UNITED STATES BOTANIC GARDEN
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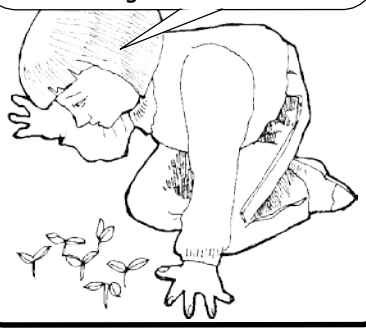
CONDUCTING AN EXPERIMENT Science Page

MAKE AN OBSERVATION

I spilled a packet of seeds on the ground. They all sprouted, even though I didn't cover them up. I wonder if some seeds sprout better in light than in darkness?



DO BACKGROUND RESEARCH

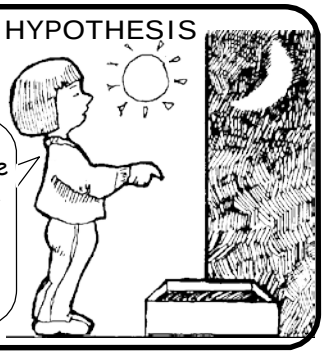
This article says that some seeds do germinate better in light, and other seeds germinate better in darkness.

ASK QUESTIONS

I wonder if these tomato seeds will germinate better in light or in darkness?

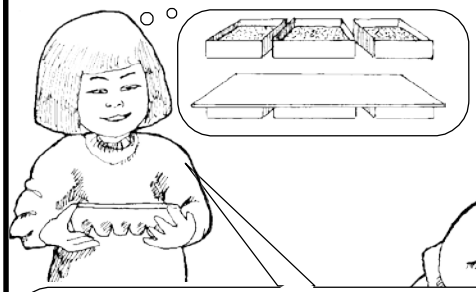
FORM A HYPOTHESIS

I hypothesize that these seeds will germinate better in light.



DESIGN AND CONDUCT AN EXPERIMENT TO TEST YOUR HYPOTHESIS

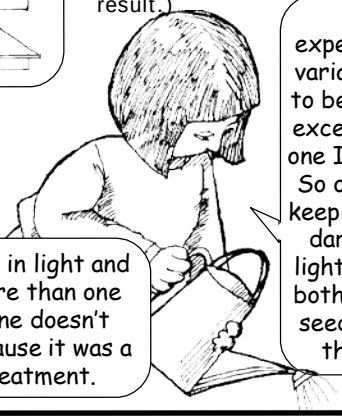
Replicate treatments



I need two groups of seeds — one in light and the other in the dark. I need more than one seed in each group, because if one doesn't sprout, I won't know if it was because it was a bad seed, or because of the treatment.

Control variables

(A variable is any factor in the experiment that could affect the result.)



In my experiment all variables need to be constant, except for the one I'm testing. So other than keeping them in darkness or light, I'll treat both groups of seeds exactly the same.

TRY AGAIN

All the seeds in this group dried up. I'll have to try again, but this time I'll make sure all the seeds in both groups stay moist.

COLLECT AND ANALYZE DATA

I need to count and record how many seeds in each group sprout.

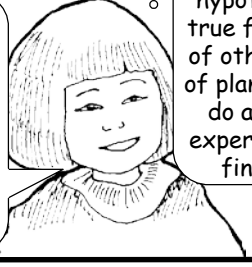
Does your experiment work?

No

Yes

DRAW CONCLUSIONS

25 out of 30 seeds germinated in the light. Only 10 out of 30 germinated in the dark. My experiment supports my hypothesis.



I wonder if my hypothesis is true for seeds of other kinds of plants. I can do another experiment to find out!

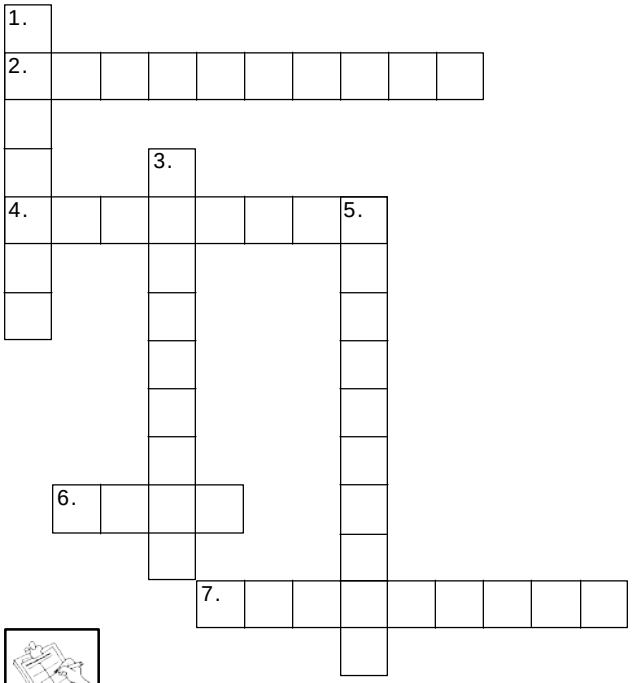
CROSSWORD PUZZLE

Across

2. and 4. What you must do to find out what others have already discovered. (2 words)
6. What you should record during an experiment.
7. What you need to control in an experiment.

Down

1. What you do when you look carefully at something.
3. What you should do to each treatment group to make sure results are due to treatments.
5. A prediction.



TRY THIS

SEED GERMINATION IN LIGHT AND DARKNESS

In this activity, you will form a hypothesis, and design and conduct an experiment to test your hypothesis.

What you need

* plastic sandwich bags
* seeds to germinate, such as tomato, corn, bean, or cucumber seeds
* paper towels
* water
* aluminum foil
* paper and pencil

What to do

1. Choose one type of seed to test for germination. Based on what you have read and observed, form a hypothesis about whether the seeds will germinate better in light or in darkness. Write down your hypothesis.
2. Design an experiment to test your hypothesis. Decide how many seeds you will include in each treatment (light versus dark), how often you will check your seeds, how you will control variables, and how you will record your data.
3. Set up your experiment and observe your seeds for a week or more, depending on the type of seed you choose. Carefully make observations (count the number of seeds that germinate in each treatment group), and record your observations.
4. If something goes wrong in your experiment, then figure out a better way to do it, and try again.
5. Once you are satisfied that you have designed your experiment well (that is, you have included replicates and controls), and you have collected your data, then you can analyze your results. Figure out a way to present your results to others. For example, you may want to draw a graph or a picture, and you may want to summarize your results in writing.

SPOTLIGHT ON RESEARCH

An experiment that went "wrong"

During World War II there was a shortage of rubber in the U.S., so the government asked big companies to have their engineers and scientists try to develop a synthetic rubber. A scientist at General Electric by the name of James Wright was working on this problem. He accidentally spilled boric acid into silicon oil, and discovered a substance with very unusual properties. It could not be used as a rubber substitute, but it bounced higher than a rubber ball. It broke when given a sharp blow. It stretched, yet snapped. When pressed on comics in the newspaper, the ink transferred to it, and the comics could then be stretched out. Samples of this new material were sent to 12,000 engineers around the world. They could find no practical use for it, but they loved playing with it! A marketing expert by the name of Peter Hodgson bought the production rights for the substance for $147.00. He packaged it in plastic eggs, and it became wildly popular as Silly Putty!

Source: Silly Putty. Inventor of the Week. Lemelson-MIT Program, Massachusetts Institute of Technology. Retrieved November 2003 from <http://web.mit.edu/invent/iow/sillyputty.html>

QUOTE

"The important thing is not to stop questioning. Curiosity has its own reason for existing."
Albert Einstein