ANCIENT EGYPT - *Crop Irrigation*

LESSON PLAN

Objective:
Given two variables to manipulate, the student will construct and test an irrigation system with a goal of reaching a wheat yield of 95% or higher.

Course / Grade Level:
Middle school general science (Grades 6-8)

Pre-Activities:
- Study the unit on fluids in motion.
- Study the watershed management portion of your ecology unit.

Activity Procedure:
1. Have the students organize in groups of 2 or 3 per computer and go to the *Water Flow* activity in the *Time Engineers* game (use the drop down menu to get to the activity). Let them listen to the audio explanation section and read the information section for that activity.
2. Make copies of the *Recording Sheet* (next page) for the students. Have them add the following headings:

   WEIR WIDTH, WEIR HEIGHT (%), WHEAT YIELD (%), COMMENTS

3. Have the student do the activity keeping the weir width at a constant number while varying the weir height. Tell them to vary the weir height as many times is needed to achieve 95% yield or your maximum possible yield given the width you started with. Have them record the results of each trial and comments on the sheet provided.
4. Once they achieve at least a 95% yield have them graph the results with their computer or on graph paper provided by the teacher. Remember the independent variable, weir height (cm), is on the x-axis and the dependent variable, wheat yield (%), is on the y-axis.
5. After they are done graphing, have them change the weir height to 50% as a constant and adjust the weir width as the independent variable. Once again they should strive for the 95% yield and record and graph their results. The independent variable now is weir width (cm) and the wheat yield(%) is the dependent variable.

Discussion / Questions:
- Which of these 2 variables, weir width and weir height, would be the easiest and most practical to control? Explain.
- What would be the optimum combination of weir width and height if you were advising the Pharaoh? Explain.

Extensions:
- Using a 5 to 10-gallon drink cooler with a spigot at the bottom you can keep open, determine the flow rate in ml/sec for every 15 seconds. Devise a method to allow the water to flow into another container that is calibrated in 100 ml units. Another drink cooler or a white 5-gallon bucket works well for this. What did you observe about the flow rate as the water level in the higher water cooler decreased?
- What purpose do water towers serve in your community?

TIME ENGINEERS™

Recording Sheet
