

Teaching the Scientific Method

START WITH A QUESTION

Which type of baking powder will cause a cake to rise higher?

PLAN THE INVESTIGATION

Think about how you would conduct this experiment.

How many cakes would you have to bake?
What would be different each time?
What would you be looking for?
When will you do the experiment?

How will you take the measurements?
How will you record the results?
Where will you perform the experiment?
What apparatus will you need?

CONVERT THE QUESTION INTO AN AIM

An aim always starts with 'TO'

To determine ...
To investigate ...
To compare ...

To determine which type of
 baking powder will cause a
 cake to rise higher.

The aim will always have
 two variables:
 the **independent** and
dependent variable.

UNDERSTAND & IDENTIFY THE VARIABLES

A **variable** is something that can change.

Independent
variable

- controlled by the investigator
- has set/predetermined values
- is **different** between setups
- happens first

What does the height of the cake
depend on?

The type of baking powder.

Dependent
variable

- changes because of the independent variable
- it is what is being **measured**
- happens second

What are we measuring?

The height of the cake.

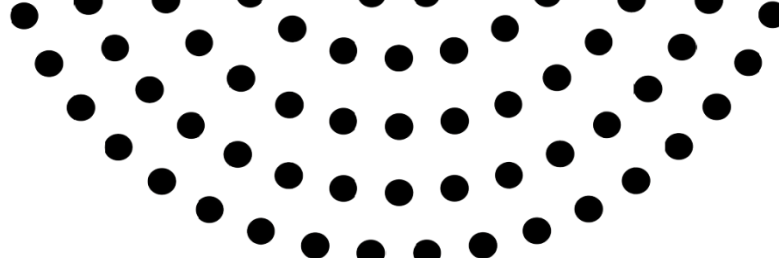
What other factors could influence the height of the cake?

Constant/
Fixed/
Controlled
variables

- can affect the results of the investigation
- must be controlled so that they do not interfere
- also known as **fixed** or **controlled** variables

same size/brand/age/type of eggs
 same amount/brand of flour
 same amount/brand of sugar
 same volume/temperature of water
 same volume/brand of vanilla
 same amount/brand of butter

same oven, at the same temperature
 same sized cake pans
 same baking time
 placed in the oven at the same time
 same amount of each type (brand) of
 baking powder



VALIDITY

Validity refers to whether the investigation tested what it **aimed** to test.

- If you do not keep unwanted variables constant, you would not know which variable caused the difference in the height of the cake.
- This would cause the investigation to be invalid, as there are too many variables to know which one caused the dependent variable to change.



WRITE A HYPOTHESIS

Requirements for a hypothesis:

1. must contain the **independent** and **dependent** variables
2. a possible **prediction/explanation** of the relationship between two variables
3. a **statement**
4. **testable**

There are many different versions of a given hypothesis, as long as the four requirements are met. This makes it difficult to examine hypotheses. Memoranda must therefore be sensitive to all the different options.

A hypothesis can be stated **positively**.

'Best' baking powder will cause the cake to rise higher than 'No Name' baking powder.

A hypothesis can be stated **negatively**.

'Best' baking powder will **not** cause the cake to rise higher than 'No Name' baking powder.

BUT it is always best to state a **general** hypothesis.

The **type of baking powder** will affect the **height of a cake**.

OR

Different **types of baking powder** will affect the **height a cake rises**.

independent variable

dependent variable



COLLECT YOUR RESULTS

Type of baking powder	Height of the cake (cm)
'No Name'	15
'Best'	20

Use the appropriate measuring apparatus.

Organise the data into **tables** or **graphs** (whichever best represents the specific data).

MAKE A CONCLUSION

Study the results and look for a general **relationship** that can be deduced.

Refer back to the **aim/hypothesis*** to make a conclusion.

'Best' baking powder caused the cake to rise higher than 'No Name' baking powder.

**Be careful of merely quoting the results and rather state a relationship that can be observed between the variables.*

RELIABILITY

Reliability refers to whether the results of an investigation are **trustworthy** and **consistent**.

1 Repeat the investigation	Can confirm whether the results are consistent
2 Calculate an average	Can provide results that can be generalised to a larger group/phenomenon
3 Take a random sample	Removes the experimenter's bias
4 Increase the sample size	Provides more data that can be used to calculate an average OR generalise the results

THE CONTROL SETUP

The control setup provides a **comparison** with the experimental results.

It **confirms** that the independent variable caused the results and not some other factor.

In the control setup we remove the independent variable to observe, measure and compare its effect.

The control would have all the same ingredients as the other two cakes, but **NO** baking powder.