What children are learning in Science

A guide for whānau

LOOK · HELP
NOTICE · FIND
EXPERIMENT
OBSERVE

Science impacts on all our lives. Knowing about science and how it works allows our children to participate as informed, critical and responsible citizens. This guide has been prepared to give whānau some ideas for supporting their childrens' science learning in school.

PLAY · MAKE
COMPARE · TALK
GROW · PLAN
MEASURE

What children are learning in science at levels 1 and 2

Children at levels 1 and 2 are encouraged to describe what they notice about the world around them. Having lots of experiences and talking about the things they notice help them begin to understand about science. They are beginning to use science words to help explain science ideas.

SOME EXAMPLES OF LANA'S SCIENCE WORK

MELTING

The ice is getting smaller. There is water around the ice. The ice is *melting*.

Lana uses some science words in her explanations like *melt*.

She notices things around her and how they change.

CONDENSATION

The water in my drink bottle got warm in the sun. It feels wet on the outside.

MEASUREMENT

The bird looks small. It fits in one hand. You could measure it with a ruler.

Lana carefully **describes** the patterns she notices. She uses simple measurements in her descriptions.

OIL AND WATER

QUESTION
What happens when oil gets in the sea?

Because the oil has a lot of *chemicals* it can *pollute* and make the fish die. If you eat them you might get sick and die.

Lana uses what she knows to explain her ideas but does not always use examples to support her explanations.

She uses some science words in her explanations, like *pollute* and *chemicals*.

QUESTION
What do you notice when we put oil in water?

It is like a lava lamp.

Lana compares her observation to something familiar.

BUBBLES

There are *bubbles* in my lemonade. After a while the bubbles stop. I wonder how the bubbles got there.

Lana asks questions about why things happen, and how.

She uses some science words in her descriptions, like *bubbles*.

Why noticing things and describing observations are important in science

In science careful observation (noticing) helps students build evidence. They use observations to look for patterns that help them understand how things work in the world.

What you can do to help

Notice things with your child. Ask them questions such as:

- What is different about ...?
- What is the same about ...?
- What did you notice when ...?

Use words that help them to describe what they notice. Try new words that describe (hairy, sharp, breezy), compare (brighter, longer, smaller, steeper), or have a science meaning (melt, freeze, eruption, beak).

Ask them for **more detail when they describe** things, for example:

- When they describe something as small, medium or large ask them what they are comparing these sizes to.
- If they measure something, where on the object would they measure? Help them to practise measuring.

Help them to **explain** what they notice. Ask them questions such as:

- Why do you think that happened?
- Have you seen something like this before?

Help them to **use what they notice** as evidence. Ask them questions such as:

- What did you notice that makes you think that?
- What other things do you notice that make you sure that your thinking is correct?
- Where else might you have seen this?

Things you could do with your child

- **LOOK** at things in nature
- **HELP** with cooking
- **EXPERIMENT** with mixtures
- **PLAY** with ramps and slides
- **LOOK** after a pet • **MAKE** paper darts that fly • **FREEZE** water and watch it melt • **DROP** different objects from a height • **GROW** plants from seed • **COMPARE** how different birds walk

What children are learning in science at level 3

Children at level 3 are beginning to understand that science ideas are based on evidence. They can ask questions that can be tested. They can carefully plan and carry out investigations, record data, and think about what their results mean. They are beginning to record results and interpret findings using scientific ways of recording, e.g., food chains, diagrams, and graphs.

SOME EXAMPLES OF SIONE'S SCIENCE WORK

COTTON REEL ROLLER

Here is my data table for my cotton reel roller experiment

Number of turns	Distance travelled (cm)
2	20
4	38
6	62
10	50

Sione enters his data into a data table.

I notice that the cotton reel goes further the more the rubberband is turned except for the last one.

When we did 10 turns it zoomed off the tiles and onto the carpet. I think if it had stayed on the tiles like the other times it would have gone further than 62 cms.

The carpet made it slow down quickly. Next time we will need to make sure there is a lot of tile area so the cotton reel can stop just on the tiles.

Sione compares patterns looking for differences.

He can spot a problem in the design of a basic science test.

Sione's explanations are beginning to show his growing understanding of basic science ideas.

SUGAR

Moana said, "Cola has more sugar than orange juice."
Question: For which drink do you need to do some maths to check if Moana is correct?

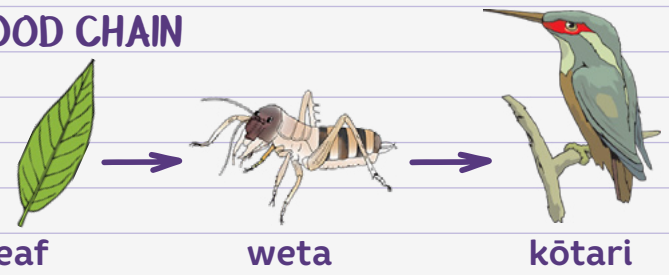
Sugar in some drinks

Bottle of drink	Bottle size	Sugar per bottle
Pure orange drink	100 ml	10.7 g
Diet fizzy	100 ml	0 g
Full cream milk	100 ml	4.8 g
Cola	200 ml	21.2 g

The bottle of cola is 200 ml and all the others are 100 ml. You would need to measure a 100 ml bottle of cola.

Sione notices a difference in the measurements and can suggest a way to fix the problem.

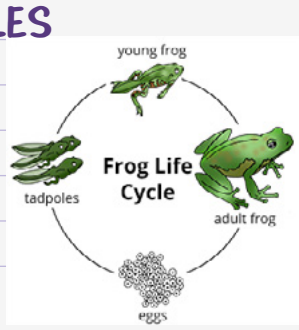
FOOD CHAIN



In this food chain the weta eats the leaves and the kōtare eats the weta.

Sione understands the meaning of arrows in a food chain.

LIFECYCLES



I think the tadpoles and the seedlings are the same because they both are the next thing that happens after the eggs and seeds and these start the cycle.

Sione is beginning to make meaning from lifecycle diagrams.

He compares different types of lifecycle diagrams looking for similarities.

Why knowing about investigations is important in science

In science we test ideas in an orderly way from things we have noticed. We do this to build evidence. Children begin to do this by using the idea of "fair tests". (Later they will learn about other sorts of investigations.) In fair tests we try to be very precise so we can be more sure that our ideas are correct.

What you can do to help

Ask your child about graphs or diagrams in the newspaper, at the supermarket, on packaging, or at the service station:

- What does this graph or diagram tell us? What does it not tell us?
- What symbols are used?
- What could make the graph or diagram better?

Ask them about advertising claims, for example:

- Do they believe the claim? Why? Why not?
- What could be done to make the claim more believable?
- What could be done to check the claim?
- What other tests could be done that would give a different way of thinking about the claim?

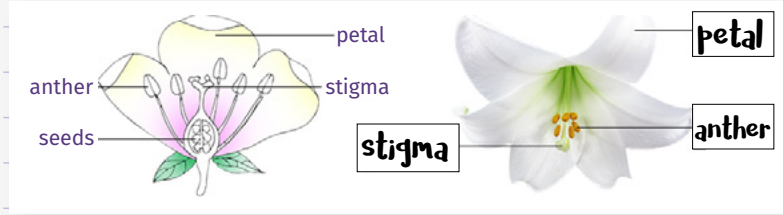
Things you could do with your child

- **WORK** out the quickest way of drying togs after swimming
- **COMPARE** the melting of different sizes and shapes of ice
- **COMPARE** photographs of camouflage in animals
- **OBSERVE** the life cycle of an insect
- **COMPARE** the phases of the moon
- **MEASURE** the growth of a seedling over time
- **EXPERIMENT** with mixtures such as slime
- **MAKE** a paper dart that flies straight
- **FIND** out how to blow the biggest bubble

What children are learning in science at level 4

Children at level 4 are continuing to develop their science understandings through investigations and reading about science. They are learning more about the special ways scientists communicate their ideas (e.g., in science reports, diagrams, graphs, and models). Their investigations and science explanations are more detailed. They can judge claims made by others and make suggestions about issues they are interested in.

SOME EXAMPLES OF MARIE'S SCIENCE WORK

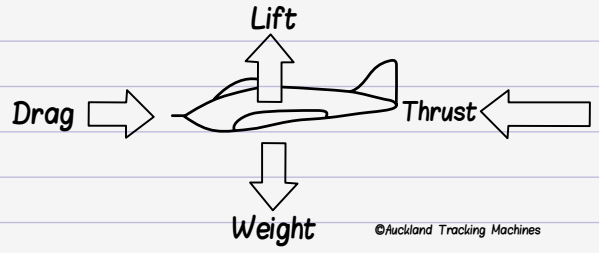


Marie compares a diagram and a photograph of the same idea.

Both the diagram and photograph show petals, stigma, and anthers. Just the flower in the diagram shows the seeds.

FORCES

The Forces on an Aircraft



Marie can explain a science idea from a science diagram.

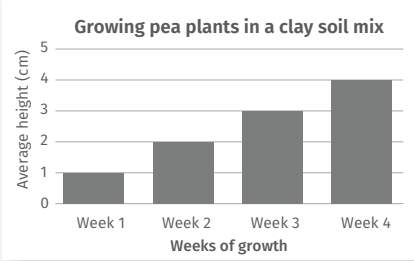
She can understand what the size and shape of arrows mean in a science force diagram.

The arrows on this diagram show there are 4 forces on the aeroplane. The arrows are pointing in the direction of the force. The longer arrow is a bigger force than the other so the aeroplane is moving in that direction. It is going forward.

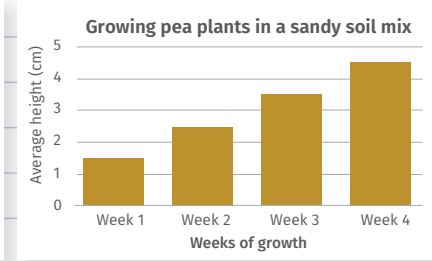
GROWING PLANTS

My class grew some peas. We wanted to find out how fast the peas would grow in different soils. We were all given 5 pea seeds, pots, water and rulers. Here are my group's results and Sienna's group's results.

MARIE'S GROUP'S GRAPH



SIENNA'S GROUP'S GRAPH



Marie can put data into a graph.

I can see that our results look different. I found out that Sienna's group watered their plants with less water than us and they measured their plants on Mondays. We measured ours on Thursdays.
I think we need to do the experiment again making sure we have everything the same except the soil.

Marie can carry out fair tests. She spots when a test is not fair and can give suggestions why this might be.

She knows when to repeat a test.

KIWIS

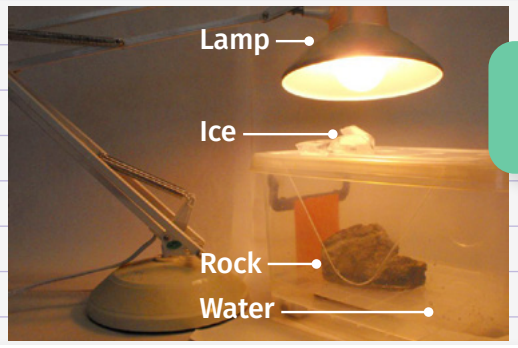
Fact file
Cats and stoats eat kiwi chicks
Dogs kill kiwi birds
Possums eat kiwi eggs
Rats eat the same food that kiwis eat

Marie can give one side of an argument for a science problem.

Question: Some people think animals should not be put in zoos. Why would it be good for kiwi to live in zoos?

I think kiwis should live in zoos because then they will be safe from predators. When they are in zoos their eggs won't get eaten by possums and then the chicks can hatch and grow to adults.

THE WATER CYCLE



Marie understands what the model represents.

The model		Water cycle
The fish tank	represents	Planet Earth including its atmosphere
The rock	represents	The land
The water in the tank	represents	The oceans
The lamp	represents	The sun

Why knowing how science ideas are shown is important

When science ideas are too big or too small to see, scientists explain the idea using diagrams, graphs, or models. Agreed ways of representing science ideas in graphs and diagrams (conventions) mean people around the world can understand each other's work.

What you can do to help

Look for opportunities to compare different types of graphs, diagrams and models. Ask your child questions such as:

- What is similar about the symbols used in a graph, diagram, model? Do they mean the same thing? Do they mean something different?

Look at models. Ask:

- What does the model show? What doesn't it show? How is it different to the real thing?

Things you could do with your child

• **TALK ABOUT** the symbols on a weather map • **LOOK AT NUTRITION** information on food packaging • **MAKE** models of our solar system • **COMPARE** a graph and a table of the same data • **FIND** evidence to support your child's opinion about an issue

What children are learning in science above level 4

Above level 4, children are working with more complex science investigations. They are drawing on evidence to argue for or against science claims. They are using more specialised science vocabulary, diagrams, symbols, and models. They may be interested in science issues and begin to contribute their own ideas.

SOME EXAMPLES OF NIKO'S SCIENCE WORK

PĀUA

Question 1. Give a reason that supports the view **It is better to take the small ones and put the big ones back.**

You need to put the big ones back because they are reproducing. They release sperm and eggs into the water. The eggs are fertilised and grow into small pāua and then to adults.

Niko uses many science words to help describe and explain science ideas

Question 2. Give a reason that supports the view **It is better to take the big ones and put the small ones back.**

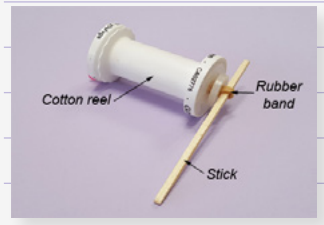
Leaving the smaller ones means the baby pāua can grow into adults and have offspring of their own.

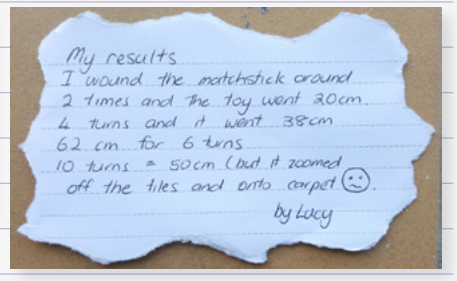
Niko can give both sides of an argument

COTTON REEL ROLLERS

Lucy and Tom wanted to find out if the number of times the stick on a cotton-reel toy is wound around affects how far the cotton reel travels along the floor.

Here are the toy and the results from their trials.




My results
I wound the matchstick around
2 times and the toy went 20cm
4 turns and it went 38cm
62 cm for 6 turns
10 turns = 50cm (but it zooned
off the tiles and onto carpet ☹.
by Lucy

Tom said, "We can't use the distance for 10 turns in our results." Is he correct?

I think Tom is correct because the carpet made it slow down. Next time we would need to make sure there is a lot of area so the cotton reel can stop just on the tiles.

Niko recognises that the data does not fit the pattern. He understands he needs to do more tests to get better evidence.

If I was going to do this experiment, I would make the cotton reel the same as Lucy and Tom's. It would be made of the same materials, be the same size, and use the same size rubber bands. I would wind the rubber band up the same number of times and let it go on the same sort of floor.

Niko can identify a range of variables in an investigation. He suggests a way to make the investigation a "fair test".

FOSSIL AND FERN

What evidence tells you the fossil and the fern leaf are two different types of ferns?

Niko compares details from different images.

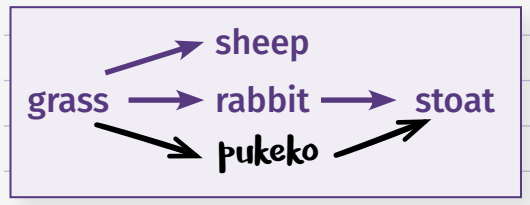
I think the fossil and the fern leaf are different types of ferns because of the shape of the leaves. The fossil leaves are thin and tiny but the fern leaf is big and wide. Also there are lots of leaflets on the fossil fern leaves but just one leaflet on the fern leaf.

FEEDING RELATIONSHIPS

Here is some more information about what animals eat.

Pukeko eat grass. Stoats eat pukeko.

Include this information in the food web below



Niko can add information to a food web.

He understands science concepts and how they are represented in detailed diagrams such as food webs.

Question: What would happen if the stoats ate all the rabbits?

The pukeko will have more grass to eat. The stoats might eat more pukeko.

Why is critiquing science processes and decisions important?

Scientists accept ideas as correct for now, when their robust testing does not lead to any further questions or differences. However, if more evidence is discovered, their ideas may change. Problems can be complex, and students need to have a good understanding of the science processed, to not only understand questions and issues, but to suggest actions that will solve them.

What you can do to help

Talk to your children about a current science issue from the media. Ask:

- What are the different ways people think about an issue?
- What is the difference between beliefs and evidence?
- What actions are different groups likely to take?
- How can science help predict the possible impact of different actions?
- Which actions might have the most merit for good outcomes?

Things you could do with your child

• **FOSTER** their interest in local science issues • **DISCUSS** their ideas about issues and the evidence they have to support them • **WORK** with them to solve practical problems such as building a rabbit hutch, planning a garden, or reducing plastics in the local area

NMSSA
Wānangatia te Putanga Tauira
National Monitoring Study of Student Achievement

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