

## Using Online Simulations (Center 1)

Online simulations can be a good way to introduce or reinforce a concept by allowing students to test variables in experiments without physically setting up the experience in the classroom. An experiment common in classrooms is to plant a bean or other seed in multiple pots and then apply various levels of water, light, and/or fertilizer to determine the effect of these variables on the growth of the plant. There are several online simulations related to this type of experiment.

At this learning center, you will use several online simulations to try your hand at setting the correct variables to grow a plant. Because all of these simulations were developed in the United Kingdom, they are also potential tools for exploring the metric system and the conversion of metric units into U.S. standard units, if that is a student objective at your grade level. Most science curricula now use only the metric system for experiments. If that is the case for your curriculum, you can use the simulations to reinforce your students' understanding of metric units as well.

### Instructions

1. Before starting the simulations, record your hypotheses regarding the amount of each variable (e.g., water, light, heat) needed for the ultimate level of plant growth. Then test your hypotheses using the simulations.
2. Use the chart at the end of this handout to record your predictions and the actual values you found using the simulations. You will use the data you collect to finalize the budget for the project, as the cost of water, food, and light (if you are using artificial light) may all come into play. In the Center 3 spreadsheet simulation, you will record these data to calculate the cost of your garden.
3. Each simulation has an introduction or instructions to explain how to operate it. You should spend some time familiarizing yourself with how things work before playing the simulation.
4. Once you have completed the simulations and filled out your chart, be sure to take it with you to Center 3. If you have already visited that center, you may want to modify the Google Docs spreadsheet you created there to reflect the data you collected at this center.

### Plant Simulation Sites

#### Helping Plants Grow Well

This simulation on the BBC website allows users to test different amounts of heat and water on plant growth. The site also provides a quiz about plants and plant growth.

[http://www.bbc.co.uk/schools/scienceclips/ages/7\\_8/plants\\_grow.shtml](http://www.bbc.co.uk/schools/scienceclips/ages/7_8/plants_grow.shtml)

#### Science Zone

This simulation is part of a website constructed by a teacher at Woodlands Junior School, Tonbridge Kent, United Kingdom. This section of the school's website has homework help and links to many online resources for science learning. When you go to the website, you will see interactive science games for many topics. Select "Plants" and then scroll down until you see the icons for the interactive games and activities. Select the game "Growing Cress." This game illustrates what happens to plants under four variations of conditions and then provides an interactive quiz at the end.

<http://www.woodlands-junior.kent.sch.uk/revision/science/index.html>

## Using Online Simulations (Center 1), cont.

### Plant Force

Plant Force is a more sophisticated simulation. It allows the user to add amounts of heat and water to support plant growth and calculates the cost of those resources versus the value of the plant. A tutorial for using the game is available; when you go to the website, click on the arrow to advance from Screen 1 to Screen 9. Once you have completed the tutorial and recorded your hypotheses, you will be ready to play the game.

The object of this simulation is to maximize the value of your plant versus the cost of the resources to grow it. A graph shows the relationship between the variables and the value of the plant over time. The value is displayed in British pounds, so the simulation also provides an opportunity to learn more about place value and currency exchange rates as well as the metric measurement of water and heat energy. (Or you can just assume that the costs are in American dollars!)

<http://puzzling.caret.cam.ac.uk/game.php?game=plants>

### The Great Plant Escape

This website, created by the University of Illinois Extension, is designed for students in grades 4 and 5. It includes a teacher's guide and is available in both English and Spanish. The site is not actually a simulation, but it provides another interesting student resource for a unit on plants.

<http://urbanext.illinois.edu/gpe/index.cfm>

### Other Sites

If you know of other online simulations regarding plant growth, feel free to use those sites as well. If you have time, you may also want to do some research of your own to find other online simulations appropriate for your students.



