



Science investigation skills

In a fair-test experiment you change one thing, measure one thing and keep the other relevant variables the same. Name the variables first; then plan the range, the equipment, the repeats and how you will record the results.

Three kinds of variable — sugar dissolving in warm and cold water

Change one thing



the independent variable

- the temperature of the water
- you choose it and change it on purpose

Measure one thing



the dependent variable

- the time for the sugar to dissolve
- it depends on what you changed

Keep the rest the same



the control variables

- volume of water, mass of sugar, stirring
- the other relevant variables, kept the same so the test is fair

Worked example

A student wants to find out whether the length of a pendulum string changes how long one swing takes. Identify the variables.

Independent variable: the length of the string, because that is what the student changes on purpose.

Dependent variable: the period of the pendulum. Time 10 complete oscillations and divide the total time by 10, so reaction time matters less. Control variables: the mass on the end, the release angle and the type of string, kept the same so only the length can cause a difference.

The common mistake

"If I do the experiment once and get a result, the investigation is finished."

One reading cannot show whether a result is repeatable or how much it varies. Take repeat readings (three is a common classroom minimum where practical), look for anomalies, then use the mean. A conclusion built on one reading is a guess with a number attached.

Test yourself

- ☐ Which variable do you change on purpose?
- ☐ Why keep the control variables the same?
- ☐ What should you do with a result that does not fit the pattern?

Plan it

Question: does the amount of light change how fast cress grows? Write the independent, dependent and control variables.

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Next topic

Measurement: units, accuracy and precision

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Answers: 1. The independent variable. 2. So that only the independent variable can be causing any change in the result: a fair test. 3. Check it and repeat it if you can. Leave it out of the mean only if there is a good reason, and say in your write-up what you did and why.