Ground Water: Construct a Model Aquifer
Based on Activity: Well, Well! (Badders, 2000)

1. Goal

Students will understand that one source of drinking water is ground water located in aquifers. Although aquifers are not visible, they do exist underground and are subject to pollution.

Objectives:

Students will understand

1) how aquifers are constructed,

2) how they process water, and

3) that they can easily become polluted.

Based on: Content Standards (California Department of Education website)
Earth Science: 3d. “Students know that the amount of fresh water located in rivers, lakes, under-ground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.”

2. Materials (for each group of 3 students)

- 1 liter (approx.) - Dry(or almost dry) Sand
- 1 - plastic container, shoebox size
- 30 cm. X 45 cm. - Wax paper
- pattern made from inside of plastic box
- 1 stick – modeling Clay
- 500 ml. Water
- 1/2 – straw
- 1 – metric ruler
- pencils, scissors

3. Vocabulary

Aquifer Porous(pore) Permeable/Impermeable
Water table Level of water table Recharging

3. Procedure

Opening:
1. Greeting – rearrange students to be in groups of 3.

2. Review from last lesson on water distribution:
   Where is water found? (Student response)
   a. Ocean
   b. Rivers & Lakes
   c. Atmosphere – What form is water in here? Water vapor – part of weather
   d. Glaciers – Do we have glaciers in California? Yes – Yosemite
   e. Ground water – How does water get there? How do we use it? (wells)

New Material Presentation:
1. What is “Ground Water”? Where is it found? (Student response)
2. Draw an aquifer on the white board, solicit ideas from students for its components.
3. Check on vocabulary: aquifer, permeable, impermeable, porous (pores)
4. Check on understanding of “models” as opposed to reality

Classroom Activities:
   Have students work in cooperative groups of 3 during a teacher-led guided instruction. Students will construct a model aquifer. Teacher will emphasize vocabulary words at key points. Teacher will demonstrate each step before students attempt it.
   1. Students should fill plastic box with 2 –3 cm. of dry sand.
   2. Students should add extra sand to narrow end of box to create a “hill”
      Hill will be 5 cm. tall (from bottom) and 5 cm. wide.
   3. Students will trace pattern onto wax paper twice and cut each one out
   4. Using ruler, students will draw a light pencil line across narrow edge of one wax paper piece at 23 cm.
   5. Give each student 1/3 stick of clay to manipulate and get warm
   6. Students should spread a thin layer of clay all over one wax paper piece from edge to the 23 cm. line
   7. Place wax paper/clay layer into box, with non-clay segment at the “hill” end
   8. Cover this layer with second piece of wax paper, pressing it into the clay
9. Students should use the pencil point to poke a hole through the wax paper and clay layers in the center of the box.
10. Students should insert the straw through the hole, making sure that the bottom sits halfway into the sand layer. This straw will be used to illustrate how ground water rises to the surface.
11. Students should use a small piece of clay to seal the area between the wax paper and the straw. Make sure that clay seals around the edges of the box and around the straw!
12. Students will now add water to the model. They need to create an indentation in the middle of the hill area with their thumb. Then they may add water slowly to the model, at the indentation, only adding new water when the previous water has been absorbed.
13. Students should watch the movement of water from the hill towards the straw.
14. Some students will see ground water rise up the straw (well) as the “water table” rises. Do not be surprised if this does not work for all models. There are many variables at work here, and the students gain a lot of knowledge just through construction of the aquifer.
15. Check on vocabulary: water table, level of water table, recharging

Evaluation and Assessment:
1. Throughout the lesson the teacher should expect that increasing number of students are able to offer correct answers to repeated questions
2. At the end of the project, the teacher should ask for reports from several groups, to have the experience summarized
3. Teacher should expect correct answers from some students to “stretching” questions

Student performance can be judged by:
1. Accurate construction of model

Upcoming Lesson
Where do we get our water here in Southern California?

Closure:
The teacher would offer a quick summary and comments reflecting on the class outcome. If there is time, the teacher should mention controversy surrounding local aquifers. In San Diego, the Gregory Canyon area is being proposed as a possible dumpsite. What are the dangers of this use, based on what we know about aquifers? Are aquifers subject to pollution? Arguments include:

1) It is our water supply,
2) Runoff from dump could infiltrate aquifer,
3) We need dump sites

Teacher should remind students that if they were adults they would need to have an opinion so that they could vote on this issue.

References


California Department of Education website, California State Board of Education, Grade Five, Science Content Standards, located at http://www.cde.ca.gov/be/st/ss/

