

Reactions to the environment

4th Grade

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Benchmarks:

SLC 17: Students will describe how plants and animals react to changes in the environment.

Objectives:

Students will develop an increased awareness of the environment around them through an experiment in erosion; understanding of the interdependence of animals, people and plants in the rainforest by participating in an ecosystem simulation; suggesting ways paper and other natural resources can be used and recycled in the classroom; and conducting a hands-on investigation into paper use and make distinctions among observations, conclusions (inferences), and predictions.

Materials:

Day 1:

- A pie tin
- A squirt bottle
- Soil
- Leaves
- Twigs
- Small stones or pebbles
- Ruler
- Water

Day 2:

- Ball of yarn
- One 4" x 6" note card for each student
- Colored felt pens or crayons
- Scissors
- Long dowel rod
- Waste paper from the classroom
- Grocery bag
- Box
- Magazine
- Gift wrap paper
- Cards
- Newspaper
- Lunch bag
- Milk carton

Set Up:

A week before you do Day 2, have the students save all waste paper generated in the classroom (see classroom conservation below). If you provide a box for the paper to go into, you will probably save yourself some mess. Each day, assign a group of 2-4 students every day to separate the paper into two stacks: partially used paper (i.e. paper that has been used on one side only) and completely used paper (i.e. both sides have been used).

Day 1: Intro and Erosion

Initial Demonstration/Activity:

Have students list 10 things in their surroundings that are most important to them. Did air, water, or trees make the list? Probably not – they are often taken for granted.

Target Observations:

- My desk/pencil/school supplies are important to me
- The game boy/Pokemon cards in my backpack is important to me
- The jewelry my parents gave me/my hair style/my shoes/my clothes is/are important to me
- I did not list air, water, or trees on my list

Target Model:

-We often forget about having healthy air, trees, and water. We take it for granted.

Procedure:

Air, water, and land are increasingly being filled or contaminated by the things people throw away. There are several ways we can help contaminate things less, known as the Three R's: "Reduce, Reuse, and Recycle." Reduce means to reduce the amount of trash that you consume everyday, as well as reduce the amount of pollution you create. Biking or walking is a good example because it reduces air pollution, saves money, develops leg muscles, and promotes a healthy heart. Reuse means to use things over and over again, so they don't end up in the landfill or the water. For example, consignment shops and second-hand stores sell cool, inexpensive clothing that others have outgrown. Recycle means to reprocess materials that have already been used, but can no longer be reused. Paper can be recycled by washing, grinding, and remaking.

Have the students think or list what would happen to the soil if we allowed the earth to wash away. Discuss briefly what the word erosion means – erosion is the washing away of something like the soil or rock.

Target Observations:

- Riding your bike, buying second-hand clothes, and recycling paper can help reduce the amount of contamination of air, water, and land.
- If the soil was washed away, there might not be anything for the plants to grow in.

Target Model:

-We often forget about having healthy air, trees, and water. We take it for granted.

-The Three R's, Reduce, Reuse, and Recycle, are ways to help promote healthy air, land, and water.

-Erosion can hurt plant growth by washing away the soil.

Procedure:

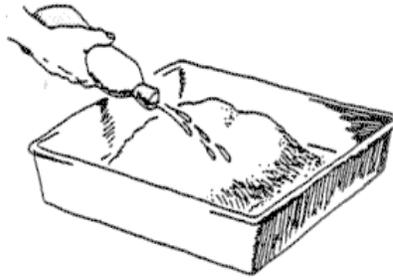
Erosion is the washing and wearing away of rocks and soil. Do you think that soil erosion varies on different land surfaces? What kind of soil might be least likely to erode? Why? What kind of soil might erode a lot? Why? What can people do to prevent this erosion?

Break the class up into groups of ~2-3, give each group the materials below, and ask them to design an experiment to test how erosion would work on several different types of soil: plain soil, rocky soil, soil with twigs and rocks, and soil with twigs, rocks, and leaves. How will you measure how well the soil is eroding? Of course, in an experiment students should make a prediction as to which soil type will erode the easiest/the hardest.

Target Experimental Procedure:

Materials:

- A pie tin
- A squirtbottle
- Soil
- Leaves
- Twigs
- Small stones or pebbles
- Water
- Ruler



1. Have students make a mountain of soil in the middle of pie tin. Build the soil up and measure the height. Record in the chart.
2. Squirt water on it. Observe what happens to your mountain when the water hits it. Re-measure the height and calculate the difference.
3. Rebuild your mountain. Add some small stones or pebbles to it.
4. Squirt water on it again. Observe what happens and re-measure the height. Record your measurements. Do the stones have any effect on the erosion?
5. Follow steps 1-4 as above adding sticks/twigs into your mountain. The twigs will act as trees. Do this again adding some leaves to the mountain

	Mountain height before rain	Mountain height after rain	Difference
Plain soil			
Soil with small stones			
Soil with stones and twigs			
Soil with stones, twigs, and leaves			

Target Observations:

- The plain soil eroded the easiest (i.e. it lost the most height after a few squirts)
- The soil with stones, twigs, and leaves eroded the least (i.e. it lost the least height after a few squirts)

Target Model:

- We often forget about having healthy air, trees, and water. We take it for granted.
- The Three R's, Reduce, Reuse, and Recycle, are ways to help promote healthy air, land, and water.
- Erosion can hurt plant growth by washing away the soil.

-Erosion happens the most with plain soil; when you place stuff in the soil, erosion happens slower.

Discussion:

Have the students discuss what this experiment could mean in the real world. The plain soil could be what happens to the land when humans cut down all of the trees. Discuss or have them list what other things are affected by trees being chopped down.

Day 2: The big picture and taking it into the classroom

Objective:

Students will demonstrate an understanding of the interdependence of animals, people and plants in the rainforest by participating in an ecosystem simulation.

Procedure:

Read *The Great Kapok Tree* by Lynne Cherry. Ask students to pay attention to the many animals that rely on the Kapok Tree for their needs. (Students will have already have a good understanding of most animals mentioned).

After reading, ask students:

- How important was the Kapok tree? To whom was it important?
- How do you think the animals in the story felt, when they saw a human who was bigger and stronger than them come to chop down their tree?
- In the end, who has the final say/power for what will happen?
- Think of some examples in our community where our ecosystem may be in danger.

Target Observations:

- The Kapok tree was very important to several different animals
- When the humans came to cut down the tree, the animals were sad that they were going to lose their homes
- Humans have the power to destroy or save the Kapok tree
- Pollution, littering, and car exhaust are examples of things that put our ecosystem in danger

Target Model:

-We often forget about having healthy air, trees, and water. We take it for granted.

-The Three R's, Reduce, Reuse, and Recycle, are ways to help promote healthy air, land, and water.

-Erosion can hurt plant growth by washing away the soil.

-Erosion happens the most with plain soil; when you place stuff in the soil, erosion happens slower.

-Ecosystems can be very interdependent – a tree can serve as a home for many different animals

-Ecosystems can be disrupted by pollution and destruction

Procedure:

Make cards from card stock paper of the following characters of The Great Kapok Tree in advance, or have students make the cards before the game is played:

Kapok Tree	Tree Porcupines
Tree Frogs	Jaguar
Boa Constrictor	Anteaters
Bee	Sloths
Monkeys	Yanomamo Tribe Children
Toucan, Macaw	

Write one character on each card, punch a hole in the two top corners of each card, and string a piece of yarn about two feet in length through the holes, tying a loop that can later be placed over the student's head. These cards will be worn by the students to identify their role clearly to the entire class while playing the game.

Have students draw role cards from a hat, and put them on so their roles are visible. Have the students form a circle. The student that represents the Kapok Tree stands in the middle of the circle, holding a long dowel upright, with 30 strings attached to it (use as many strands as are children in the class). As the narrator (teacher) recites the story, each animal introduced takes a strand of yarn from the "tree". This will form a "web of dependence" on the tree.

Narrator/teacher -

1. The boa constrictor lives in the Kapok Tree. He slithered down the trunk. The Kapok Tree is the boa's home. It has been home for our family for years and years. We are dependent on you for shelter.
2. The bees buzz around the Kapok Tree. They have built their hive in the tree. The bees fly from tree to tree and flower to flower collecting pollen. They pollinate the trees and flowers throughout the rainforest. The Kapok Tree provides a place for bees to build many hives.
3. The monkeys swing from vines to branches of the Kapok Tree. They are dependent on your vines to swing on. The Kapok Tree provides many vines to many monkeys to swing from branch to branch.
4. The tree frogs crawl on your leaves. Tree frogs need the leaves to hide from predators - so they can be camouflaged. Your leaves match our skin perfectly.
5. The jaguar also sleeps in the tree - he finds his lunch and supper in the Kapok tree. The Kapok Tree provides a home to the jaguar's prey - the animals that he depends on for food.
6. The porcupines swing down the Kapok tree from branch to branch:
"We need you for our OXYGEN. All animals - people included - need you to breathe!"
7. The anteaters climb down the Kapok Tree with their young clinging onto their backs. They say: "our children are dependent on you. You provide us with a home! Without you, our children have no future!"
8. The sloths began climbing down VERY SLOWLY from the canopy of the Kapok Tree. You are such a beautiful tree. On you, flowers grow and butterflies rest. You make the rainforest a beautiful place.
9. Two children from the Yanomamo tribe walked up to the Kapok Tree and said: "You provide shade for the forest floor, and a sturdy trunk for our family's home. On you we depend for fruits and other vegetation to eat."

10. Then the woodcutter came from the huge furniture factory. He came with a huge, heavy ax and began chopping the Kapok Tree down. Soon, the entire tree was chopped down.

Once all animals have been presented, the teacher (as a woodcutter) will cut the Kapok Tree down, cutting all "ties" from tree to animals. This action will represent "deforestation" and how it harms our ecosystem by creating an imbalance.

After all strings are cut have students answer the following questions.

1. How do you think the animals feel now that the Kapok Tree has been cut down?
2. What will happen to the animals?
3. What will happen to the people in the rainforest?
4. In a "community" – an ecosystem such as the rainforest – all living things are dependent on one another for food, shelter, and many other things. We share "resources" in our community to meet our needs, but we must be careful not to "use up" these resources - what resources will be left after the Kapok tree is cut down?

Target Observations:

- The animals are not happy that the Kapok tree has been cut down
- The animals will likely have to find a new home, or die
- The people in the rainforest will have to find new animals, since the ones by the Kapok tree will no longer be around
- Not many resources will be left after the Kapok tree is cut down

Target Model:

- We often forget about having healthy air, trees, and water. We take it for granted.
- The Three R's, Reduce, Reuse, and Recycle, are ways to help promote healthy air, land, and water.
- Erosion can hurt plant growth by washing away the soil.
- Erosion happens the most with plain soil; when you place stuff in the soil, erosion happens slower.
- Ecosystems can be very interdependent – a tree can serve as a home for many different animals
- Ecosystems can be disrupted by pollution and destruction
 - Destruction of a single part of an ecosystem web can affect a lot of other parts of the web*
 - Destruction of parts of an ecosystem can take away resources from the ecosystem*

Objective:

Students will be able to suggest ways paper and other natural resources can be used and recycled in the classroom. Students will conduct a hands-on investigation into paper use and make distinctions among observations, conclusions (inferences), and predictions.

Procedure:

At the end of the week, compare the amount of collected waste paper in the stacks the students have been sorting and ask students if the class is wasting paper? Is there a way to waste less paper?

Target Observations:

- There is more paper in the “partially used” stack than in the “completely used” stack.
- Some of the partially used paper could be reused to save paper

Target Model:

- We often forget about having healthy air, trees, and water. We take it for granted.
- The Three R’s, Reduce, Reuse, and Recycle, are ways to help promote healthy air, land, and water.
 - We usually throw away a lot of stuff that could be reused.*
- Erosion can hurt plant growth by washing away the soil.
- Erosion happens the most with plain soil; when you place stuff in the soil, erosion happens slower.
- Ecosystems can be very interdependent – a tree can serve as a home for many different animals
- Ecosystems can be disrupted by pollution and destruction
 - Destruction of a single part of an ecosystem web can affect a lot of other parts of the web
- Destruction of parts of an ecosystem can take away resources from the ecosystem

Procedure:

Give each group some of the reusable paper, pencils, and one of these articles: grocery bag, box, magazine, gift-wrap paper, cards, newspaper, lunch bag, or milk carton. Ask each group to list on the paper all the ways they can think of to reuse the article, or list alternatives to these items that could be used over and over again (e.g. reusable plastic containers instead of sandwich bags, thermos instead of milk carton, etc.). After ten minutes, share the ideas. Repeat the exercise with items commonly used in the classroom.

Target Observations:

- Grocery bags can be reused as trash bags or lunch bags
- Magazines can be reused as bedding for birds or hamsters
- Gift-wrap paper can be reused on another gift (if it is opened carefully!)
- Etc...

Target Model:

- We often forget about having healthy air, trees, and water. We take it for granted.
- The Three R’s, Reduce, Reuse, and Recycle, are ways to help promote healthy air, land, and water.
 - We usually throw away a lot of stuff that could be reused.
 - Many things can be reused for things that they were not initially made for.*
- Erosion can hurt plant growth by washing away the soil.
- Erosion happens the most with plain soil; when you place stuff in the soil, erosion happens slower.
- Ecosystems can be very interdependent – a tree can serve as a home for many different animals
- Ecosystems can be disrupted by pollution and destruction
 - Destruction of a single part of an ecosystem web can affect a lot of other parts of the web
- Destruction of parts of an ecosystem can take away resources from the ecosystem