

## Where Does your Drinking Water Come From?

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Prepared for Bassett Middle School Grade 6, El Paso, Texas, April 2007

### TEKS Objectives

- 6.1 Science Processes. The student conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.
- 6.2 Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations.
- 6.3 Scientific Processes. The student uses critical thinking and scientific problem solving to make informed decisions.
- 6.4 Scientific Processes. The student knows how to use a variety of tools and methods to conduct science inquiry.
- 6.14 (B) Identify relationships between groundwater and surface water in a watershed

### References

Dr. John Walton, Civil Engineering faculty at The University of Texas at El Paso  
[http://www.epwu.org/conservation/well\\_in\\_a\\_cup.html](http://www.epwu.org/conservation/well_in_a_cup.html)  
<http://www.epwu.org/>  
[http://www.epwu.org/water/r\\_umbenhauer.html](http://www.epwu.org/water/r_umbenhauer.html)

### Lesson Vocabulary

Groundwater, surface water, aquifer, bolson, contamination

### **Day 1 -Water in the Desert**

### Materials Required

Water model (furnished by John Walton in the Engineering department), food coloring, various sizes of sand grains, mud, pebbles, funnels, dry erase markers, **PowerPoint presentation (PPT)**, **handouts** with statistics for El Paso's water resources

### Preparation

Prepare the water model, allowing for a steady flow of water. Have funnels with different grain sizes for porosity demonstration. Set up PowerPoint slide show. Set up mantle convection model according to Braile (2000) so the students will be immediately engaged upon entering the classroom.

### Safety Considerations

General lab safety

### Engagement Technique

When the students walk into the classroom they will be able to observe a model of the groundwater and surface water system in El Paso. I will show the students "injection wells" at different levels. Food coloring will be "injected" into the injection wells, and is meant to represent contaminants or

pollutants. I will ask students to predict where the contaminant will go by making a simple sketch. The students will then observe the contaminated water traveling up to the surface water system. I will then show a short PowerPoint presentation about contaminating agents, mentioning the importance of reading labels when disposing of chemicals. I will also mention the costs incurred during contamination clean up efforts.

### **Exploration**

So where does the drinking water in El Paso come from? Give the students a couple minutes to discuss with their groups where their drinking water comes from and share with the class.

### **Explanation**

Each student is then given a **list of statistics** on water supply in El Paso, and given a few minutes to examine the break-down drinking water sources for our community. The students will be asked to report their findings.

### **Elaboration, Extension**

If time permits, discuss the seasonal variation in water used from the Rio Grande.

### **Evaluation**

Students will answer the following questions:  
Where does the drinking water in El Paso come from?  
Why shouldn't we dump oil into the ground?

## **Day 2 - Groundwater Modeling Pumping and Replenishment**

### **Lesson Vocabulary**

Model, groundwater, precipitation, recharge, well, pumping, climate

### **Materials Required**

50, 10 ounce clear, flexible plastic cups (Solo TP10)  
50 lids for cups (Solo 600)  
50 2x3 inch piece of window screen (metal)  
Pebble sized grains to fill cups

### **Preparation**

Distribute the materials to each table. Prepare an activity check list.

### **Safety Considerations**

General lab safety

### **Engagement**

The students will see all the supplies on their desks and will probably start to ask “What are we doing?”, and “What is this for?” I will then tell them all the things on the checklist that the teacher(s) need to sign off on and explain how they can receive full credit on the activity. I will then define model and give examples.

### **Exploration**

Let the students try to set up models, before giving them the blue print. Let them experiment with the water and pipette. Eventually give them a diagram of the water cycle.

### **Explanation**

This time the students will explain to me what they are modeling. I will check off on precipitation, recharge, pumping. Students will explain what happens with continued pumping, but no recharge. I will then ask them to describe the situation if those conditions presided here in El Paso. How would the people living in this region be affected?

### **Elaboration, Extension**

Students will analyze and compare annual precipitation data for El Paso, and some kind of national or state average. They will understand that the annual precipitation in El Paso is less than average. I will ask them how that affects recharge. The hope is that students will learn to appreciate water resources and understand that they are limited.

### **Evaluation**

Students will hand in their completed check-lists with questions answered.

## **Day 3: Purifying water from the Rio Grande River**

### **Lesson Vocabulary**

Rio Grande River, Robertson/Umbenhauer Water Treatment plant, surface water

### **Preparation**

Signed parent permission forms  
Communication with El Paso Water Utilities contact  
Reserve school district bus & driver

### **Safety Considerations**

Our El Paso Water Utilities guide will provide safety information for students.

### **Engagement**

Prepare students for what they will see and hear on the field trip.

### **Exploration**

Students will learn about how water from the Rio Grande River is purified to become drinking water.

### **Elaboration, Extension**

Students will travel to the Rio Grande River to collect samples of river water, which they will attempt to filter the next day.

### **Evaluation**

The next day students will have to design a filtering system with the knowledge acquired during this field trip.

## **Days 4, 5 Purifying Water**

### **Lesson Vocabulary**

Rio Grande River, groundwater, surface water, brackish water, desalination plant, reverse osmosis

### **Materials Required**

Coffee filters, sand, silt, membrane, river water, chlorine tablets, charcoal

### **Preparation**

Distribute materials to student desks.

### **Safety Considerations**

General lab safety

### **Engagement**

Ask the students to recall steps for purifying water that they learned yesterday. Tell them to experiment with the materials, and design the best filtering system. Explain the **rubric/checklist**, which includes design of filter, list of steps and their effects, and demonstration.

### **Exploration**

Let the students figure out ways to use these materials to purify water that they collected from the river.

### **Explanation**

Students will demonstrate their filtration systems to me and explain how they work.

### **Elaboration, Extension**

With the base expansion, El Paso will add more than 40,000 new residents. Let's review our resources: Rio Grande, Hueco Bolson, Mesilla Bolson, and a great volume of brackish water.

Hopefully the students will suggest using the brackish water. We will then talk about the desalination plant, and I will do a demo on osmosis, and show images on reverse osmosis.

### **Evaluation**

Students will hand in their completed checklists for the filtering activity.