Environmental Scientist

Overview:
This lesson and activity are designed to give students hands-on experience using critical thinking skills.

Grade: 1

TEKS
Scientific processes
1.2 (A, B, C, D, E)
1.4 (A)
Science Concept
1.6 (B)
1.7 (C, D)
1.8 (A, B)
1.10 (A)

Literature
Starry Messenger
The Fall of Freddy the Leaf
The Wise Woman and Her Secret

Vocabulary
Scientific Method
Deductive Thinking
Bioassay

Materials
Discovery Book
Compass
Thermometer
Field Guides
Ziploc Baggies

Think Like A Scientist

Classroom Activity

1. Lateral thinking problems are a great way to help your students begin thinking about their thinking. State the problem as written below and only answer yes or no to your students' attempts to solve the problem.

   A man rode into town on Friday. He stayed for three nights and then left on Friday. How come?
   Solution: The man's horse was called Friday.

   Five pieces of coal, a carrot and a scarf are lying on the lawn. Nobody put them on the lawn but there is a perfectly logical reason why they should be there.
   Solution: They were used by children who made a snowman. The snow has now melted.

   A police officer was sitting on his motorcycle at a red traffic light when two teenagers in a sports car drove by him at 50mph. He did not chase them or try to apprehend them. Why not?
   Solution: The teenagers were travelling on the road that crossed the road that the police officer was on. They drove through a green light.

   A man was painting using an ordinary brush and paint container. Something startled him. He dropped the paintbrush and it fell on the ceiling, not the floor. Why?

Solution: He had been painting the walls of a miniature dollhouse, and had turned it upside down to make the work easier.

2. Lateral thinking puzzles are a great way to help students understand the concept of deductive thinking. Initially, students need help listening to each other's questions and possible solutions. Help your students think through the first lateral puzzle.
   Teaching Tip: Lateral thinking puzzles are great to use as rewards for the class.

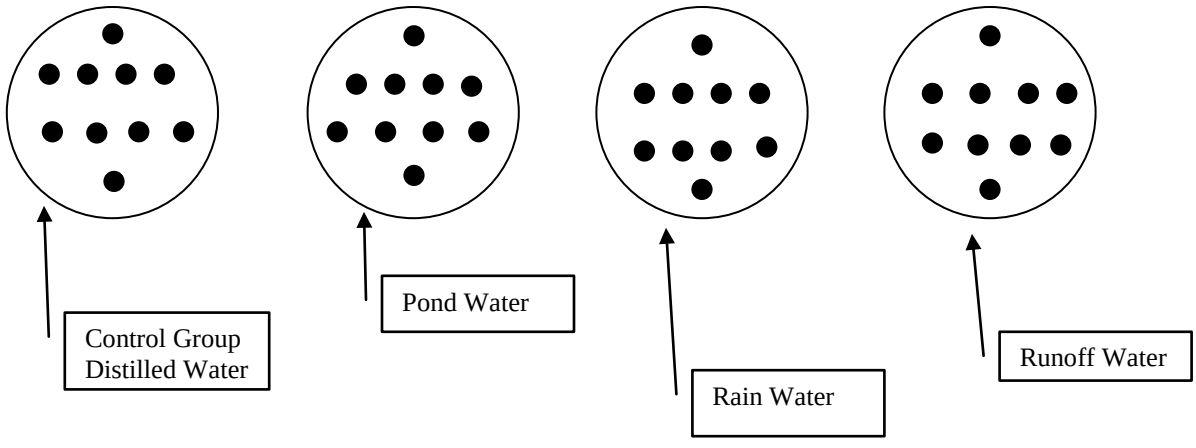
3. Explain to your students that scientists do the same thing as they seek to understand and explain how our world functions. Scientists use deductive (general too specific) or inductive (specific to general) thinking skills. For example, if a house has swing/play ground equipment in the backyard one can deduce young kids live in the house. Ask your students to think of other examples of deductive thinking. Write their ideas on the overhead.

4. Conducting a lettuce bioassay experiment is a good way to help your students begin to understand the scientific process.
   Bioassay: the testing of a substance with living organisms to determine its quality and potential harm to the health of humans and the environment.

   The experiment is based on the "canary in the coal mine" air quality test. Coal miners carried a canary in the mine as a way to monitor the air quality. If the canary died then coal miners deduced the air quality is contaminated and quickly left the coalmine. This experiment uses lettuce seeds as the living organism to determine the quality of water. Basically, the better the quality of the water the better the growth of the lettuce. Poor water quality will produce little or no plant growth. Therefore, one can draw conclusions about the quality of the water being tested.

5. You will need to collect water from several different sources. Collect about 1-liter of water from a pond, stream or storm water runoff from the street near your school. Label each container with the location of the sample and return to the classroom. Purchase a gallon of distilled water for the "control" part of the experiment.

6. For this experiment you will need a container for each sample of water. Plus, one container for the "control" group of lettuce seeds. In a plastic petri dish or a shallow container place a paper towel and pour enough sample water in to wet the paper towels. Place 10 **Butter Crunch** lettuce seeds in each container and cover the seeds with the plastic petri dish cover or use clear cellophane.



7. Carefully wrap each container with aluminum foil so the seeds are not exposed to light. Then place each foil-wrapped container inside a gallon ziploc baggie and seal the end of the baggie. This will keep the moisture inside the baggie and help the germination process.

8. Out of direct sunlight, place the containers in a safe location (at room temperature) for 5 days.

9. After 5 days, carefully open each container and make your initial observation. Did the seeds germinate? How did the control group do? What percent of seeds sprouted in each group?

10. Use the data sheet provide to record your observations. Count and record the number of sprouted seeds in each container.

11. Measure and record the length of each sprouted seed.

12. Ask your students to draw conclusions about the results of their experiment. Is there a difference between the control group and the other water samples? What action can your students take to help improve the quality of water?

13. Create graphs of the data and have your students draw conclusions about their experiment.

14. Close the lesson by reading Eve Merriam's *The Wise Woman and Her Secret.* Why are the people in the story not able to find the secret? Do you think Jenny will make a good scientist? Why?

In the Field

Think Like A Scientist

1. Prior to leaving your school make sure you have the following items.
   - Discovery Books
   - Ziploc Baggies (1 gallon size)
   - Pencils (inexpensive mechanical pencils are excellent)
   - Compass
   - Thermometer
   - Water
   - First Aid Kit
   - Sack Lunch or light snack
   - Camera
   - Backpack
   - Hula-Hoops

2. Before getting on the trail, remind students their observations and data collected will be used back in the classroom to create charts and graphs of their observations.

3. Set your behavior expectations before leaving the parking lot. Explain how students are to behave along the trail and in small groups. State specifically what behaviors you want to see along the trail. Remind students the higher their voices are the less likely they will see wildlife along the trail.

4. Distribute Discovery Books to students and record weather data observations. Teachers a gallon size ziploc baggie make an excellent container for pencils and Discovery Books during lunch or at the end of the day.

5. Walk through the gate and follow the trail. Remember to go slow and listen to your student's observations along the trail.

6. If you have enough adult supervision, divide your class into two groups. Have each group go in opposite directions along the trail. This will help reduce the noise level and also give your students an opportunity to share their observations when the class comes together at the halfway point. This is a good opportunity reinforce the idea that scientists share data too.

Post Eastman Activities

Think Like A Scientist

- Ask your students to discuss their experiences while at the Eastman Nature and Wildlife Habitat Center.
- Have your students create charts and graphs of the data they collected while at the Eastman Nature and Wildlife Habitat Center. Compare the Eastman data with the data collected at your school. Have your students draw conclusions about their observations.
- Create a "big book" about your class' experiences at the Eastman Nature and Wildlife Center.
- Invite a Biologist to visit your classroom and discuss the importance of observation skills.
- Students create an "Environmental Report" based on their Discovery Book observations.
- Write a Haiku about thinking like a scientist.
- Where's Waldo is an excellent and fun activity to reinforce observation skills. A recent study found that people that can easily find Waldo make good Biologists.
- Maintain an Environmental Journal for 1 school year.
- Read *The Fall of Freddy the Leaf* by Leo Buscaglia. Make connections with the plant life cycle. Did your students observe plants at different stages of their life cycle?

Lettuce Seed Bioassay

Date:_____ Time:_____

Container #1
How many seeds sprouted?_____
What is the length of the longest root?_____

Container #2
How many seeds sprouted?_____
What is the length of the longest root?_____

Container #3
How many seeds sprouted?_____
What is the length of the longest root?_____

Container #4
How many seeds sprouted?_____
What is the length of the longest root?_____

Resources

Publications

Starry Messenger by Peter Sis
The Fall of Freddy the Leaf by Leo Buscaglia
Tricky Lateral Thinking Puzzles by Paul Slone
The Wise Woman And Her Secret by Eve Merriam
Field Guide for the Eastman Nature Trail by Eric L. Taylor, Ph.D.

Web Pages

Bioassay
http://ei.cornell.edu/toxicology/

Fun Science Gallery
http://www.funsci.com/texts/index_en.htm

Termite Tracking Activity
http://www.accessexcellence.org/AE/ATG/data/released/0106-LanaHays/index.php

The Why Files
http://whyfiles.org/

The Lion King
http://www.lionking.org/lyrics/OBCR/CircleOfLife.html