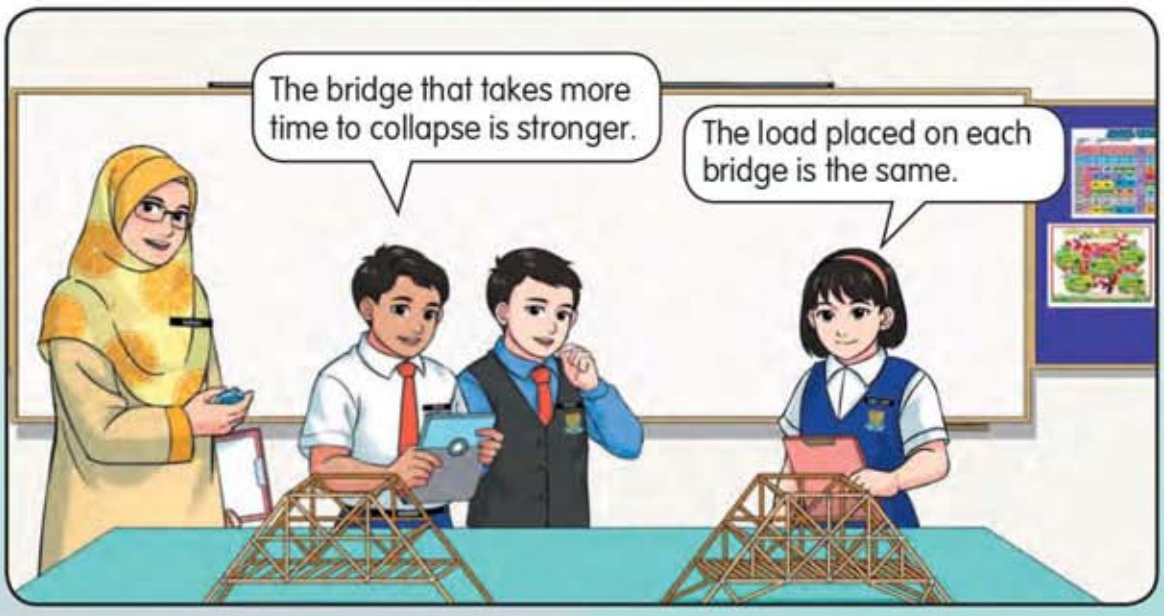
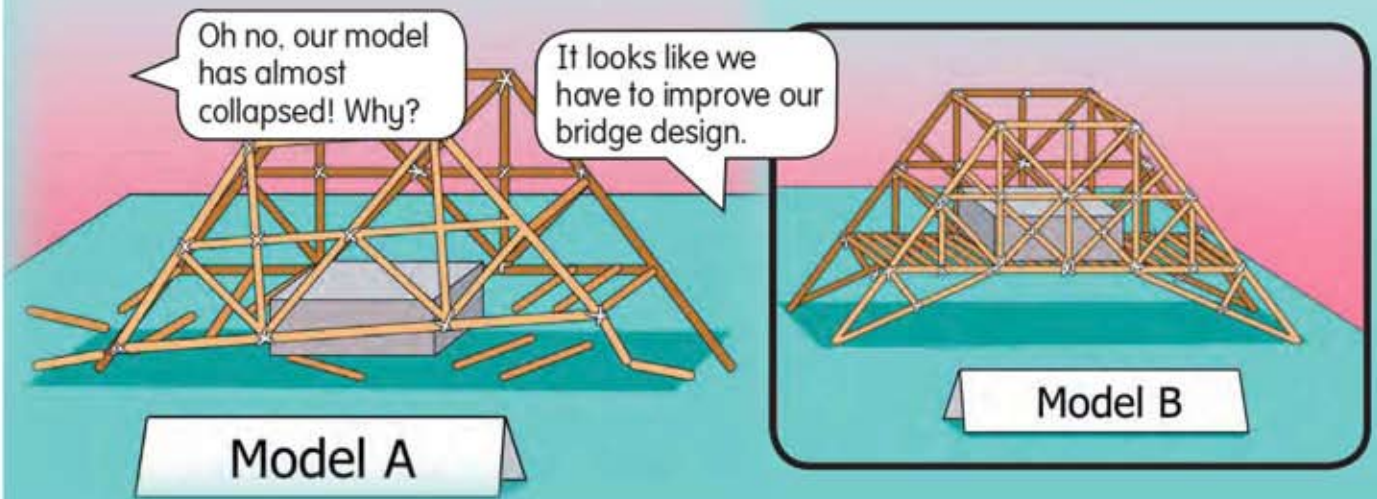
UNIT 1

SCIENTIFIC SKILLS

Two groups of Year 4 pupils participate in a model bridge construction competition. They use the scientific process skills throughout the competition.





How can you help Group A to win the competition?

Science Process Skills

Do you still remember the science process skills that you have learned? The science process skills help us to scientifically understand objects and our surroundings. Let us observe the situation below.

They are **discussing** ways to dispose of the rubbish.

KPM

1.1.1
1.1.2
1.1.3
1.1.4
1.1.5
1.1.6

Based on the situation above, list the science process skills that they have applied.

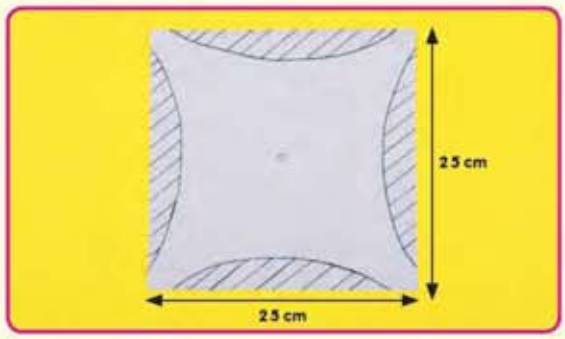
FUN ACTIVITY **Parachute**

GROUP ACTIVITY

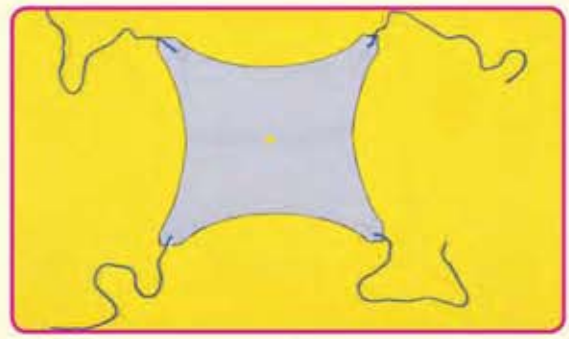
Apparatus and Materials

Scissors, knife, ruler, tracing paper, thread, paper clip, stone, stopwatch, adhesive tape

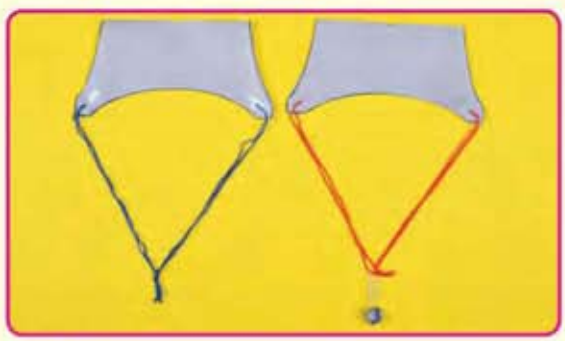
Steps



1. Sketch two squares with a measurement of 25 cm. Cut and make a hole at the centre of the tracing paper.



2. Cut four 30 cm-length of threads. Stick each thread to each corner of the paper. Tie all the ends of the threads together into a knot.



3. Make a second parachute. Hang a paper clip that is tied to a stone at the end of the parachute.

4. Drop both parachutes from any high place at the same time. Observe the time taken for each parachute to reach the ground.

Questions

1. Which parachute reaches the ground faster?
2. If the parachute had holes at the sides, what would you observe?

FUN ACTIVITY Classifying Objects

GROUP ACTIVITY

Apparatus and Materials

Wooden ruler, popsicle stick, metal spoon, glass plate, lens, marbles, hockey stick

Steps

1. Identify a characteristic to classify the objects.
2. Construct a classification table of different characteristics.

Question

State the characteristics that you have identified to classify the objects.

FUN ACTIVITY Brightness of a Bulb

GROUP ACTIVITY

Apparatus and Materials

3 bulbs with holders, 7 wires, 2 dry cells with holders, 2 switches

Steps

1. 

Build a complete circuit with one bulb. Observe its brightness.

2. 

Build another complete circuit with two bulbs. Observe their brightness.

3. 

Record the observations in a table.

4. 

Present the observations to the class.

Questions

1. Other than tables, what other presentation methods can be used?
2. Predict the brightness of the bulbs if the activity is repeated using three bulbs.

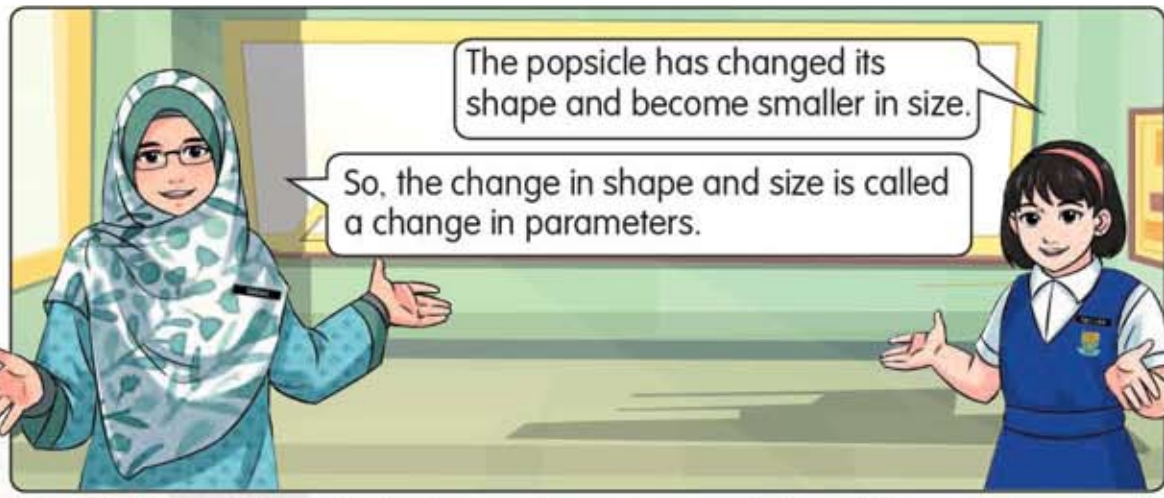
Using Space-Time Relationship

Using space-time relationship is a skill that describes changes of situations or phenomena based on the changes in parameters over time. The examples of parameters are location, direction, shape, size, volume, and weight.

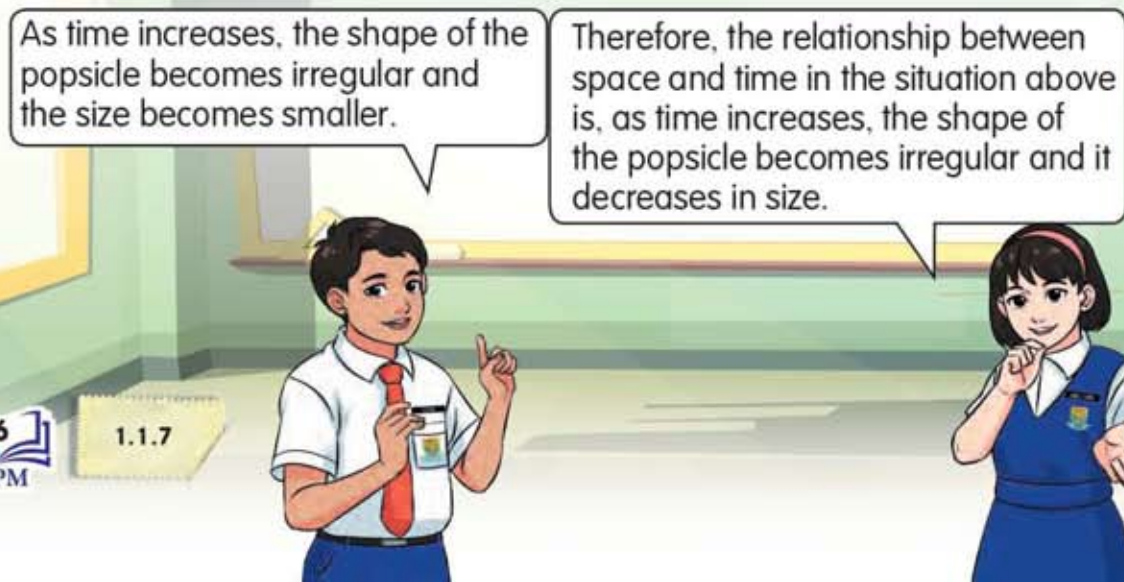
What changes can be observed when a popsicle is placed under the sunlight for 20 minutes?

After 10 minutes

After 20 minutes



What is the relationship between the shape and size of the popsicle and the time taken based on the investigation above?



FUN ACTIVITY **Dough and Time**

GROUP ACTIVITY

Apparatus and Materials

1 cup of wheat flour, 150 mℓ of warm water, 1 teaspoon of yeast, 1 teaspoon of sugar, plastic container, blue and red marker pens

Steps

1. Put wheat flour, sugar, and yeast into the plastic container. Then, mix using a spoon.

2. Pour 150 mℓ of warm water and stir the mixture until it becomes a dough.

3. Flatten the dough inside the container. Mark the initial level of the dough using a blue marker pen. Leave the dough for 30 minutes.

4. Mark the final level of the dough using a red marker pen. Then, discuss the changes in parameter over time in this activity.

Question

How does the parameter of the dough change over time?

Hafiz released an inflated balloon into the air from the ground floor of the school. After 10 seconds, the balloon deflated and was found on the first floor. What are the changes in the parameters over time?

Interpreting Data

Interpreting data is a skill to give rational description about objects, events or patterns from collected data.

Fariz and his friends built three bird feeders. The number of birds that flock to the bird feeders is recorded as shown in the table below.

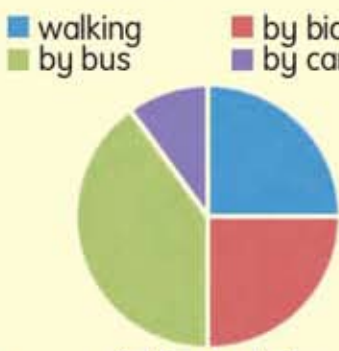
Bird feeder	Number of birds					
	Day 1	Day 2	Day 3	Day 4	Day 5	Total number of birds
A	4	8	7	9	5	33
B	2	4	5	5	4	20
C	3	6	8	7	2	26

Then, they explained about the data collected to their other friends as shown below.

The explanation given by Fariz and his friends are examples of interpretation of data.

Observe the examples of data interpretation based on the diagrams below.

Ways pupils come to school

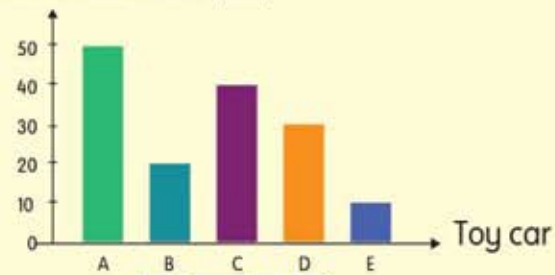


Pie chart

Data Interpretation

The number of pupils riding a bicycle to school is the same as those walking.

Distance travelled by a toy car

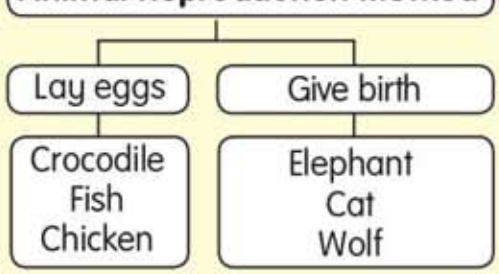


Bar chart

Data Interpretation

Distance travelled by toy car A is the farthest.

Animal Reproduction Method



Classification chart

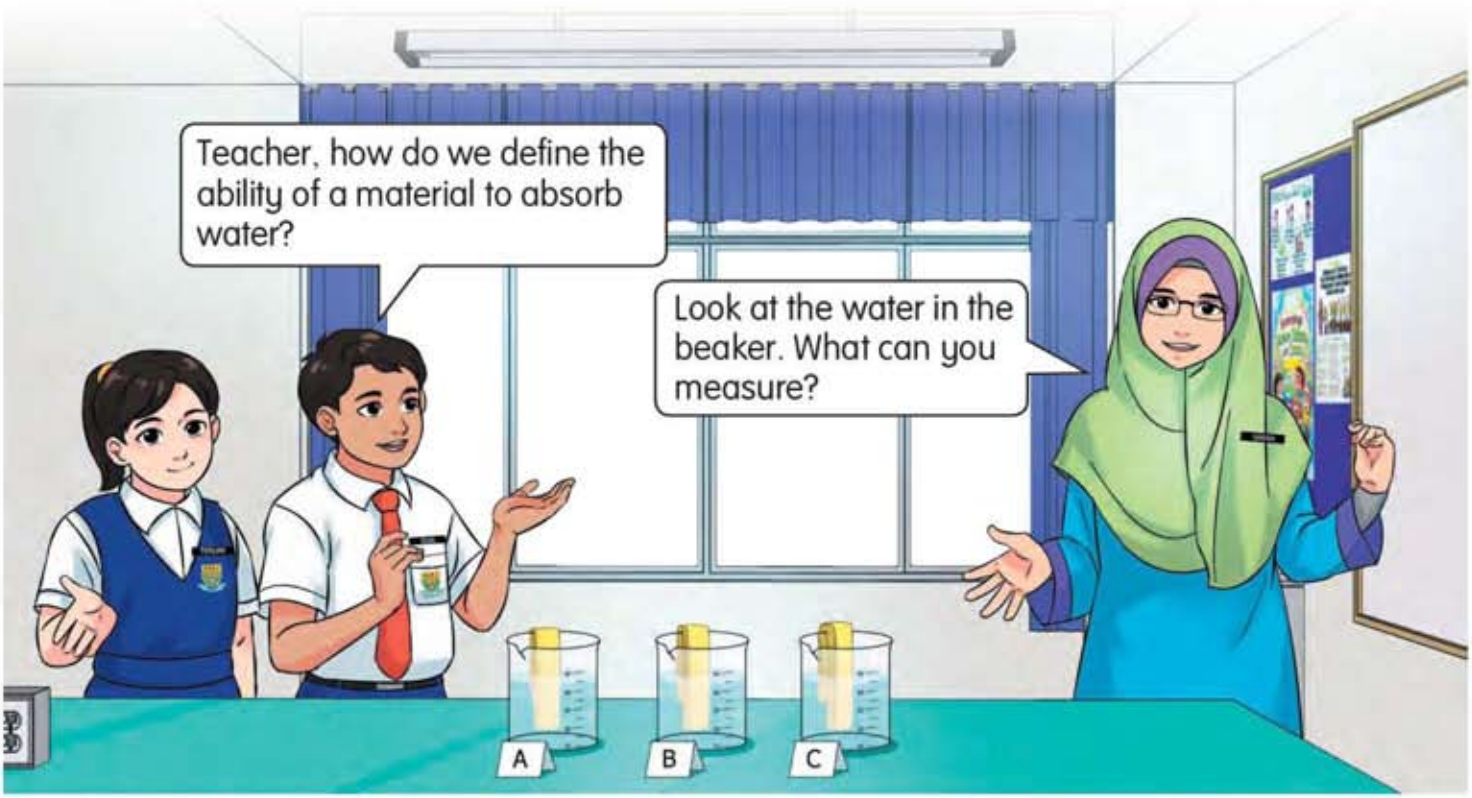
Data Interpretation

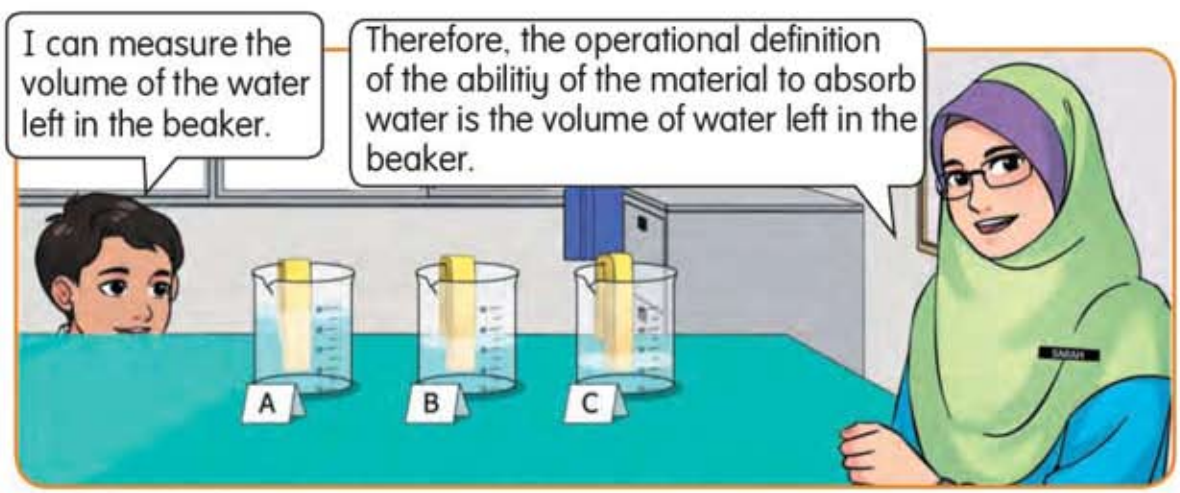
Crocodile, fish, and chicken lay eggs, while elephant, cat, and wolf give birth.

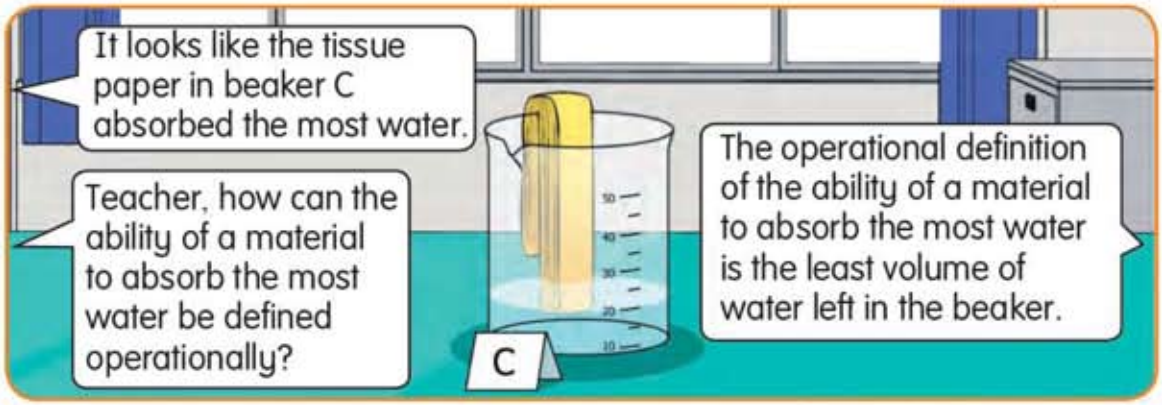
Defining Operationally

Defining operationally is a skill to define a concept by stating what can be carried out and observed.

Siva and Teruni want to test the ability of a material to absorb water. They soak three tissue papers of different thickness in 50 mℓ of water for one minute. Observe the situation below.







LET'S TEST

The Growth of a Green Bean Plant

GROUP ACTIVITY

Objective

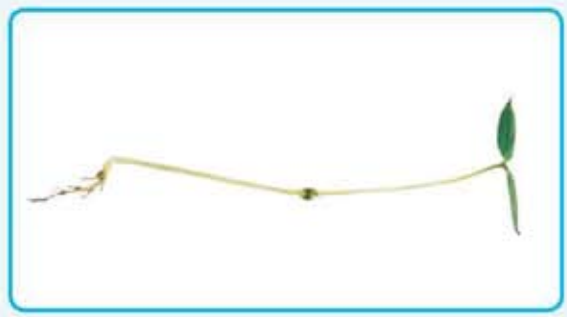
To define operationally the growth of a green bean plant.

Apparatus and Materials

5 green bean seeds, plastic container, cotton, ruler, thread, water

Steps

1. Place the green bean seeds on wet cotton. Observe their growth for a week.



2. Take one of the seedlings. Record the number of leaves and height of the seedling.

Question

What is the operational definition of the growth of a green bean plant?

Fizah investigates the elasticity of a rubber band. She can stretch the rubber band up to 15 cm and it will snap if she pulls any further. How can Fizah operationally define the elasticity limit of the rubber band?

Controlling Variables

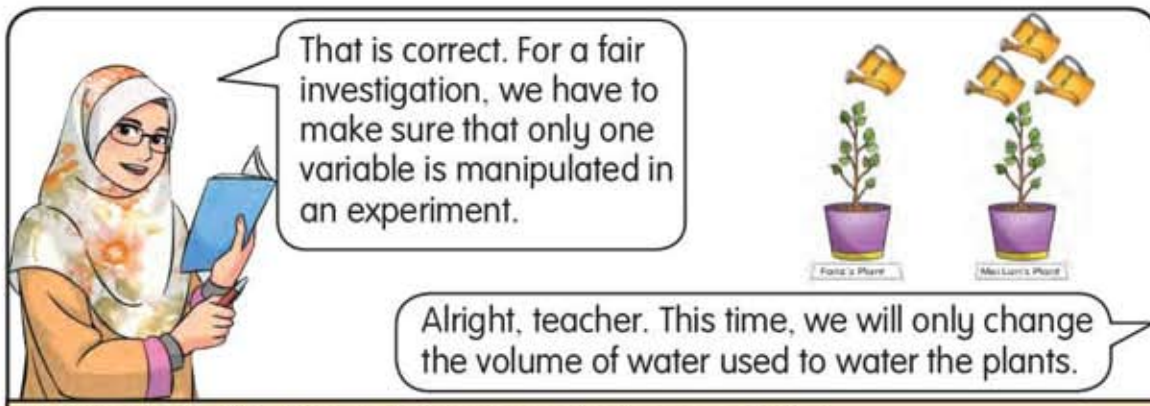
Variables are factors that can change in an investigation. Let us find out the types of variables in the following situations.

Fariz and Mei Lan were given two plants of the same type. They were required to investigate the amount of water needed for the healthy growth of the plant.

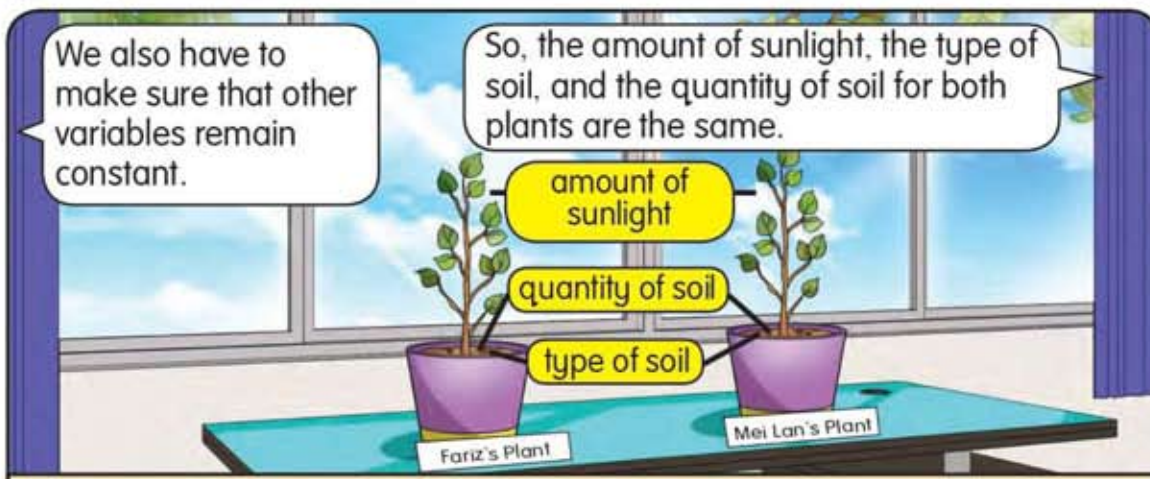
Fariz placed his plant beside the window. He watered his plant with 100 mℓ of water, once a week.

Mei Lan placed her plant in the cupboard. She watered the plant with 100 mℓ of water, three times a week.

After a month, Fariz's plant is larger in size.



A variable that is changed in an investigation is called a **manipulated variable.**



Variables that remain constant are known as **constant variables**.

A variable that is observed in an investigation is known as a **responding variable**.

FUN ACTIVITY

Far and Near

PAIR WORK ACTIVITY

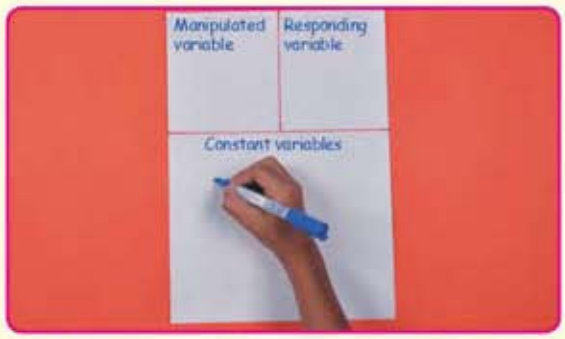
Apparatus and Materials

3 books of the same thickness, wire casing, toy car, measuring tape, marker pen

Steps

1. Plan how to move the toy car to get to different distances using the apparatus and materials mentioned above.

2. Your partner has to list all the relevant variables.



3. Share and discuss your idea with your partner about the variables.

4. Conduct your investigation repeatedly according to the variables that were determined earlier.

Question

What are the manipulated variable, responding variable, and constant variables that you have identified?

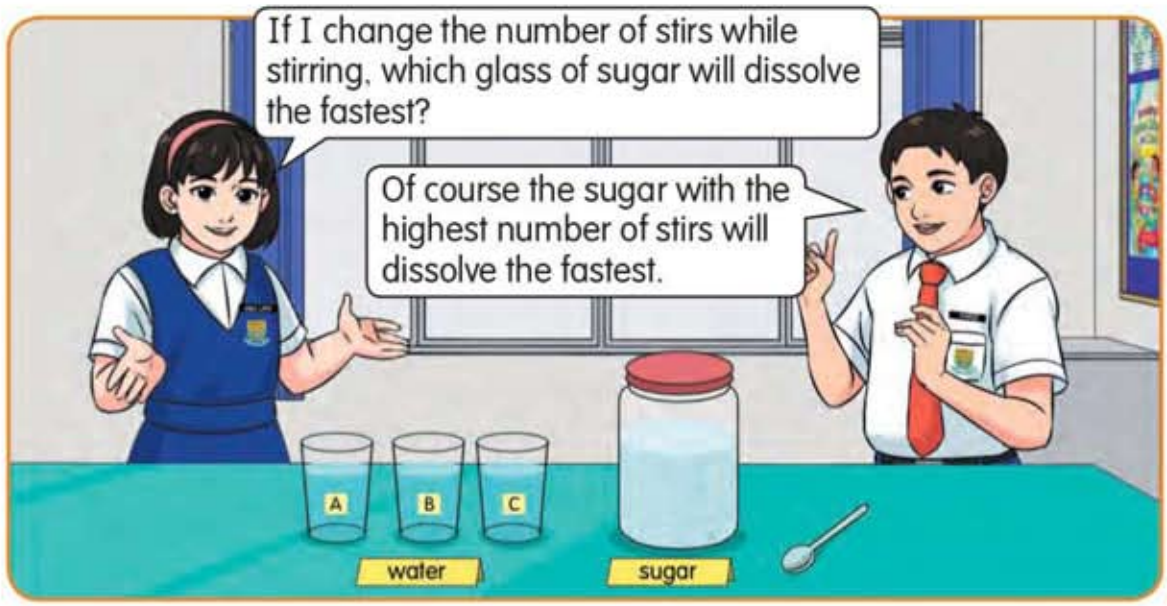
TEACHER'S NOTES

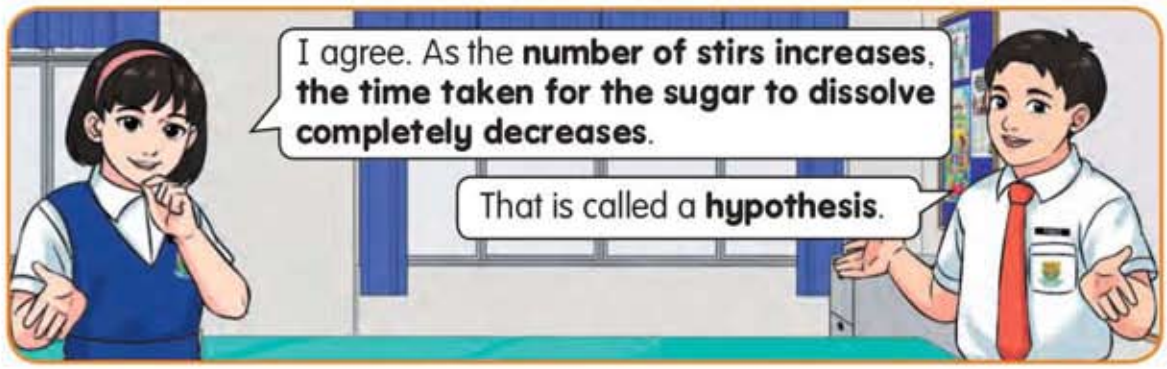
Wire casing can be bought at an electrical hardware shop or it can be replaced with a wooden track.

Making a Hypothesis

Making a hypothesis is a skill to make a general statement that can be tested about the relationship between the variables in an investigation. Let us follow the situation below.

Mei Lan and Fariz want to investigate whether the number of stirs can reduce the time taken for the sugar to dissolve completely.





They successfully made a hypothesis by relating the manipulated variable, which is the number of stirs, to the responding variable, which is the time taken for the sugar to dissolve completely.

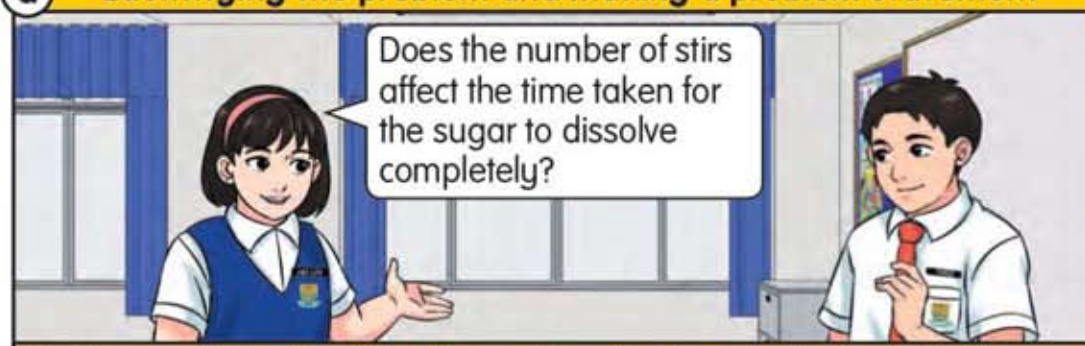
1.1.11
1.1.12

Experimenting

Experimenting is a skill to plan and conduct an investigation to test a hypothesis by collecting and interpreting data to make conclusions from the investigation.

Planning an experiment

(a) Identifying the problem and making a problem statement



Mei Lan and Fariz identified the problem that needed to be tested by making a problem statement.

(b) Making a hypothesis

The more the number of stirs, the lesser the time taken for the sugar to dissolve completely.

Before the investigation, they made a hypothesis.

(c) Controlling the variables

They identified all the variables to test the hypothesis made.

d Listing the apparatus and materials

They listed the apparatus and materials that will be used to conduct the investigation based on the variables that have been identified.

e Planning the steps

1

Pour 100 mℓ of warm water into each beaker; A, B and C.

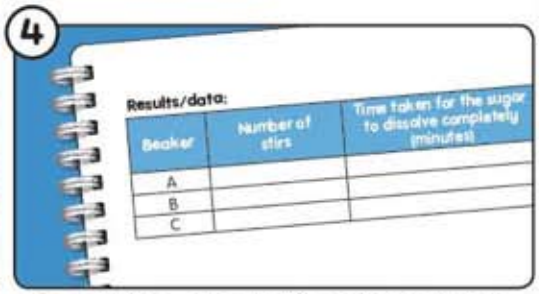
2

Place one spoon of sugar into each beaker.

3

Stir the mixture in beaker A once per minute. Stir the mixture in beaker B, three times per minute. Stir the mixture in beaker C, six times per minute. Record the time taken for the sugar to dissolve completely in each beaker.

4



Results/data:

Beaker	Number of stirs	Time taken for the sugar to dissolve completely (minutes)
A		
B		
C		

Record the observations in the table that has the information about the manipulated variable and the responding variable.

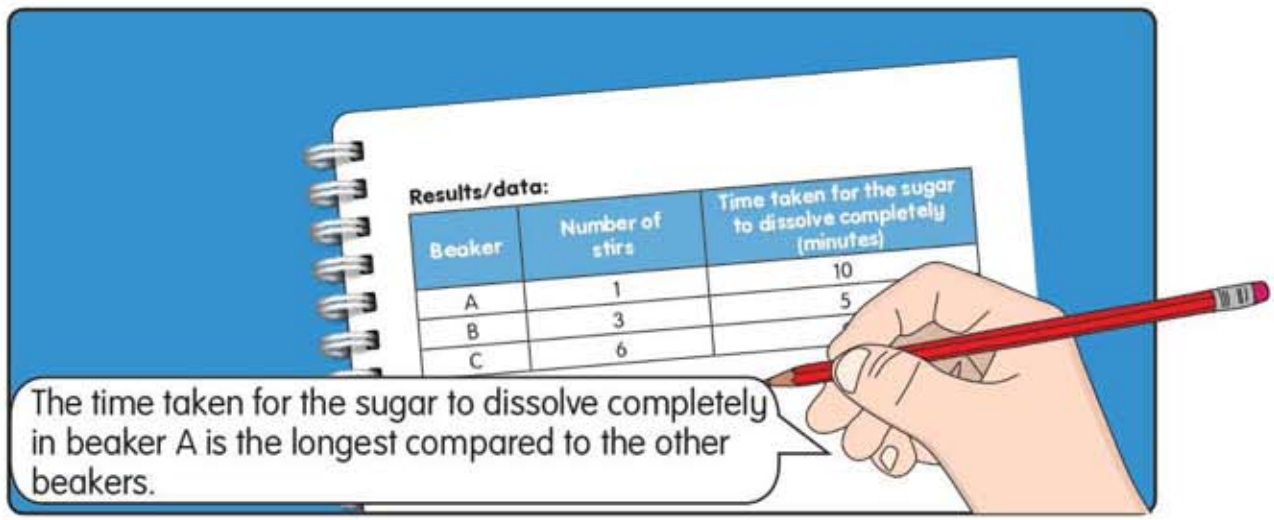
They planned the steps to test the hypothesis.

Testing the hypothesis

They tested the hypothesis by conducting the investigation according to the steps that were planned.

Collecting and interpreting data

After conducting the investigation, they interpreted the data collected.



Making a conclusion

Based on the interpreted data, they are finally able to determine whether their hypothesis is accepted or not accepted.

Writing a report

After the investigation is completed, they write a complete experimental report as shown in the example below.

Experimental Report

1. **Aim:** To investigate the relationship between the number of stirs and the time taken for the sugar to dissolve completely.
2. **Problem statement:** Does the number of stirs affect the time taken for the sugar to dissolve completely?
3. **Hypothesis:** As the number of stirs increases, the lesser the time taken for the sugar to dissolve completely.
4. **Determining the variables:**
   (i) Manipulated variable: Number of stirs.
   (ii) Responding variable: Time taken for sugar to dissolve completely.
   (iii) Constant variables: Quantity of sugar, size of sugar, volume of water, temperature of water.
5. **Apparatus and materials:** 3 beakers, 3 spoons of sugar, 300 mℓ warm water, stopwatch, glass rod
6. **Steps:**
   (i) 100 mℓ of warm water was poured into each beaker; A, B and C.
   (ii) One spoon of sugar was added into each beaker.
   (iii) Beaker A was stirred once per minute. Beaker B was stirred three times per minute. Beaker C was stirred six times per minute. The time taken for the sugar to dissolve completely in each beaker was recorded.
   (iv) The observation was recorded in a table that has the information about the manipulated variable and the responding variable.
7. **Results/Data:**

Beaker	Number of stirs	Time taken for sugar to dissolve completely (minutes)
A	1	10

8. **Interpreting the data:** The sugar which was stirred the most was the fastest to dissolve completely.
9. **Conclusion:** As the number of stirs increases, the lesser the time taken for the sugar to dissolve completely. The hypothesis is accepted.

Now, let us read the story.

Let us read the following steps.

1

Pour 300 mℓ of vinegar.

2

Place one spoon of baking soda on a tissue paper. Wrap it to look like a sweet.

3

In an open area, put the wrapped baking soda into the bottle and cover it with a cork.

4

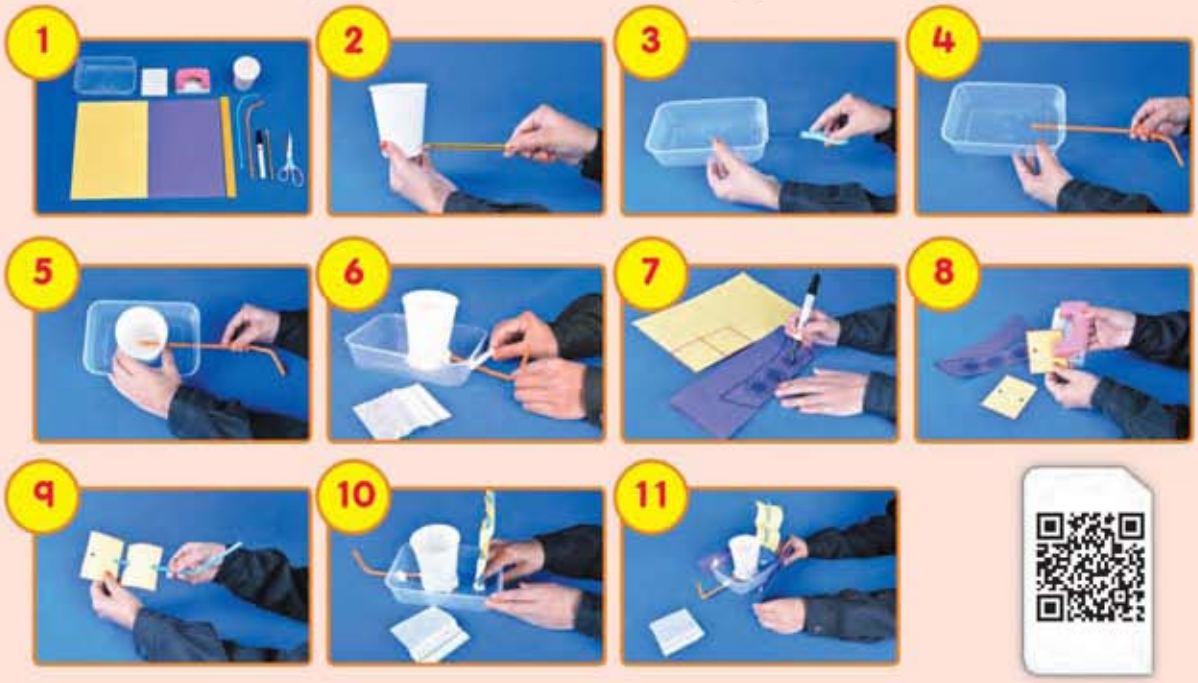
Flip the bottle upside down quickly and put it on the floor. Record the time taken by the rocket to be in the air.

Try planning and conducting an experiment to determine the variables that will enable the rocket to be in the air longer.

FUN SCIENCE Boat

Steps

Use a plastic container, paper cup, straws, coloured papers, and adhesive clay to make a boat based on your creativity.



Pour water into the paper cup and place the boat on water.

What can you observe if different volumes of water is used?

MIND REFLECTION

Science Process Skills

- Observing
- Classifying
- Measuring and using numbers
- Making inferences
- Predicting
- Communicating
- Using space–time relationship
- Interpreting data
- Defining operationally
- Controlling variables
- Making hypothesis
- Experimenting