

Variables



Your NameDate.....

In science, a carefully controlled experiment must be set up in a way that allows a fair comparison between things that you are finding out about. To experiment means to carefully control equipment and conditions so that any hypothesis you make is based on reliable evidence.

Today's research question is: what is the effect of the size of a jar on the burning time of a candle? We must carefully set up an experiment so that we have a fair comparison between different jar sizes.

To make this a carefully controlled experiment, we must decide the one **manipulated variable**. This is the variable you decide to change (manipulate) and is related to your research question. In this experiment, the manipulated variable is the size of the jar.

Next you must state your **dependent variable**. This is the thing that changes in response to your manipulated variable. You measure this or make other relevant observations. In this experiment, the dependent variable is the time it takes for a candle to burn. You must design your experiment so that you can measure the dependent variable and so be able to answer your research question.

Then you must identify all the controlled variables. These could vary, but you as experimenter must control them so they don't. Controlled variables would include things like:

- Size of candle and wick
- Air temperature
- Starting air quality in each jar.

Method:

1. Gather the equipment, measure and record the size of each jar
2. Light the candle, place the jar as shown in diagram 1 and commence timing. Record.
3. Repeat step 2 twice.
4. Repeat steps 2 and 3 for the other two jars.

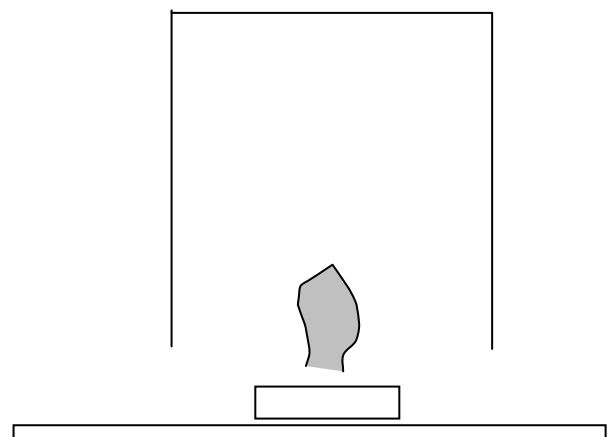


Diagram 1: a candle burning inside an upside-down jar.

Part 1. **Purpose** of the text

Find the key ideas from the text, and their meaning in the context of the experiment. **Organise** below.

a. Title (purpose)

Key word(s)

Meaning in context

Part 2. **Synthesise** some inferences in response to the following questions.

a. Why must all the **controlled variables** be kept the same through your experiment?

b. What would happen if you had two **manipulated variables** at once?

Part 3. Experiments in real life

a. If your group finds a certain variable does affect the reaction time, and another group finds that the same thing does not affect this, who is right?

b. Can you total believe the results of one small experiment?

Part 4. Generate a table of results

Experiment Checklist

- a. Discuss with your group what things interest you about reaction time. Spend five minutes brainstorming, and write a list of at least ten things you could investigate.
- b. Decide what your research question will be. It must be specific.
- c. Write down a list of variables in a table like this:

Manipulated variable	Dependent variable	Controlled variables
		(write as many as you can think of)

- d. Write down the equipment you need, and draw your experimental design.
- e. Write down what you predict will happen, and why.
- f. Draw up a results table. **Have all this checked by your teacher before commencing.**

When your experiment is finished, include points a to f in your report and make a title page.

- g. Discuss what happened.
- h. Is this the same or different from your prediction?
- i. What have you found out that you didn't know?
- j. How could you improve your experiment?
- k. What hypothesis can you come up with, based on your results?
- l. What can you do to test your hypothesis?

Part 5. Communicate and apply your understanding of the key words by completing the following exercise. □

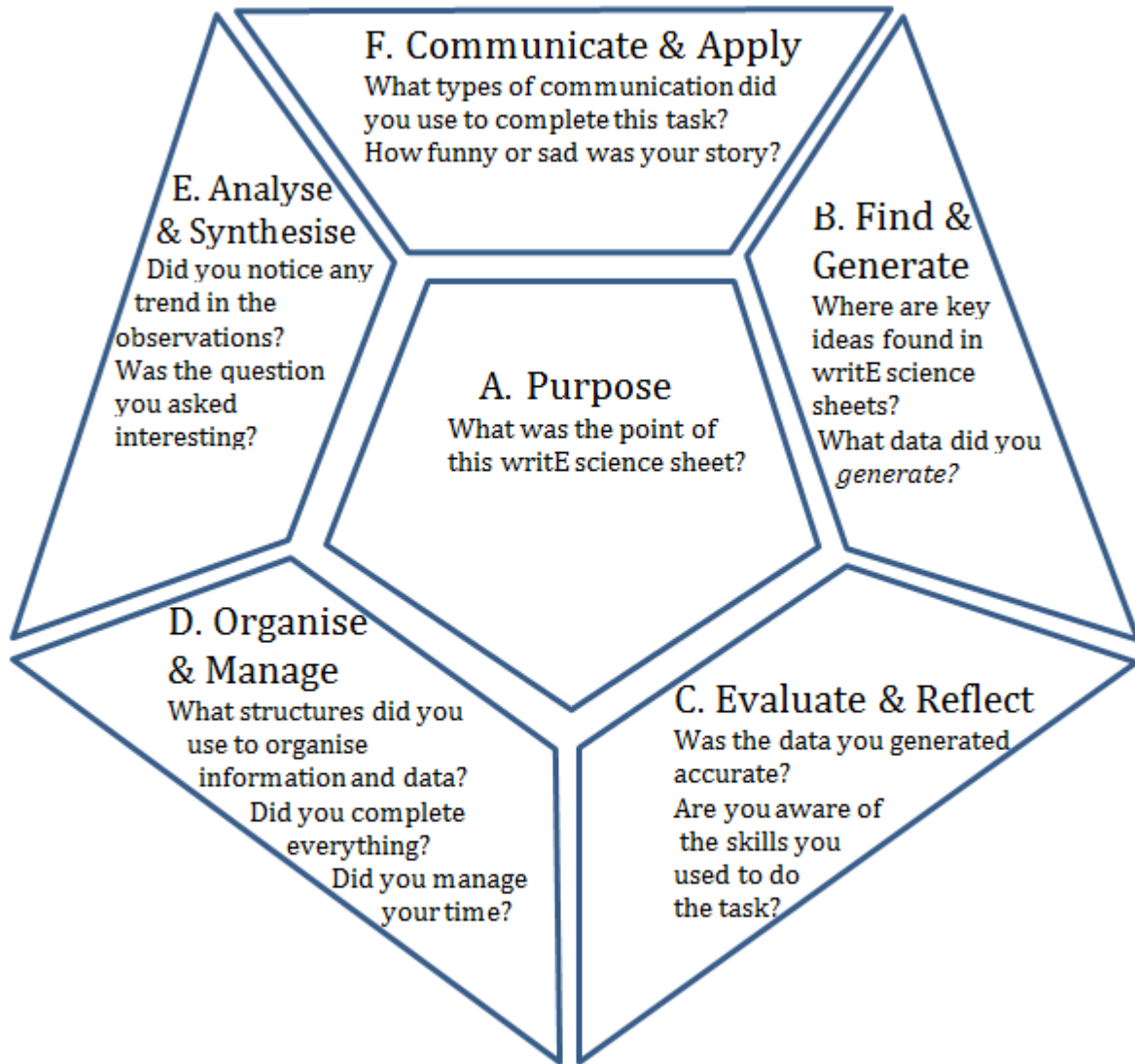
- a. Correctly label the graph below. Write the name of the manipulated variable underneath the graph (i.e., on the x-axis), and the name of the dependent variable to the left of the graph (i.e., on the y-axis). The title should be “[Name of dependent variable] vs. [name of manipulated variable]”.

- b. When you have finished labelling the graph, look at your data from the experiment, and plot the data points onto the graph below.

Title:



- c. Analyse the pattern, and try to explain it in words.



Part 6. **Evaluate** and **reflect**.

Evaluate this activity and reflect by suggesting ways to improve it.



Page 4 and onwards given out at teachers' discretion.

Teacher's notes:

1. Great extensions can be conducted using budgie seed mix – it has about five different types of seed, and many experiments can be considered.

2. The story is written so that the key words we are concentrating on are in bold type. These are always the leading idea of a paragraph, and so are in the first sentence of that paragraph. These keywords are to be placed in the small bubbles in the structured overview. The second sentence contains a definition of the key word. Students should be assisted with as much effort as you can afford, to write this definition in point form, leaving out joining words at least. I think constant modelling is necessary, especially from other students when they show good note-taking skills. The rest of the paragraph contains supporting details about the keyword. Again, point-form notes are to be taken.

3. Remember, this is part of a year-long strategy to assist students in developing note-taking skills. The idea is to make their writing an activity that requires their brain. Converting text to notes means they have to actively engage with the text. They struggle to make meaning of it, and so it can assist their understanding. For them to be able to use their notes and write good sentences/paragraphs from them is also something we will develop. This is all very difficult for many students. But these skills are common to other work across the learning areas. Set the kids a high standard for this piece, so all other work can be compared to it. Any questions you have, please feel free to ask.

John W.

