I maintain that this is a natural learning progression. We all need to learn to "move around the circle". We sense and feel, we experience, then we watch and reflect, then we think, we develop theories we experiment. Finally, we apply what we have learned to the next similar experience. We get smarter, we apply experience to experience.

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Learning Cycle Lesson: The Earth Moves Under Our Feet

Exploration Activity 1
MATERIALS: jello, pan for the jello, and sugar cubes
PROCEDURE:
1. Hand out jello in a pan.
2. Move the pan back and forth on a flat surface.
3. Add sugar cubes on top of the jello and move the pan back and forth.
4. Repeat step three creating different structures with sugar cubes and move the pan back and forth.

QUESTIONS:
1. What does the jello and sugar cubes represent?
2. If you build the sugar cubes in different ways, do the structures hold up differently when moving the pan? Why?

What is the best type of structure that holds up in this activity? Please describe and explain why.

Exploration Activity 2
MATERIALS: A small cup (Dixie or Styrofoam), a penny, a nickel, and a quarter, sand and water.
PROCEDURE:
♦ Fill the small cup 2/3 the way full with sand.
♦ Bury half of each individual coin.
♦ Rotate the cup clock-wise while gently tapping it on the table.
♦ Slowly add enough water that the sand becomes moist but not soupy.
♦ Repeat steps two and three.

QUESTION: Does there seem to be more destruction of the area with the dry sand or with the wet sand?

Exploration Activity 3
MATERIALS: slinky, ping-pong ball
PROCEDURE:
1. Place the ping-pong ball in the slinky.
2. Have each person grab an end of the slinky.
3. Have one person push the end of the slinky toward the other person and record what happens.
4. Next lay the slinky on the floor and shake it back and forth. Then record how you observed the slinky moving.
5. Finally place the slinky on the floor and shake the slinky up and down. Record how you are seeing the slinky move.

QUESTIONS: What are the different motions of the slinky representing? Did your predictions match with your observations?

Application Activity: Shake Table
MATERIALS: A shake table (built according to instructions or your own ideas); Student Constructions (bridges, buildings, any model)
IDEAS FOR PROCEDURE:
1. Challenge students to build models of structures that they believe will stand up to the stress offered by the shake table in your classroom.
2. Provide each group of students with the same materials and challenge the students to build the strongest structure possible with those materials.
3. Have students build the same structure (house, bridge, etc.) out of varying materials (ex. clay, wood, metal, plastic). The students can then make predictions about how the different materials will fair under stress.

QUESTIONS: 1. What types of structures are fashioned in earthquake-prone zones? 2. What innovations have engineers developed to make structures in these zones better able to resist damage? 3. Based on your research, what type of structure would you want to inhabit during an earthquake?
Note about Application Activity
A shake table is simply a convenient, small-scale way to model an earthquake. There are several designs and levels of complexity in various shake tables. The purpose of using a shake table in the classroom is to model how student-built models might fare during a simulated earthquake. Using a shake table in the classroom could be a long-term trial and error exercise or a simple demonstration.

These sites provide several ideas for building and using a shake table in the classroom:
http://www.exploratorium.edu/faultline/ls/buildingsc.html
http://nceer.eng.buffalo.edu/schools/shtable.html

Proficiency Test Learning Outcomes
The Earth Moves Under Our Feet Lesson

Sixth grade:
• Makes inferences from observations of phenomena.
• Predict the influences of the motion of some objects on other objects.

Ninth grade:
• Describe the results of earth-changing processes.
• Describe changes taking place in the earth’s surface.

THE LEARNING CYCLE PHASES

Phase 1: Concept Exploration
♦ Activity-oriented
♦ Ample time is provided for activities
♦ Provides student-student interaction

Phase 2: Concept Explanation
♦ Concept is introduced as an outgrowth of observations made during the Exploration Phase
♦ Concept is named and defined
♦ Concept definition is related to each Exploration Phase activity

Phase 3: Concept Extension
♦ Concept is applied to a new situation (another student activity or teacher demonstration)
♦ Concept is applied to real life, everyday occurrences

♦ Website for Conference Paper: http://www.nku.edu/~scienceed (follow the links to faculty page for Yvonne Meichtry)
♦ Website of Learning Cycle Lessons: essc.calumet.purdue.edu/default.html
<table>
<thead>
<tr>
<th>Activity</th>
<th>PREDICT: What do you think will happen?</th>
<th>OBSERVE: What did happen?</th>
<th>EXPLAIN: Why do you think this happened?</th>
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Concept: