Source: http://cte.jhu.edu/techacademy/fellows/ullrich/webquest/ScienceLesson.html

5 E Model Science Lesson

Indicator: Observe and describe the process of erosion, transportation, and deposition of the earth's land surface using natural phenomena and models

***State Outcomes*:**

Concepts of Science Nature of Science
Habits of Science Application of Science
Processes of Science Attitudes (develop throughout)

Objective: Students will observe and describe the processes of erosion, transportation, and deposition by creating a physical model.

Materials

- paint tray (the kind used for a paint roller)
- pieces of sod (enough for each group)
- potting soil
- heavy clay like soil
- Rainmaker (paper cup with about ten tiny holes poked in the bottom)
- Water

Engagement

Take students on a walk outside the school building and ask them to note where the soil is worn away or seems to have collected. Before going on the walk you may want the children to explain what they will look for or what are the signs that soil has worn away or built up? (Suggested answers may include: erosion - puddles, hollowed out areas, areas that dip or are lower that the surrounding area; deposition - mounds of dirt, collection of soil or other materials in a certain spot, etc.) Upon returning to the classroom make a list of the sites where soil was worn away or collected.

Engagement Examples:

- bottom of slide under swing
- end of splash guard by rain spout at entrance to door
- path leading to the playground at the bottom of hill/slope

Do you notice anything different about these areas? (They are just dirt; no grass is growing here.)

What do you think caused these changes? (Students walking over them; water running through it)

Exploration

Construct a model to investigate how these changes may have occurred. Provide materials so the students can construct their own model of a landscape. It should include a piece of sod, fine potting soil, and a heavy clay like soil. Have them use a paint roller tray as the base of the landscape. Do not put any landscape materials in the bottom well; it should remain empty. Once students have constructed their models have them diagram and label their models and make a prediction as to what will happen if it "rains" on their landscape.

One student pours a cup of water all at once into the rainmaker. Hold the rainmaker about 4 inches above the upper end of the landscape and slowly move it back and forth so the water "rains" down on the model landscape. Observe what happens to the landscape. When it is finished raining have the students observe the final effects of the rain on their landscape. Have students go back to their predictions and record what actually happened.

Explanation

Tell me what some of your prediction were before it rained on your landscape. (Record on board.)

What actually happened to your landscape when it rained on it? (record so you can make comparisons.)

How is your landscape different after the rain than before it rained on it?

What happened to the soil? Where did it go? Why did this happen?

As students share their ideas and understandings, record key phrases on the board. Some phases that may be valuable to your later discussion may include:

- dirt and soil washed away
- the soil collected at the bottom of the slope
- the water hollowed out the soil
- the rain carried the soil down the hill
- when the water washed away the soil it formed a hole

Relate their observations to the processes scientists observe over an extended period of time. Use student models to identify and label erosion and deposition. Have students work to create definitions for these terms. When you are sure students have a real understanding of the terms, formulate a final definition and post on board or chart in the classroom for future reference. Demonstrate the process of transportation and lead students to understand that it is the movement of soil particles from one place to another. Refer to the list generated during the engagement and

have students make connections; they should use the new terms to discuss and explain what they saw. Help them to understand that they just used water to simulate erosion, transportation, and deposition, but it can also be caused by wind, people, animals, etc.

Extensions

1. Using the same paint roller tray as the base for their landscape, have the groups of students plan a method to decrease or eliminate erosion. Students should draw a diagram of the model planned and label the materials used in their landscape. They should write a short explanation explaining why they think this will work to curb erosion. (Tell students that you will provide the same materials that they used today and they are responsible for supplying the rest of the materials to build their new landscape tomorrow.)

2. Have students use a variety of resources and references to research various landmarks that are the result of these processes (e.g. Grand Canyon, Mississippi River Banks, etc.). You can then lead a class discussion on the topic: Erosion and Deposition - Help or Hindrance?

Evaluation

1. Have photographs representing each process and have students identify and explain why they identified it as such.

2. Have students take a walk in their own neighborhood tonight to find examples of each process. They should draw and write one sentence telling what they observed.

3. Have students write their own definition and list an example for each process in their science journals.

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SIMPLE CIRCUITS

I. **MSPAP SCIENCE OUTCOMES**
   A. Students will demonstrate the ability to interpret and explain information generated by their exploration of scientific phenomena.
      1. Demonstrate that scientific knowledge allows us to make predictions.
      2. Demonstrate creativity in developing physical models.
   B. Students will demonstrate positive attitudes toward science and its relevance to the individual, society, and the environment.
      1. Recognize that everyone can do science.
      2. Demonstrate persistence.
   C. Students will demonstrate the ability to employ the language, instruments, methods, and materials of science for collecting, organizing, interpreting, and communicating information.
      1. Developing a testable hypothesis
      2. Explain findings orally or in writing.

II. **OBJECTIVES**
   A. COGNITIVE
      1. Students will be able to accurately define circuit by the end of the lesson.
      2. Students will be able to name and identify the parts of a simple circuits when given diagrams or the physical materials with 100% accuracy.
      3. Students will be able to correctly explain how a flashlight operates after having the opportunity to examine it with their peers.
   B. **PSYCHOMOTOR**
      1. Students will be able to construct a working simple circuit when provided with wire, a light bulb, and a battery.
      2. Students will be able to classify circuits as open or closed when presented with diagrams of various setups with 90% accuracy.
   C. **AFFECTIVE**
      1. Students will demonstrate perseverance as they attempt to construct a simple circuit.
      2. Students will display open-mindedness as they work with their peers to determine how a flashlight works.

III. **MATERIALS**
   A. Batteries
   B. Wire
   C. Light bulbs
   D. Circuit worksheets
   E. Transparency

IV. **PRESENTATION**

Source: http://cte.jhu.edu/techacademy/fellows/ullrich/webquest/ScienceLesson.html

A. **ENGAGEMENT**

1. Read section of Dear Mr. Henshaw by Beverly Cleary where Leigh Botts wants to build a burglar alarm on his lunch box.
2. How do you think Leigh might be able to build an alarm for his lunch box? (He could use wires and a bell. I think he would also need a battery for power.)

B. **EXPLORATION** (predicting, observing, communicating, inferring, constructing)

1. Today we are going to continue our investigation of electricity.
2. I am going to distribute to you a package of materials; using the wire, light bulb, and battery I want you to put them together to make the bulb light.
3. As I am distributing the materials, take out a piece of paper and draw a setup which you think will light the bulb. This is the setup you will test when you get together with your group. Be very specific with your drawing.
4. You may move into your group and share your diagram and ideas. After you have discussed this, you may begin to construct you setups to test them.
5. Be sure to note on your paper whether your setup worked or not. If your group did not have any working setups, continue to investigate and build one that does work. Draw a diagram of the working model.
6. I will walk around at this time asking questions of the students.
7. Why did you decide to do it that way?
8. Why do think that works/ does not work?
9. Can you design another setup that is different and will still work?
10. Is there anything special that you should know about the light bulb to make it light?

C. **EXPLANATION**

1. Have students share successes and failures by diagramming them on the board.
2. See if other groups have setups that are not listed.
3. Have students explain why they work.
4. Discuss the similarities of each model that worked.
5. Introduce the term "circuit" and define as the pathway from the energy source through the wire to the bulb and back to the battery.
6. Stress that it is a complete pathway without any breaks in it. Trace some of the successful diagrams to emphasize this.
7. Identify this as a simple circuit and label the parts (energy source, pathway, appliance).
8. Examine the diagrams of those that did not work and try to have the students determine why they didn't work. Ask questions as follows.
9. Is part of the circuit missing? (No)
10. Are they all connected? (Yes)
11. Then why isn't the bulb lit? (It is not in the correct order.)
12. How can we fix that? (Take suggestions from students and try them.)

13. Let's take a look inside a light bulb and see if we can understand this a little better.
14. Show transparency of light bulb paying particular attention to the filament.
15. Point out that the filament is connected at the bottom and the side, therefore the wires must be touching those two areas.
16. Why does the wire have to touch these areas? (It has to touch here to form a complete circuit for the energy to move through.)
17. Explain that a complete circuit that delivers energy to an appliance is called a closed circuit; use the analogy of a closed circle or an athletic track.
18. What would happen if I erased part of this circle? (It would be incomplete and we couldn't travel all the way around it.)
19. Yes, the same thing would happen in an electrical circuit; the energy could not reach the appliance.
20. This is called an open circuit.
21. To help you remember this you might think:
22. A **C**losed circuit is **C**omplete. (Both start with C.)
23. An **O**pen circuit is **I**ncomplete. (Both start with a vowel.)
24. Briefly tell them this is how a switch works, but we will study them later this week.
25. Show the students a flashlight, turning it off and on.
26. I am sure all of you have used a flashlight, but did you ever stop to think how it works?

D. **ELABORATION** (predicting, forming hypotheses, communicating)

1. I would like you to work with your group to determine how it works and be able to explain it using the terms we have just learned.
2. Distribute flashlights and allow groups to investigate how it works.
3. Each group should select a spokesperson to explain their group's theory as to how the flashlight works.
4. Identify groups with correct explanation.

E. **EVALUATION**

1. Distribute circuit worksheet and have students complete independently.
2. Put students back into groups and allow them to test the answers on their worksheet using the materials.
3. Ask if there are any unclear areas or questions which may have developed.

V. **SUMMARY**

A. Display a transparency of a simple circuit on the overhead and have students correctly label the parts.

B. Have students define open and closed circuit. (An open circuit does not provide a complete pathway for the energy , therefore the appliance will not work. A closed circuit provides complete pathway for the energy, therefore the appliance will work.)

VI. MODIFICATION FOR LEARNER DIFFERENCES

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5 E Model Science Lesson

Grade 4 - Unit: Investigating Space

Lesson Topic: Rotation of the Earth

Indicator: Use knowledge of science and available technology and materials to identify that the Earth is approximately spherical in shape like all planets and stars. The rotation of the Earth on its axis every 24 hours produces the night and day cycle. (AAAS, pg. 68)

Instructional Objective: Students will describe the shape of the earth and explain that the Earth's rotation causes day and night by participating in investigations.

Engagement

Share with me what you have learned so far about the solar system. About our planet Earth?

Tell the class a story about my neighbors who are from India and decided to move back home. We still want to keep in touch so we exchanged phone numbers. My problem is trying to decide what would be the best time to call them; when would they be available.

Exploration **(Concepts of Science, Nature of Science, Processes of Science)**

Shape of the Earth - What is the shape of the Earth? [sphere] What do you mean by that? Give me an example. Is a sphere the same thing as a circle? (Get students to understand that a sphere is a 3 dimensional object; a circle is only 2 dimensions. This is an important aspect as the lesson continues.)

Show students a grapefruit and ask if the shape is pretty close to spherical? Next push a long stick through the grapefruit and see if the students know what it represents. [axis]

What is the Earth's axis? [imaginary line through center of the Earth extending from the north to the south pole; it has a slight tilt]

What is the purpose of the axis? [Earth rotates around it like a top spins.] Have students demonstrate this motion by standing in place and slowly rotating. (Remind students to stay in one place and imagine they have an axis right through the center of their body.)

*Go over investigation before moving children into groups. Review safety issues: don't shine light in eyes and handle equipment properly - no throwing balls. Move students into groups according to color of name tag and distribute materials and directions. The number on the tag denotes their job during the investigation.

Directions

1. Student #2 selects a sphere and holds it in front of him/her.

2. Student #1 write the size of the sphere on the chart.

3. Student #3 turns on the flashlight and shines it on the sphere holding it about 8 inches from the sphere.

4. The group observes the sphere to determine about how much of the sphere is lighted. Make an estimation and student #1 records it on the chart. (whole sphere, half the sphere, just a slice of the sphere, etc.)

5. Student #4 holds up the second sphere and repeats the activity: #3 holds the flashlight, the group observes the amount of the sphere lighted, and #1 records the estimation on the chart.

6. Put the spheres back in the bag.

7. Discuss with your group why you think that much of the sphere was lighted by the flashlight. Write one sentence explaining this to your classmates.

After completing the investigation have students sit where they are with their group. Have a discussion about how much of the sphere was lit by the flashlight. Record responses on the board.

Question students about why they think this occurred. [Light spreads only to the widest part of the sphere; it can't bend around the curve of the sphere so the other half is dark or unlit.] Reinforce the difference between a sphere and a circle. Do you think the same thing will happen with a globe? Why or why not?

Distribute a globe to each group and have them try the same flashlight activity. [They should observe that again, only half of the sphere is lighted.]

Move all the students to a circle in the back of the room. Bring your globe and flashlight with you; put it on the floor in front of you and do not touch. (Collect the flashlight.)

Have a lighted lamp in the center of the circle (shade removed).

What does my light represent?(sun) How did you know? Note that it shines in all directions, unlike the flashlight which shines in only one direction.

Turn your globe so the USA faces the sun (lamp) in the center. What do you notice? [1/2 is lit.] Notice the half that is lit; what time of day would it be in the USA? [day] Don't move **t**he globe, but look at it and tell me about the countries on the other side of the Earth? [It is dark; it is night time.]What about at the edges where it is just fading into the darkness?[This is dawn or dusk.]

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When will the other side of the Earth have daylight? [When the sun shines on it.] How will that occur? [The Earth will need to spin on its axis until it moves into the sunlight.]

Have students spin globe until USA (North America) faces the student and India is in the sunlight. Now tell me what you notice. Explain.

Does this change from day to night occur all at once? [No, it is gradual.] What are the periods in between called? [dawn and dusk] Explain what it is like outside at those 2 times of the day.

Explanation **(Concepts of Science, Nature of Science, Habits of Mind)**

What have we observed as the cause of day and night? [The rotation of the Earth on its axis.] Do you think it matters which way the Earth spins? Explain.

Do you know where the sun rises? [east] Where does it set? [west]

Does the sun really rise and set? [No, it only appears that way because of the Earth's movement; the sun stays in the same place.]

Let's try something. First, find the US on your globe and point to the east coast of the USA. [Check to see that all students are pointing to the correct area.] Which direction would the globe have to spin for the sun to appear to rise over the east coast first? [from west to east or as the students are seated spin it from right to left] Give students an opportunity to investigate by moving the globe in different directions. Have students share their findings; demonstrate if no group has the correct answer.

Okay, put the USA in the night time position again (facing away from the lamp).

It is now midnight in the USA; how long would it take for the Earth to make a complete rotation with the USA returning to the position it is in now? (Tell students to think about the question while you demonstrate.)[It will take 24 hours to make a complete rotation.]

So how long is one day on the Earth? 24 hours

When we say one day is 24 hours, does that mean that we have daylight for 24 hours? (Use the globe to explain that during that 24 hour period the USA will experience dawn, daylight, dusk, and night time. Have the students help with this explanation.)

Are day and night exactly 12 hours each? [No, because it depends on the season.]

If it is 12 midnight in the US, what time would it be in India if it is half way around the globe? [12 noon] How do you know? [1/2 of 24hrs is 12 hours] Students do not need to know or state the exact time; it is sufficient to note that it would be daytime.

Give a few more examples: China/night - North America/day

Greenland/night - Australia/day

Japan/night - Brazil/day

Extension Activities **(Habits of Mind, Application of Science)**

Have students work to solve as time permits. They may use the globe and discuss this in their group, but each student is responsible for writing his/her own response.

Can you tell me what would be a good time to call my friends in India. Remember I don't want to wake them up in the middle of the night. Also, I can't call in the middle of the day because they work and I don't have their work number.

Tell me when I should place my call using USA time. Please explain why you decided on that time and how you figured it out.

Evaluation

Have students respond to the questions on the handout.

1. What is the shape of the Earth? Provide an example of this shape.

2. What causes day and night? Explain completely.

3. How long is the Earth's day?

4. When we are having daylight in the USA, what are the people on the other side of the Earth having? Why?

*** Maryland Learning Outcomes: Attitudes should be addressed throughout the lesson.**