

# Types Of Investigation

Scientists use different methods of investigation in different circumstances. These methods include (in no particular order) fair testing, identifying and classifying, modelling, pattern seeking, and researching.

Research has shown that science teaching is dominated by fair testing. The principles of fair testing are important, but may not always enable students to understand ideas or concepts, answer their questions, or understand how scientists work and the nature of science.

The aim of this section is to broaden your understanding of the different types of investigations you can use with your students. The activities provided on this website also provide examples of these types of investigations.

## Identifying And Classifying

Identifying and classifying involves sorting objects or events into groups or categories. Clear systems (criteria) must be developed and used. Keys are often used as criteria to carry out a classifying process for example, identifying and naming plants.

If the criteria are changed the groupings that result may be quite different and can lead to new scientific discoveries. For example, living things were initially divided into two kingdoms – plants and animals. When micro-organisms were discovered and studied, changes were made to the classification system and the number of kingdoms. A five kingdom classification system is now commonly accepted.

## Modelling

A model can be used to help students understand how a process works, or to explain ideas or a concept. More than one model can be used to explain different aspects of the same concept for example, there are several models that help describe the structure of the atom.

Some models are already produced, for example, a model heart or diagram.

Others will need to be set up, for example., using flour to model impact craters on the Moon.

Electronic models can show sequences and processes, and some can be found on the Internet, for example, Day and Night: Views from the Southern Hemisphere and Open Heart.

## Pattern Seeking

This method involves observing and recording natural events, or carrying out experiments where the variables can't easily be controlled.

In pattern seeking, it is still important to note and record variables. The investigator needs to try to identify patterns that result from these variables.

This method is well suited to system sciences like geology, astronomy, ecology, or meteorology.

Once a pattern has been observed this may lead to other investigations in an effort to try to explain why a particular pattern occurs, and to a classifying and identifying system.

Pattern seeking can also help us create models to explain observations, for example, to explain the phases of the Moon.

## Researching

Researching involves gathering and analysing other people's opinions or scientific findings in order to answer a question or to provide background information to help explain observed events.

Research can also show how scientists' ideas have changed over time as new evidence has been found.

Students need to practice each stage in the research process.

Stage 1: Focusing and planning - Questions relevant to the direction of the research are generated.

Stage 2: Sourcing information - Appropriate resources must be found. Using a range of different sources of information helps ensure the ideas are those commonly accepted.

Stage 3: Analysis - The information needs to be organised and then analysed to ensure that valid conclusions can be drawn.

Stage 4: Reporting - This can be done in various ways – e.g. a demonstration, a poster, a video or a report.

## Fair Testing

Fair testing finds relationships between factors (variables). A single variable is changed while keeping other variables the same. Any differences are said to be the result of the changed variable.

This method is most easily suited to technology investigations, for example, 'Which paper towel can soak up the greatest volume of water?', and physical sciences, for example, 'Will the reaction go faster if a more concentrated acid is used?' Fair testing is particularly well suited to investigations that record measurements.

This method will not work well where investigations:

- \* need to be done in the field
- \* are monitoring change over time
- \* need to examine a whole system, not just isolated parts.

Reference: Ministry of Education. (2001). Making better sense of the living world. Wellington: Learning Media.

[http://www.tki.org.nz/r/science/science\\_is/teaching\\_science/teaching\\_models\\_e.php](http://www.tki.org.nz/r/science/science_is/teaching_science/teaching_models_e.php)