watershed like the one we had set up in the EnviroScape®? Was there construction? Could the students name places around town where they had seen similar activities as we were portraying in the EnviroScape®. I found it easy to get the children involved with the model but tried as much as possible to show the resemblance to our watershed and make it less like a toy.

I found the hydrologic cycle and watershed lessons evolved nicely together but after we had fully muddied up the EnviroScape® with mock oil, dirt from construction sites, farm effluent and other urban pollutants, I realized something was missing. How could I instill hope and a sense of social responsibility after showing how everyday practices lead to such polluted waters? I then began to ask groups other questions after the simulated precipitation event. Is the situation hopeless? What could they do to change things? I began to incorporate information during the EnviroScape® presentation about alternatives such as lower impact farming practices, organic produce and mitigation procedures at construction sites. Still, our lake was brown with pollution.

I was afraid I was presenting the truth in a devastatingly exaggerated form. I briefly explained about constructive wetlands and how reeds such as we saw there helped to clean the water. This was how the final lesson “What can we do?” was inspired.

I have not yet tried this lesson. But I suspect that it is the most important aspect of the entire lesson series, because it places the hope and inspiration to act back in the minds of the children. Our goal after all is to give our children the tools to become mindful, conscientious and active global citizens.

CHAPTER V
WHAT CAN WE DO?

Subject: Science

Time: 45 minutes

Materials:

Construction paper

Leaf templates (make ahead from reused cardboard)!

Safety scissors

Markers/ writing implements

Vocabulary/background:

Mitigate/mitigation- to make less severe; to reduce the intensity of something

Pervious surface- any surface in which water can soak into or through it

Impervious surface- any surface in an urban landscape that can not absorb water

Biodegradation- the decay and decomposition by bacteria and other biological agents;
certain detergent may be biodegradable

Dilution- weakening the concentration of a solution (or pollutant) but the addition of
water or other thinner

Plant nutrient uptake- plants can take up and filter out pollution in the soil or water

(Bassirirad 200)

Introduction/motivation: (5 minutes)

Recall the previous watershed lesson plan in detail and pass out the students' drawings of what their watershed looked like after the watershed or EnviroScape® activity. Ask them to describe how that makes them feel. Encourage student who wish to share elaborate on their drawings and their emotional response to such and environment.

Presentation: (30 minutes)

Begin by brainstorming a list of thing we can each do to save the earth or come up with mitigation factors to what we experienced first hand while exploring the EnviroScape®. Try to ensure understanding of each new suggestion. If a student says "eat organic foods" make sure they know what organic means, in this case refer back to the pesticide/herbicide used on the farm from the watershed activity.

Read aloud the story "What Can I do?" and take a few moments afterward for discussing comprehension questions I suggest doing this in discussion format not as the multiple choice handout presented. After the story and comprehension discussion pass our construction paper so the class room can make their own promise leaf and affix it to the classrooms very own promise tree.

What Can I do?

The little boy walked dejectedly down the cracked sidewalk. His backpack was heavy and his feet were slow. He stayed to his path, pausing every now and then only to pick out a new can or wad of paper to kick as he went along his way. His heart felt as heavy as his backpack as he opened the door to his house and went inside.

His mother was in the kitchen, taking brownies out of the oven. She smiled as she turned around but stopped when she saw his face. "Tyler, what happened? Is everything okay?" "Nothing is okay, mom. Nothing will ever be okay again." He stood in the middle of the kitchen as his mother came over to the kitchen table. "Sounds like you had a rough day, Tyler. Is there anything I can do to help?" "That's just the thing, Mom. We can't help. There's nothing we can do." He sat down at the table and put his head in his hands. His mother sat down and waited a moment until Tyler began to speak again.

"Today, in science, the teacher was talking about Earth Day and the environment. Earth Day is supposed to be a day when every person promises to do something to help take care of our world. Mrs. Green was telling us how many companies are not careful about how they get rid of their industrial waste. She said that our world is getting dirtier and that many animals and plants are dying. She wants us to think of something we can do to help and I thought all the way home and there is nothing I can do. I can't stop the companies from polluting our air and water and I can't save all of the animals! There is not anything that I can do to make a difference."

His mother sat for a minute, thinking. "You sound like this really concerns you and that you have put a lot of thought into it, Tyler." Tyler nodded. "Let me tell you a story that your grandfather told me. I don't know where he heard it, but I think that it might help you think about your problem in a different way." She began, "one morning a man was walking down a beach that was covered in dying starfish. The tide the night before had been especially strong and thousands of starfish had been washed up on shore, too far up for them to make it back into the water by themselves. The man shook his head as he trudged along thinking what a shame it was that all of those starfish would die on the beach. He came upon a boy who was throwing starfish back into the ocean as fast as he could. He was out of breath and it was obvious that he had been at this task for a while. "Son," the man said, "you might as well quit. There are thousands of them. They are washed up all over the beach as far as you can see. There is no way you can make any sort of a difference." The boy did not even pause in what he was doing. He kept bending and throwing but as he did, he spoke to the man, "I can make a difference to this one, and this one, and this one." And the man thought, and he knew the boy was right. He began to help return the animals to their home, smiling at how life's biggest lessons sometimes came from the smallest people."

Tyler stared intently at his mother. "But he did make a difference, didn't he? To every starfish that he threw back in?" His mother nodded, smiling. He sat for a moment, thinking about what his mother had said. "So, what it means is that even though I can't change everything, I can make a big difference by doing the little things that matter?"

"That," she said, sliding him the plate of brownies, "is exactly what I am saying." Tyler grinned and took a brownie from the plate. "That gives me an idea." His mother smiled even bigger and said, "I kind of thought that it might."

The next morning on the way to school, his feet hardly touched the ground. He told his teacher the story of the starfish and his idea. Mrs. Green thought it was a great idea, and decided to let Tyler share the story and his idea with the class. Everyone got to work immediately, cutting out the large green leaves.

On Earth Day, there was an assembly and everyone in the community was invited. Many of those gathered were startled to see the large brown tree trunk affixed to the auditorium wall. They sat, puzzled, and waited for the program to begin. A boy, dressed up to look like a man, walked across a stage filled with starfish. The play went on as Tyler and his class told the story taking place. When it was over the audience applauded as Tyler stood at the podium.

"We were all thinking, and it was frustrating because we didn't think that we could do anything. The problems seemed too big for us to do anything about them. But we decided that together, even the little things we do could add up to mean a lot to our world." The kids began passing out the green leaves and pens to the audience. "We want every person to think of one thing they can do that could make a difference to our world. Even if it seems like something small, it will matter."

The audience began writing, and soon the tree was covered with the green leaves. Tyler and his class read many of them as they attached them to the tree. "I will walk to work." "I will use both sides of my paper to save trees." "I will have my pet neutered so there won't be any puppies born that won't have a home." "I will plant a tree every year." "I will start recycling my newspapers." Tyler thought, and bent to write his promise on the leaf. Soon, the tree was beautiful and green and covered with the Earth Day promises. People were laughing and talking as they left, thinking of what they had promised to do.

When the dismissal bell rang, Tyler got his backpack and began the short walk home. As he reached the sidewalk, he pulled an old grocery bag from his backpack. He began picking up the trash as he made his way home, instead of kicking it. He smiled all the way, thinking of the difference they would make.

Closure/question: (5 minutes)

If you fulfill your promise leaf do you think it will make a difference in the same way throwing one starfish back into the ocean made a difference?

Do you think children everywhere are doing things like building a classroom promise tree?

Why is it important to take care of our planet?

Evaluation: (5 minutes)

Have student journal about a source of pollution that can be eliminated.

Optional activities:

- Read any of the books from additional reading list (various grade levels)
- Make junk art! (all grade levels)
- Waste watchers- identify opportunities to reduce waste in the classroom available at http://www.kab.org/kids/waste_intro.htm (grades 3-5)
- Arrange a class field trip with another agency that is involved in watershed education (all grade levels)
- Have the class design and engage in their own community service project ideas available at <http://www.epa.gov/teachers/> (all grade levels)

- Pervious/ impervious cover experiment with small cups with holes in the bottom and a variety of everyday materials: sand, clay, gravel, modeling cement (all grade levels)
- Play the Lorax's Save the Trees Game available at <http://www.seussville.com/games/lorax/> (suggested grades 2-4)
- Color a healthy planet – handout (suggested grades K-2)

Additional reading:

The Lorax

Dr. Seuss

ISBN: 0394823370

"UNLESS someone like you...cares a whole awful lot...nothing is going to get better...It's not." Long before saving the Earth became a global concern, Dr. Seuss, speaking through the Lorax, warned against mindless progress and the danger it posed to the planet's natural beauty. In this cautionary tale of greed and environmental destruction, the lovable Lorax tries to save the Truffula Forest and its inhabitants from disaster at the hands of the cantankerous Once-ler.

A Pig's Tale

Olivia Newton-John

Sal Murdocca (Illustrator)

ISBN: 0671787780

"Protect our dear earth. Don't throw it away. You, too, could make magic from garbage someday." Ziggy, a pig, and his pop, Iggy, live in a house that is filled to the rafters with all kinds of discarded items that Iggy has collected and saved. The piglets at school tease Ziggy that he lives in a dump. But jeers quickly turn into cheers when Ziggy's pop transforms all the junk into a wondrous creation. Perfect for every young recycler.

Compost Critters

Bianca Lavies

ISBN: 0525447636

Describes what happens in a compost pile and how creatures, from bacteria and mites to millipedes and earthworms, aid in the process of turning compost into humus through the stunning photos from this former National Geographic photographer. This book proves that nature's wonderful diversity can also be found and encouraged in any backyard.

My First Green Book

Angela Wilkes

ISBN: 0-679-81780-8

Features environmental activities and projects in such areas as water pollution, recycling, acid rain and wildlife gardens all in an oversized-book format and with beautiful full color photos.

Worms Eat Our Garbage: Classroom Activities for a Better Environment

Mary Appelhof, Mary Frances Fenton, Barbara Loss Harris, Daniel L. Dindal

ISBN: 0942256050

Information on composting and vermiculture.

What Can I Do?
Reading Comprehension Questions

1. What were Tyler and his classmates learning about in school?
 - a. division
 - b. American History
 - c. adjectives
 - d. protecting our environment

2. Why was Tyler upset when he went home from school?
 - a. He didn't know how to do long division.
 - b. He didn't think he could help our environment.
 - c. He wanted to go camping at the lake.
 - d. He was mad with his friends.

3. What did Tyler's Mom do to help him understand how he could help take care of our world?
 - a. She baked a birthday cake for him.
 - b. She wrote him a letter.
 - c. She told him a story about a boy on the beach.
 - d. She took him to the movies.

4. What did Tyler and his classmates do to share the story about the boy and the starfish?
 - a. They told the story at the Earth Day Assembly Program.
 - b. They took a field trip to the beach.
 - c. They baked brownies in class.
 - d. They invited a clown to juggle the Earth at the program.

5. What did Tyler's class ask the audience to do?
 - a. work division problems
 - b. write one thing each of them could do to help our world
 - c. clean up their houses
 - d. none of these

6. What is the main idea of this story?
 - a. We can all learn to work math problems.
 - b. We can all learn to speak Japanese.
 - c. We can all do something to help protect our environment
 - d. We can all cut out green leaves.

The story "What Can I Do?" is available at
<http://www.kidsdomain.com/holiday/earthday/cando.html>
Questions contributed by Linda Owens
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free for home, classroom, and non-profit use



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CHAPTER VI

CONCLUSION

In the day camp setting certain of the activities are appropriate as intensive workshops provided the emphasis be on the fun the creative and the locomotor aspects of each lesson. In a regular classroom setting I think the above three lessons can be broken down into an entire unit perhaps spanning nearly a month. In that case other activities would be engaged and elaborated upon. The lessons can be adapted from kindergarten to a 5th or 6th grade level and possibly beyond. For example, math and map skills can be incorporated for an older age group. In the watershed lesson, 5th and 6th graders can be challenged to understand topographic maps. If I had the opportunity to work with third graders I would focus on 2-3 new vocabulary words for mastery per week.

I highly encourage working in an outdoor setting whenever possible to break free from the academic atmosphere and because so much learning about the natural world comes from being immersed in Mother Nature. The combination of the informal teaching style, outdoor setting and interactive learning made learning appear to enjoyable for all children I had the opportunity to work with. The most significant insight I was able to gain from this experience was the importance of ending on a positive note even when working with a serious subject.

The importance of watershed education for children of all ages can not be underestimated. It gives children a sense of place and the ability to understand issues in their community. It can also teach them that their actions can and do make a difference in the real world and they have the power to help to solve problems. We need to empower

children with a sense of achievement and prepare them to be knowledgeable and competent future global citizens.



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