

# NATURAL SCIENCES GRADE 9

## Introduction and Scientific Method

Purpose of experiments or scientific investigations in the science classroom:

An experiment can provide proof of a theory, and

A Scientific investigation is used to determine a *relationship* between different variables and to confirm or reject a hypothesis.

To determine the relationship between variables you must alter ONE variable and measure or observe another variable while keeping everything else the same.

Why just one? If you changed more than one variable it would be hard to figure out which change is causing what you observe.

### Investigative question:

The investigative question determines what is tested in the experiment.

The investigative question:

1. Must include the independent AND the dependent variable.
2. Must ask a QUESTION about the RELATIONSHIP between the variables.
3. How will the ... affect the ... ?

OR

What is the relationship between ... and ...?

4. Must end with a question mark?  
Make sure the answer to the question is NOT yes or no. Yes or no questions are not well- formulated investigative questions.
5. Change the aim into a question.

## **Variables:**

In science, a variable is any item, factor, or condition that can be controlled or changed.

### **How to identify the variables:**

Look for a "hypothesis", a "scientific question" or an "aim" given at the beginning of the investigation

TWO clear "FACTORS" OR "VARIABLES" will stand out - ONE that influences the other one in the particular investigation. These TWO factors are the independent and dependent variables

### **Independent variable:**

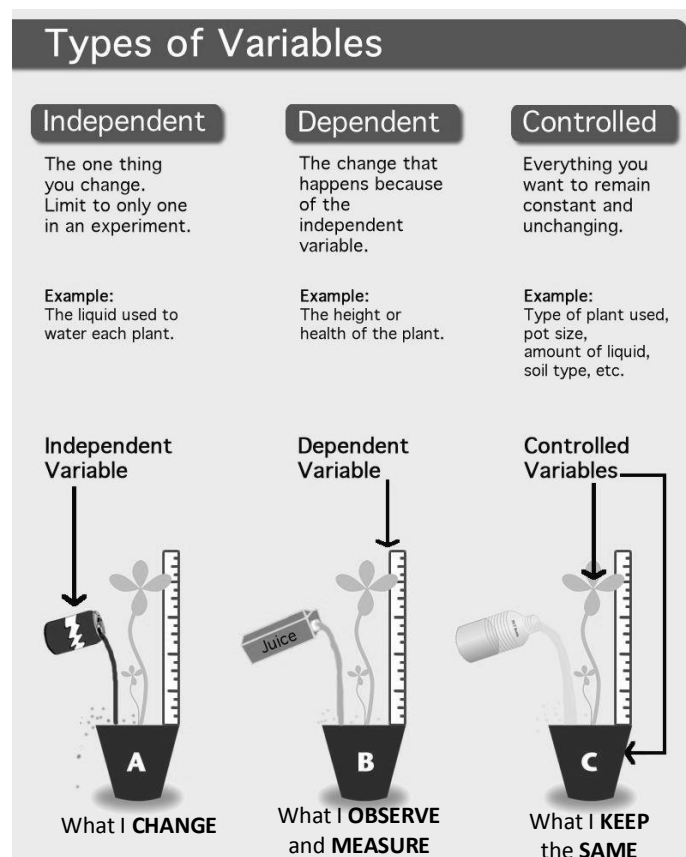
The factor/variable that the investigator choose to change or manipulate and that normally influences the other factor/variable

### **Dependent variable:**

The factor/variable that is influenced by the independent variable and the one where the investigator measured or observed any change or influence

### **Controlled variables:**

Controlled variables are quantities that a scientist wants to remain constant. If these variables are kept constant they will ensure the validity of the investigation.



## **Hypothesis:**

A hypothesis is a testable statement about a relationship involving two variables. When a hypothesis is formulated the following is a guideline that should be used:

### **How to write a hypothesis:**

Two variables (dependent and independent) should be mentioned in the hypothesis.

A hypothesis should show the relationship between variables and a hypothesis is NOT a question.

The hypothesis must be measurable.

### **The hypothesis:**

1. Indicates what you expect the outcome of the investigation to be.
2. Must include both variables and indicate the relationship between them.
3. If ... , then ...
4. Use words like increase, decrease, etc. to indicate that if one variable gets more/less, the other variable gets more/less.

## **Planning a scientific investigation involves the following:**

Ethical issues around the investigation, e.g. by getting permission from the appropriate authorities before the investigation is conducted

Making all the logistical arrangements, e.g. by identifying and getting all the materials to be used in the investigation

Deciding on the method/procedure that is going to be used or followed e.g. how to catch the fish for the investigation

Dealing with how the data will be collected, recorded, analysed and presented.

NB: Use hints from the given scenario/investigation to determine PLANNING STEPS applicable to the particular investigation

## **Results:**

Results are presented in tables and graphs.

### **Table:**

A table always has a heading. The heading should contain the dependent and the independent variable.

A table is made up of columns and rows. The columns and rows should be labelled with units.

## Graphs:

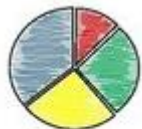
A graph always has a heading with the dependent and independent variables.

A graph has a y-axis (dependent variable) and x-axis (independent variable)

The axis should be labelled with units.

Types of graphs:

Pie chart



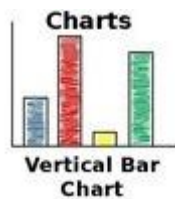
**Pie Chart**

Line graph:



**Line Graph**

Bar graph:



**Vertical Bar Chart**

Histogram:



**Histogram**

## **How to draw a conclusion:**

The conclusion should:

1. Answer the scientific question asked at the start of the investigation.
2. State the effect that the independent variable had on the dependent variable.
3. Contain both variables.
4. Indicate if the hypothesis can be accepted or be rejected.



Variables:

Independent variable:

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Dependent variable:

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Controlled variables:

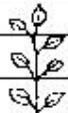
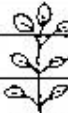
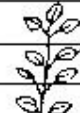
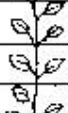
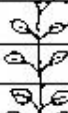















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Results:

Record observations and measurements in a table.

POT	A	B	C	D	E	
Average height of seedlings in cm	25					
	20					
	15					
	10					
	5					
	0					
Amount of water given per day	20 cm <sup>3</sup>	35 cm <sup>3</sup>	45 cm <sup>3</sup>	50 cm <sup>3</sup>	80 cm <sup>3</sup>	

Draw graphs to illustrate the data.

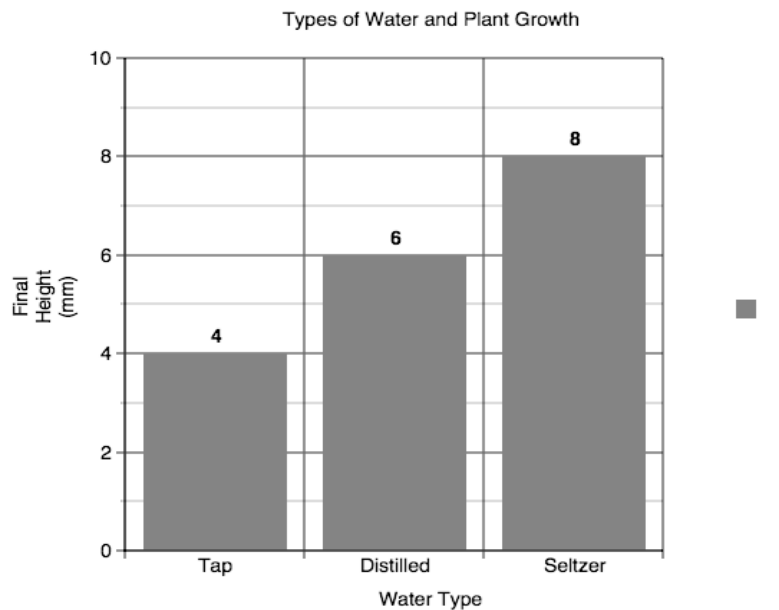
Conclusion:

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**Experiment 2:**

Study the graph of an experiment that was done by a group of learners.



Formulate an investigative question.

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Identify the:

Independent variable:

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Dependent variable:

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Controlled variables:

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