



## **The Scientific Method**

Note: this is for the Investigation type of project (experimental or observational study).

### ***Step 1: The Initial Question***

Look around you. Look outside. Take a walk and observe the environment. What do you wonder about? Are there any questions about the world you want to ask? This is the perfect opportunity to find your own answers. Once you have formulated some kind of question, conduct research to form the overview or big idea. Brainstorm some possibilities and narrow it down to one specific question that will provide the basis for the purpose of the experiment.

Stuck inside the house? Visit our cyber Greenhouse and explore the nature of our world as it changes alongside human action and other natural occurrences.

(provide link to our web layout of the different environmental categories)

An example of a question could be “Do sunflowers need sunlight to survive?”

### ***Step 2: A Hypothesis For You***

Now that you are curious about something, make a prediction or an educated guess from what you know and have researched about so far! You can make a prediction by using the old-age traditional scientific statement: “If \_\_\_\_\_ then \_\_\_\_\_.” Be sure to include why you think this will happen; be specific.

For example “If a sunflower does not receive any sunlight then it will die.”

### ***Step 3: Determining the Variables***

- Determine the controlled variables (these must remain the same).
- Determine the manipulated variables (these are independent).
- Determine the responding variables (these are dependent).

If we use the example above, the sunflower, as well as the amount of water it receives, are the controlled variables, the amount of sun it receives is the manipulated variable, and the way the sunflower reacts to different amounts of sunlight is the responding variable.

### ***Step 4: Before the experiment, comes the Materials***

So you've got a game plan, your next step is to make a list of what you need to gather in order to carry out your experiment. Ask your parents, guardians or teachers for help if you cannot get something on your own. Some things to consider are what kind of materials do you need and how much do they cost? If you can get them from home or borrow them from school, make sure you ask for permission. Your parents or teachers might also know other adults that have access to some of these materials at a cheaper cost or even for free. Check community resources that may also have them lying around as donations or left-overs (community recycling centre, Goodwill, etc.).

For the sunflower example, you would need sunflowers, pots, water, soil, and something like a boxes that can be used to control the amount of sunlight the sunflowers receive.

***Step 5: The Procedural Engagement:***

List the specific and detailed steps that you will follow. This is the planning stage and crucial for your own experiment, but it also exists so that anyone can repeat the exact experiment. During the experiment, you may make many changes to your original plan; if so, make sure you re-visit your written procedure and make the necessary edits. Remember, you want to be able to prove your discovery to other scientists. Seeing is believing, so a curious person must experience the same answers you received.

You want to record everything, the amount of sunlight and for how long, how much water the plants received, how long sunlight was allowed for each plant (if any), what was used to block out sunlight. Remember, in science nothing is considered proven until more than one scientist is able to produce the same results from the experiment. If you make a big discovery, you will want to make sure it can be duplicated once it is published.

***Step 6: For the Love of the Experiment:***

During the experiment, pay close attention to the details. It is important to record all of the data in a log book. This log book should be similar to an informal journal entailing all of the steps and observations you make from the moment to ask yourself the initial question until the time you stop your experiment.

If the sunflower did die, how long did it survive for without the sunlight? 1 day, 2 days?

***Step 7: The Big Conclusion***

You have finally arrived at the end of your experiment! But wait, you're not completely done! Now what? What do the final results mean? What did you find out about the experiment or learn from it?

For example, "sunflowers cannot survive without sunlight." Could this perhaps lead to another experiment to find out if other plants are able to survive without sunlight? If so, the judges may like to hear your future plans as well. It shows your genuine interest in your topic and your desire to continue to study it.

Interpret and organize the results from your experiment in graphs and charts so that it is easily comprehensible. Present the information on a display board (<http://www.nsis.ca/display-tips>). Prepare a presentation for the audience and judges. You've just made a discovery about the world we live in; blow the audience away with your creativity and knowledge! It is your time to share your hard work and present yourself as a new, young Scientist! Be enthusiastic, professional, and above of all, have fun!