

How to follow the 'Scientific Method'

Depending on the competition topic, required tasks and your year level (see your current competition guidelines), you may be asked to design an experiment and follow the 'Scientific Method' in order to answer a research question.

The most important thing to consider when designing your own experiment is to follow the organised thought process scientists use, called the 'scientific method'. (http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml).

This method aims to discover cause and effect relationships by asking questions, carefully gathering and examining the evidence, and seeing if all the available information can be combined into a logical answer.

The method is generally broken down into a series of six major steps which can be repeated or backtracked during the experimental process as new information is discovered.

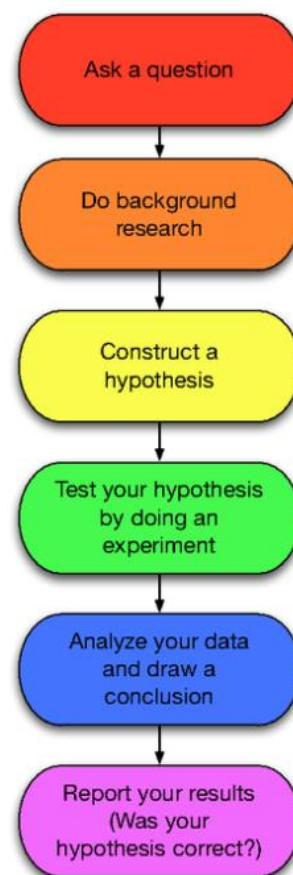
The major steps are listed in the flow diagram to the right and include:

1. **Ask a question** - what do you want to find out by doing your experiment? (eg. How, What, When, Who, Which, Why, or Where?)
2. **Do background research** - what can you find out about your question by using library and internet research to help you discover the best way to do things and not make mistakes.
3. **Construct a hypothesis** - a hypothesis is a guess about how things work based on the background research you have done. What do you think the outcome of your experiment will be? A good hypothesis allows you to then make a prediction: "If _____ [I do this] _____, then _____ [this] _____ will happen." Predictions must be able to be measured.
4. **Test your hypothesis by doing an experiment** - what procedure will you use to answer your question and test your hypothesis? What type of data will you collect? It is important for your experiment to be a fair test. You conduct a fair test by making sure that you change only one factor at a time while keeping all other conditions the same. You should also repeat (or replicate) your experiments several times, or grow several pots of plants with the same treatment to make sure that the results you obtain aren't just an accident. You must be sure to collect data regularly along the way using your science journal. Data you may want to collect could include: measurements, weather conditions, observations, photos, drawings etc.
5. **Analyse data and draw a conclusion** - once your experiment is complete, you take the collected results (graphs, photos, tables of measurements etc.) and analyse them to see if they support your hypothesis or not. Even if your hypothesis is not supported it is important to communicate what was learned during the experiment (as this can be the beginning of another question or hypothesis and more experiments to find the answers!). Your findings are the most important part of this experimental process.
6. **Report results** - share your data and conclusions. This can be done in the form of a report, poster, or electronic media. Most scientific reports (whatever form they are presented in) follow a formal format including a title, abstract, introduction, materials/method, results, discussion/conclusion, references/bibliography and appendices. When reporting, it is important to present and discuss your results and what they might mean. You could maybe answer questions like: Did it support/not support my hypothesis? Are the results surprising? Does the data bring up new questions? What would I do differently next time?

Our DAF scientists perform experiments on a regular basis and follow the 'scientific method' in order to answer their research questions.

We would like you, as Australia's future scientists and agriculturalists, to develop skills in following the scientific method too!

The Scientific Method



Throughout the process of performing your experiments, you should keep a science journal containing all of your important questions, hypotheses, ideas, research, observations, data and other relevant information. This journal will be important to refer to when you are reporting your results. (http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml).

