

Surface to Groundwater Interaction, Filtration and Usage

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Prepared for Canyon Hills Middle School Grade 6, El Paso, Texas, May 2007

Lab 1: El Paso Flood Modeling

Lesson Vocabulary

Drainage system, flooding, gradient, groundwater, runoff, surface water

Materials Required

Plastic bins

Screening

Gravel

Sand

Tin foil

Small model houses and/or additional structures (e.g., monopoly houses)

Spray bottles

Preparation

Depending on time allotted for this activity, flood models may need to be prepared before class. This includes: 1) making drainage holes at bottom of plastic bins; 2) cut and fit screen to the bottom of the bins; 2) put down layer of gravel and/or other base material; 3) cover with sand or clay material; 4) form desired surface topography

Safety Information

Flood models contain sand and rocks. Students should be instructed and monitored to keep materials inside models. Use of spray bottles to simulate flooding should be monitored strictly.

Engagement Technique

Students will be engaged by a demonstration on the flood models, which should include an introduction of vocabulary and an inquiry based investigation into what a model is.

Exploration

Step 1: Before class, prepare flood models.

Step 2: Instruct students in teams of 4 to 5 to develop city plan on surface. They must include houses, drainage system and roads. Show them an example development, but present them the challenge of doing better.

Step 3: Students will develop their city plans. They must write down a description of their plan, why they designed it that way and a hypothesis for what they think will happen. They must show the teacher their plan and write-up before they can continue with the experiment.

Step 4: One at a time, each team will present their model to the rest of the class. They will then test their models. The teacher will use spray bottle to simulate a rain/flooding event.

Step 5: Students will record the results and answer the discussion questions after the test.

Procedure:

Tell students that they will design, test and evaluate city flood planning. For the design phase, they will be given a pre-developed model of the local surface environment. This includes a plastic bin with visibly layered materials and an initial environment simulating the Franklin Mountains. They will develop a plan for building their community to deal with flooding from heavy rains and local mountains. This may include initial drawings and should involve discussion between group members.

They will then build their city on the surface of the model, developing a drainage system and housing developments. Then they will write a description of their plan and a hypothesis for what they think will happen to their city during flooding. This should include details about why they set it up the way they did.

Testing:

Each group will present its model and describe how they built it. The instructor will use a spray bottle to simulate a flooding event.

Explanation

A review or explanation of the results should be carried out in two ways. First, students should present their model and explain their design before the test and a dialogue of what is occurring should be addressed during the test. Second, each group will answer several questions regarding the results of their model and what could/should be done differently.

Elaboration, Extension

This exercise can and may need to be extended over 2 to 3 days. Some classes will need more time. Allowing students to carry out step 1 in class, including a discussion of the layered structure of the earth, may accommodate this. If enough supplies are available, step 2 and 3 could be performed during one day and step 4 and 5 could be finished up on the 2nd day. Students will address the question of how the model could be improved, how well it represents the local environment.

Evaluation

Each group will observe the results of the test on their model and answer questions addressing their observations. Students are assessed on effort put into city planning, and the discussion of their results.

Peer Review

The lesson plan will be observed by and reviewed by both co-teachers at the participating middle-school as well as the GK-12 program manager.

El Paso Flood Modeling

Names _____ Date: _____
Period _____

Answer the following questions:

Describe your city plan. Why did you design it the way you did?

What do you think will happen? What is your hypothesis?

What were the results? How did your model work?

How could the model be improved?

Do you think this model fits El Paso very well? If not, how could it be improved?