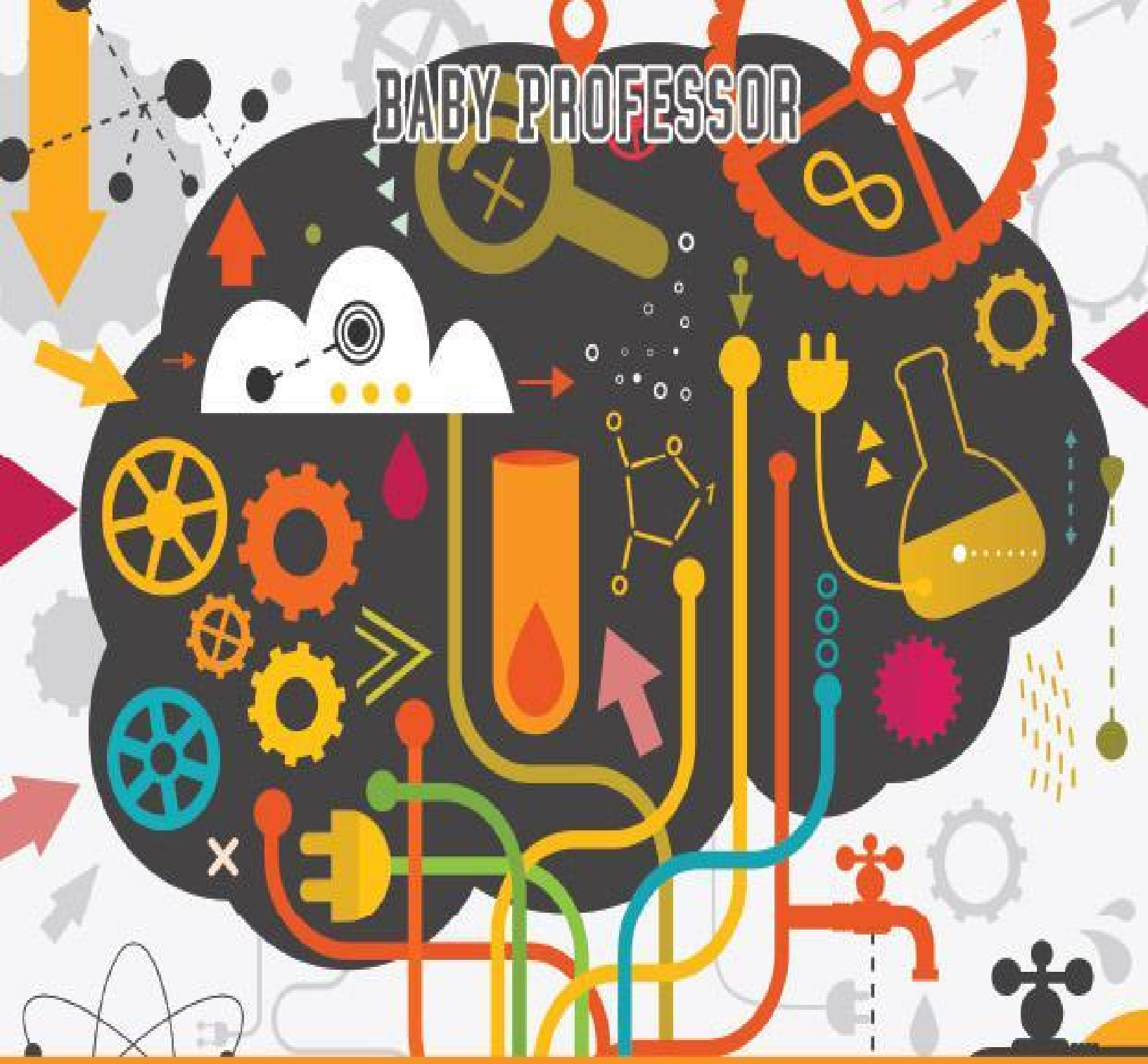
BABY PROFESSOR



WHAT IS THE SCIENTIFIC METHOD?

SCIENCE BOOK FOR KIDS | CHILDREN'S SCIENCE BOOKS

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SCIENCE BOOK FOR KIDS
CHILDREN'S SCIENCE BOOKS

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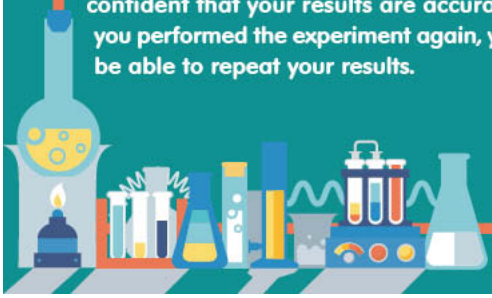
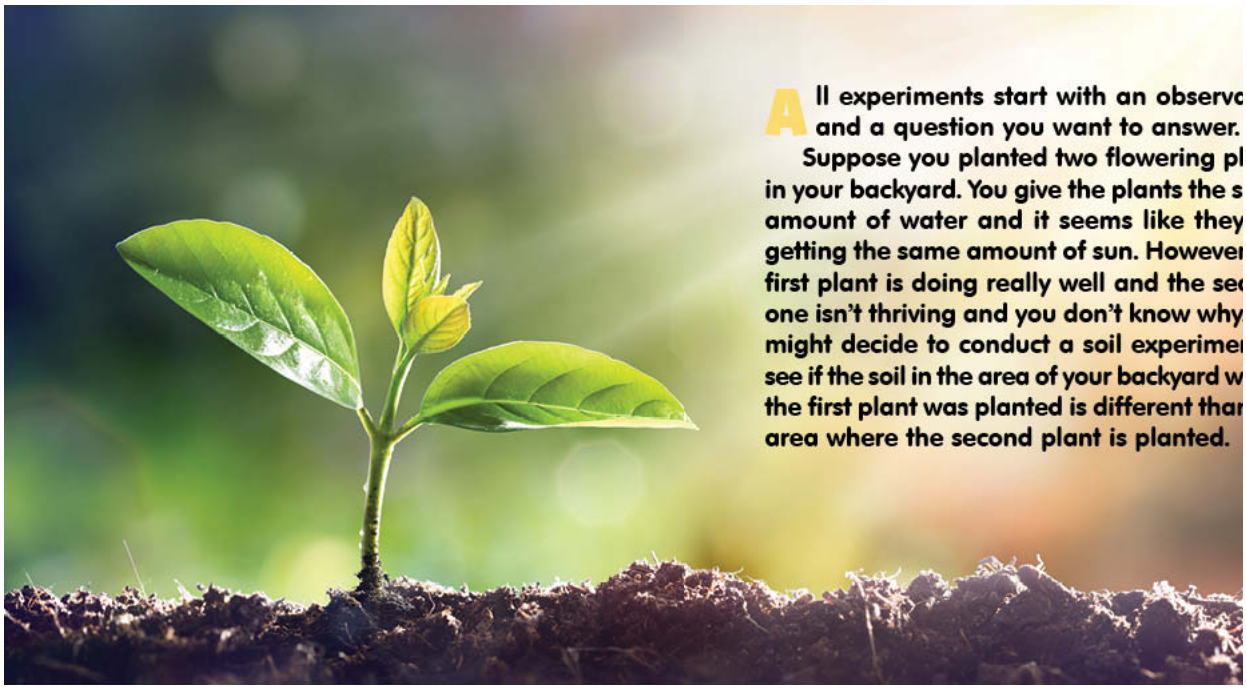
In this book, we're going to talk about the scientific method. So, let's get right to it!

WHAT IS THE SCIENTIFIC METHOD?

The Scientific Method is a system that scientists use to create and try experiments. The process is designed to minimize errors in experiments. If you follow the steps properly, it helps you feel confident that your results are accurate, and if you performed the experiment again, you would be able to repeat your results.

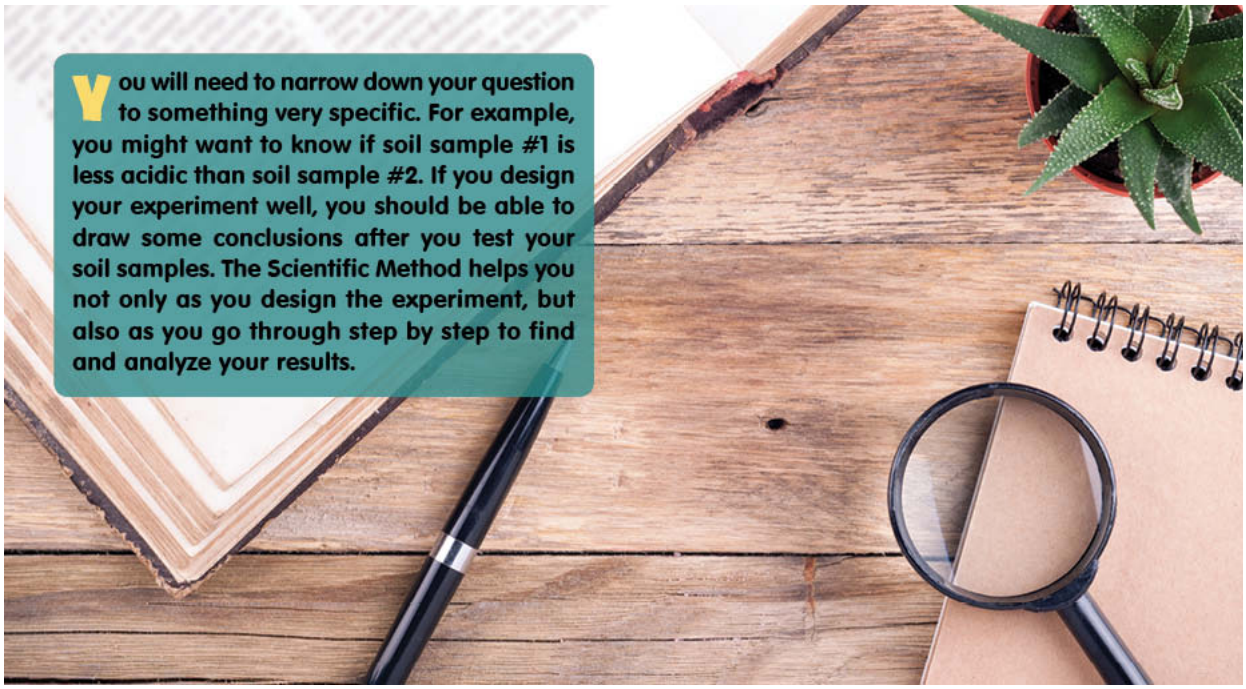


FEMALE SCIENTIST WORKING IN LABORATORY



All experiments start with an observa and a question you want to answer.

Suppose you planted two flowering pl in your backyard. You give the plants the s amount of water and it seems like they getting the same amount of sun. Howeve first plant is doing really well and the se one isn't thriving and you don't know why might decide to conduct a soil experime see if the soil in the area of your backyard w the first plant was planted is different tha area where the second plant is planted.

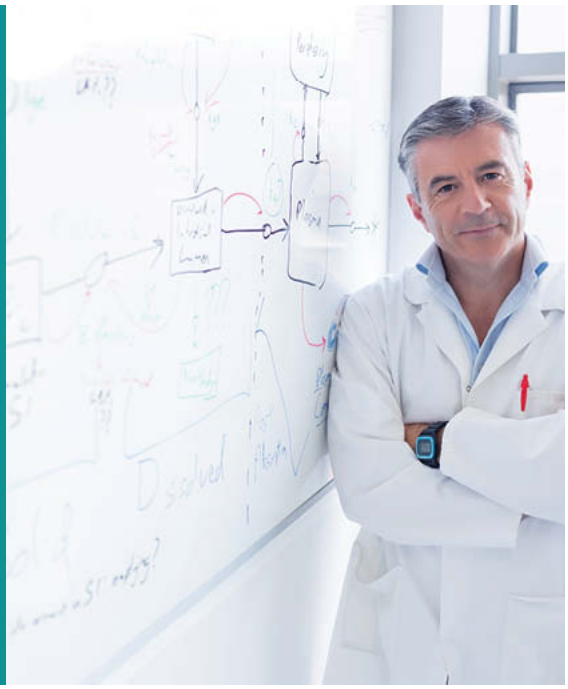


You will need to narrow down your question to something very specific. For example, you might want to know if soil sample #1 is less acidic than soil sample #2. If you design your experiment well, you should be able to draw some conclusions after you test your soil samples. The Scientific Method helps you not only as you design the experiment, but also as you go through step by step to find and analyze your results.


The Scientific Method uses a step-b
step logical process. It eliminates th
need for just guessing and gives you
method to obtain facts and data to pro
or disprove your theory or hypothesis.
THE THEORY OF RELATIVITY, ALBERT EIN

THE HISTORY OF THE SCIENTIFIC METHOD

The method we know today as the Scientific Method wasn't invented by just one scientist. The process was proposed by different scientists. It was discussed and debated for many centuries until it became a standard that all scientists use.

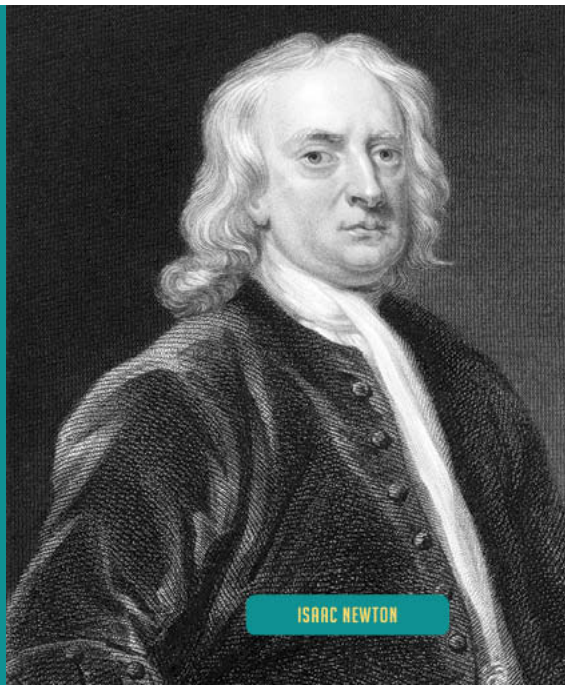


Many scientists contributed to the tho
process behind the Scientific Metho
there were three in particular who contrib
a great deal to it. They were:

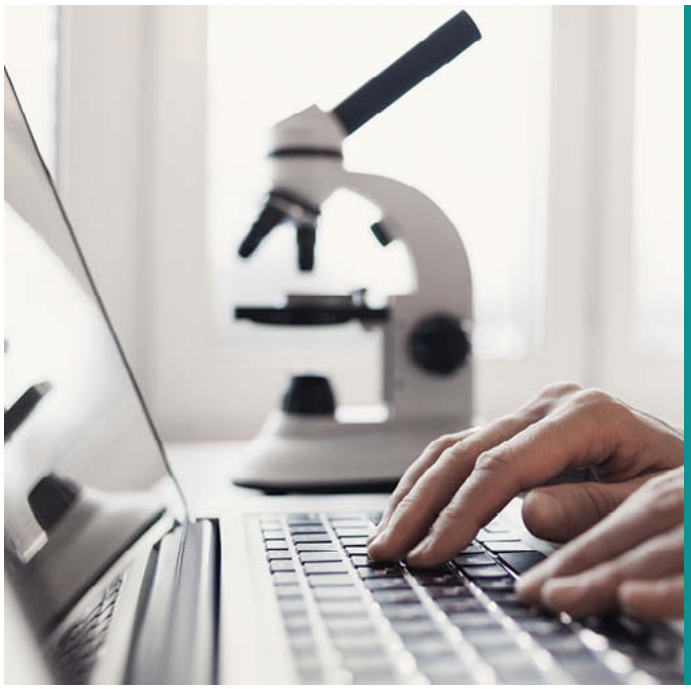
- Francis Bacon (1561-1626), who wa
English philosopher
- Rene Descartes (1596-1650), who wa
French mathematician and scientis

- Isaac Newton (1643-1727), who was an English astronomer and physicist

Scientists continue to refine the ways in which they create and conduct experiments, but the structure and process they follow has been standardized and is followed by scientists around the world.

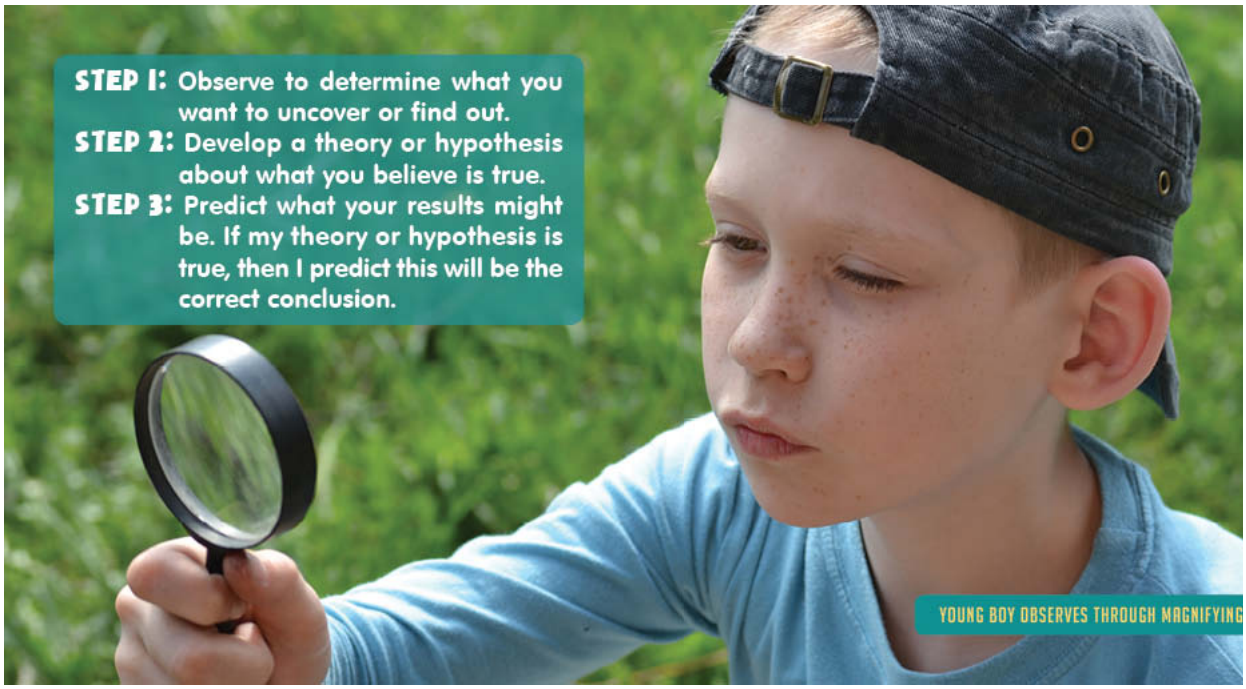


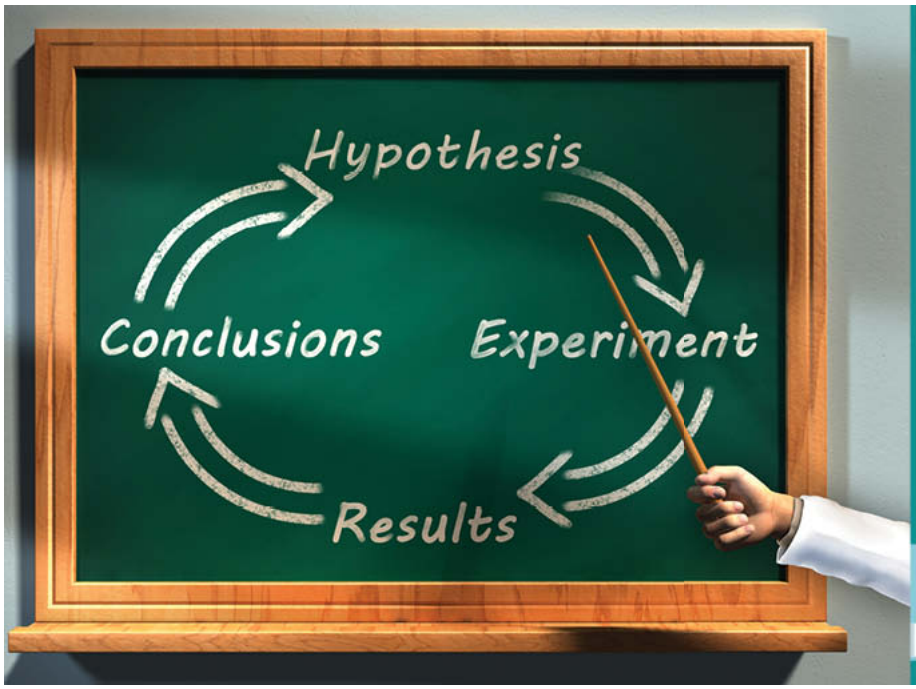
ISAAC NEWTON



STEPS IN THE SCIENTIFIC METHO

The Scientific Method is based on a logi
procedure of steps so that you can co
to a conclusion once you've performed y
experiment. It helps you to organize y
thinking and your resulting data.


STEP 1: Observe to determine what you want to uncover or find out.
STEP 2: Develop a theory or hypothesis about what you believe is true.
STEP 3: Predict what your results might be. If my theory or hypothesis is true, then I predict this will be the correct conclusion.
YOUNG BOY OBSERVES THROUGH MAGNIFYING



STEP 4: Conduct the expe
that you have desi
test your hypothes
STEP 5: Organize and analy
findings and summ
conclusion.

This may seem complicat
after you've conducted one
experiments using these gui
it will become second natur

OBSERVATION

This step usually involves research. After you have chosen a specific topic for your experiment and a detailed question that you want to answer, you'll need to research as much material as possible about it. For example, for the plant experiment, you'll want to know all the factors that could possibly impact the growth of your plants.

BOY CHECKING YOUNG SEEDLING PLANT

GREEN PLANTS AND SCIENTIFIC EQUIPMENT IN BIOLOGY LABORATORY

You might want to know
about the biology of the
and the factors that lead to
growth. You might want to co
whether something is happe
one plant and not the other th
obvious from direct observati
think it might be a difference
soil, but is there anything el
could be causing the proble

There are many different ways to research any topic you're interested in for your experiment. If you are performing some of your first experiments for science class, you can gather research from books, the internet, and people who have knowledge about the subject, such as teachers, librarians, and other experts. You can even use smaller "experiments" you have tried that might give you ideas on how to put together your more formal experiment.

PUPILS DOING SCIENCE EXPERIMENT WITH A TEACHER IN CLA

HYPOTHESIS

Now that you have completed the rese and "brainstorming" portion of your thin it's time to propose a theory or hypothesi your experiment. You want this hypothes be simple and clear. Let's use the plants in backyard as an example.

OBSERVATION: All other factors being equal, does the soil acidity affect the growth of plants?

HYPOTHESIS: "I think that the soil sample from plant 1 will be less acidic than the soil sample from plant 2 since plant 1 seems to be growing better than plant 2."

ANALYSIS OF SOIL SAMPLES UNDER MICROS

This hypothesis is based
fact that most plants don'
as well in highly acidic soil th
acidic soil. It's also based on t
that the sunlight and water the
are receiving appear to be the
and the plants don't seem t
any diseases or insect pests.

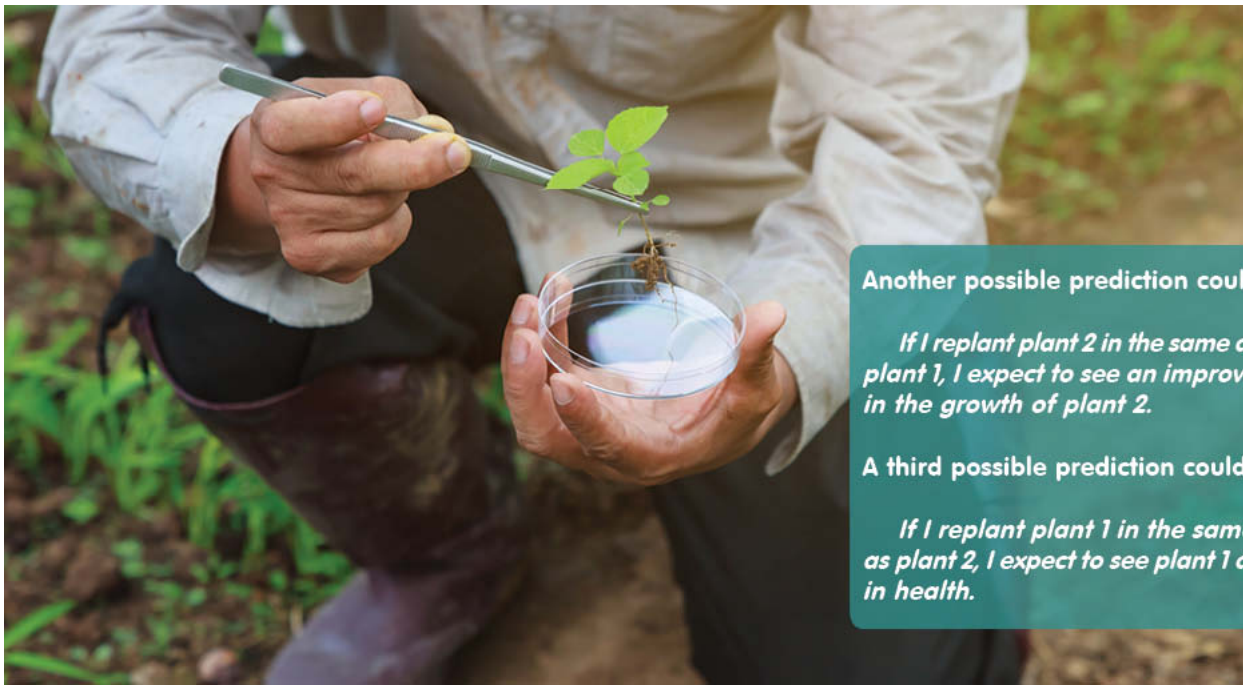
Your well-thought-out hyp
should give you a concise i
what you think is happening
the process of your observati

PREDICTION

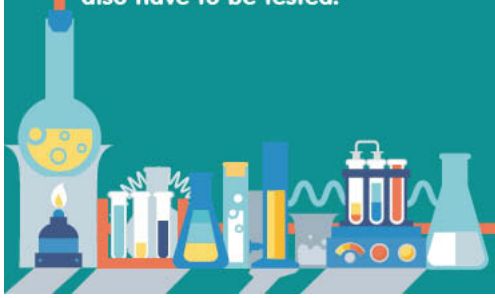
At this stage of the process, you will want to create a prediction that you can test. For example, with the experiment we've discussed, one possible prediction could be:

If I test the soil under plant 2, I expect it to be 20% more acidic than the soil under plant 1.

WOMAN BIOLOGIST HOLDING TEST TUBE


Another possible prediction coul
If I replant plant 2 in the same
plant 1, I expect to see an improv
in the growth of plant 2.
A third possible prediction could
If I replant plant 1 in the sam
as plant 2, I expect to see plant 1
in health.

The prediction you decide upon will help you to decide how you are going to conduct the experiment. It's very important to remember that if your prediction doesn't turn out to be true, it doesn't mean that your experiment has failed. It just means that your experiment may have brought some other facts to light that also have to be tested.



SCARED YOUNG SCIENTIST LOOKING AT THE OVERFLOWING FOR

In fact, some of the great scientific discoveries of all ti have happened when speci theories and predictions ha been proven by experimentati that they were NOT correct. Wh this happens, scientists mu dig deeper and approach th experiment or experiments in different way to discover n truths and form new hypothes

A prediction that turns o false doesn't mean that you ha failed as a scientist!

EXPERIMENT

Now it's time for the actual experiment to start. You decide to go with your first prediction. You are going to run a test on the two soil samples to see if the sample under plant 2 is 20% more acidic than the soil under plant 1.

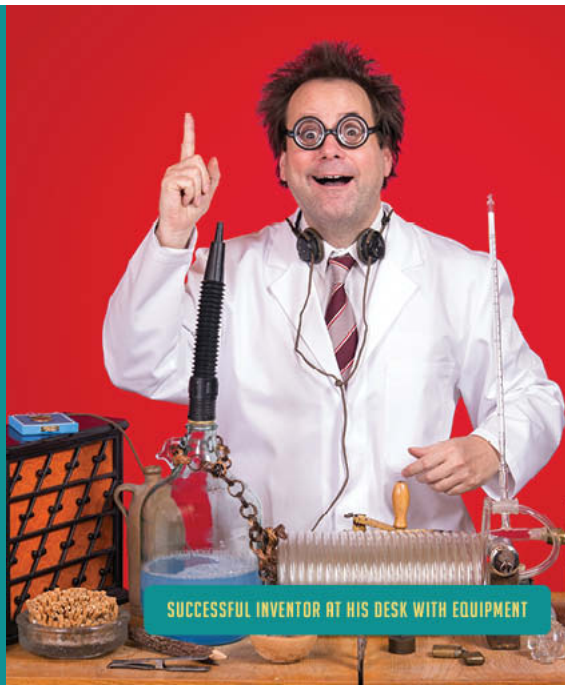
You perform the experiment and you're very surprised at the results you get.

You discover that the soil under plant 2 is actually less acidic than the soil under plant 1! In fact, the two soil samples only vary about 3% in their acidity.

ANALOG TOOL TO MEASURE SOIL PH

Your original prediction is incorre
Remember, you haven't failed. It j
means that the variable you thought v
causing the problem, a possible variar
in the soil, may or may not be causing
problem. Perhaps this type of plant thri
in a soil that's more acidic. It's possible t
if you make the soil more acidic, the pla
will do even better! You'll have to go b
to the drawing board and think about w
other variables might be causing plant 2
not be growing as well as plant 1.

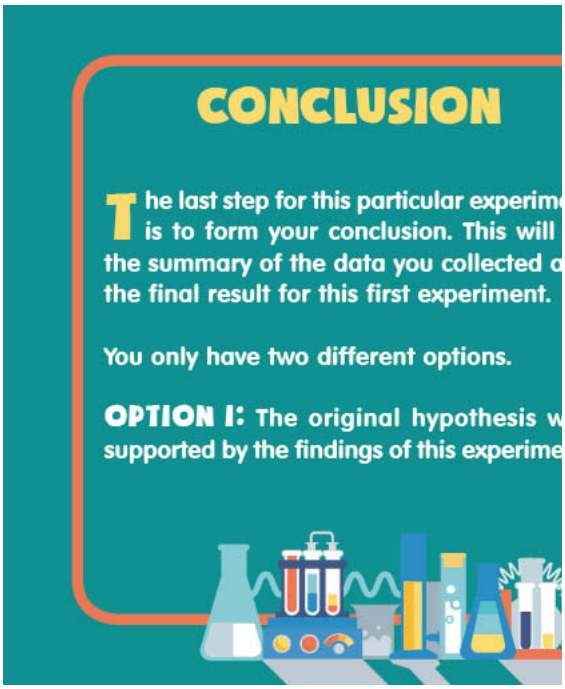
It's important to remember that it's rarely possible to prove a theory by conducting just one experiment. The idea is to test and refine, test and refine, and test and refine again, until you have enough data and feel absolutely certain that another scientist would get the same results that you did if he or she conducted the same experiment.



SUCCESSFUL INVENTOR AT HIS DESK WITH EQUIPMENT


SHELVES FULL OF F
Master scientists keep careful records of their data so that others can study their results and try to prove or disprove their theories.

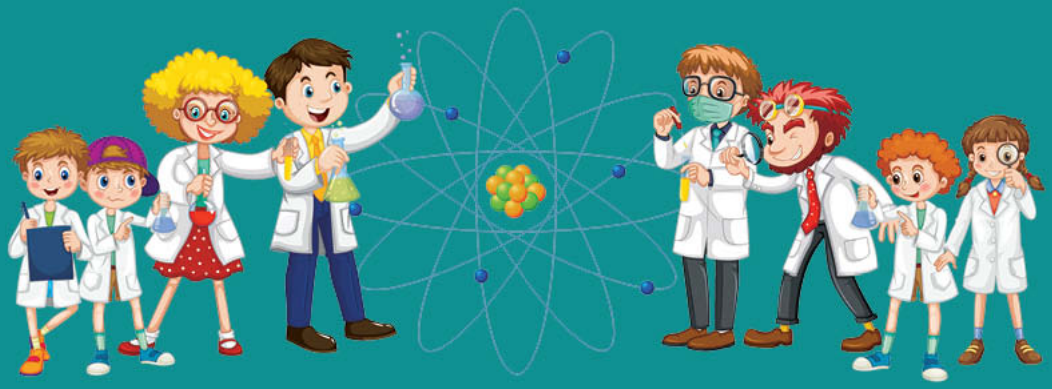

Conclusion


CONCLUSION
The last step for this particular experim
is to form your conclusion. This will
the summary of the data you collected a
the final result for this first experiment.
You only have two different options.
OPTION I: The original hypothesis w
supported by the findings of this experime


OPTION 2: The original hypothesis was NOT supported by the findings of this experiment.
The important thing to remember is that even if your results had supported your original hypothesis, it doesn't mean you would have proved your hypothesis to be true. Experiments can always have flaws so you have to repeat an experiment more than once to prove your findings and other scientists would have to be able to get the same results you did too.

An experiment is only a failure if it doesn't control the variables you want to test or doesn't provide data that helps you to answer your original question.

Awesome! Now you know more about the scientific method. You can find more Science books from Baby Professor by searching the website of your favorite book retailer.



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