Practicals: key vocabulary

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Roughly 15% of the available marks in your GCSE science papers will be based on the practical work which you carry out in Years 10 and 11. In this blog, we focus on some of the key vocabulary which is used when carrying out a practical investigation.

Variables

- A **variable** is something that can change in a practical.
- The **independent variable** is the one which we (the experimenters) change.
- The **dependent variable** is the one which changes *because* we change the independent variable.
- A **control variable** is a variable which is deliberately kept the same.

For a practical investigation to be a **fair test** which produces **valid** results, just two variables should change – the independent variable (the one which we change) and the dependent variable (the one which changes *because* we change the independent variable). Everything else should remain the same. In other words, every other variable should be **controlled**. For this reason, a fair test can also be called a **controlled scientific investigation**.

Example

Let's say you wanted to investigate how **eating different types of food** affects a person's **maximum blood sugar level**. Read that sentence again. We're investigating how changing one variable (the type of food eaten) which we call the independent variable, affects another variable (the person's maximum blood sugar level) which we call the dependent variable.

Every other variable would have to be controlled for the results of this practical investigation to be valid. These control variables could include:

- the mass of food they had eaten
- the surface area of the food they had eaten
- what the person had eaten earlier that day
- their initial blood sugar level
- whether or not they had done exercise

If the person had eaten one type of food while running a marathon one day, and another while watching TV the following day, we would have no idea whether a change in their blood sugar level was due to the type of food they had eaten or due to the different levels of physical activity on both days. Without controlling the other variables, an investigation would not be a fair test and so would not produce valid results.

*When you're watching videos about practicals on **My GSCE Science**, can you identify the independent, dependent and control variables? Questions on variables often come up in the GCSE exams!*

How science develops

We carry out scientific investigations to develop our understanding of the world around us.

A **hypothesis** is a statement which can be tested scientifically, for example: *the amount of carbon dioxide absorbed by a plant is proportional to the light intensity*.

A **prediction** is a statement of what we *expect* to happen when a hypothesis is tested, for example: *if the light intensity is doubled, the amount of carbon dioxide absorbed by the plant will double*.

An investigation is said to be **repeatable** if similar results are obtained when it is repeated under the same conditions by the same person (or by the same group scientists). An investigation is **reproducible** if it is repeated by a *different* person (or group of people) and similar results are obtained.

Science develops due to a process called **peer review**. This is when different scientists check each other's work. If the results of a given investigation are **reproduced** by enough scientists, the hypothesis on which the investigation will be built into scientific **theory**.

A theory is a scientific idea which is supported by the results of scientific investigations. That doesn't always mean that theories are correct however, they are just our best guess at a given point in time at explaining how something works!