

Wonder
Project

Ice Cream
Challenge

Challenge Guide



Engineering
New Zealand
Te Ao Rangahau

NOURISHED BY



Dairy for life



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Using the challenge guide

The challenge guide provides all the information you need to run the challenge successfully. Use it alongside the online modules in the student Learning Hub.

It's not important that you pānui this entire document – we know it's pretty huge! We recommend you understand the challenge overview, but otherwise please feel free to simply focus on the parts that are helpful to you. Karawhiua!

Kupu Māori glossary

We use kupu Māori throughout this document because it's a small but important way of encouraging others to do the same, to help keep the language alive.

Auahatanga	Creativity	Manawanaui	Perseverance, commitment
Ākonga	Student	Pānui	Read
Karawhiua	Give it heaps!	Pātai	Question
Kaiako	Teacher	Rōpū	Team
Kōrero	Speak	Whakarongo	Listen
Kupu	Word	Whanaungatanga	Connection, relationships
Mahi	Work		

STEM skills

Some of the STEM skills ākonga will use throughout the challenge are:

STEM skill	Description
Teamwork	Working with others to achieve an end goal – recognising each other's expertise and strengths, being flexible, and making sure each rōpū member has a job.
Whanaungatanga (connection, relationships)	Fostering belonging and togetherness by forming connections, strengthening relationships and embracing differences.
Communication	Passing on information effectively, whakarongo when others are sharing ideas, understanding instructions, and asking pātai. Bringing different knowledge and experience to the table to improve results.
Open mindedness	Being willing to whakarongo, considering and accepting different ideas, and being open to new experiences and learning about the world around you.
Auahatanga (creativity)	Respecting past knowledge while using inventiveness, creativity and outside the box thinking to collectively find solutions to issues ahead.
Problem solving	Thinking innovatively, being resilient, never giving up and trying lots of ideas to find the best solution.
Manawanui (perseverance, commitment)	Persevering when things don't go as planned, learning from mistakes made, and committing to solving the problem – no matter the journey.
Analysis	Being observant, collecting and interpreting data, detecting patterns, brainstorming ideas, and making decisions based on the results.

Challenge overview

Module	Activity sequence			
Module 1: Scoop 120 minutes Purpose: Understand the challenge, the pātai (question) you'll be solving, and the challenge goals before exploring the scientific inquiry process, what's in ice cream, and food microbiology.	We all scream for ice cream • Watch: Welcome to the Ice Cream Challenge video • Understand the challenge pātai (question) ākonga will solve – I wonder what makes ice cream yum? • Understand the challenge goals: Creamy, Scoopable, Flavourful • Listen to the Ambassador's career story • Complete "Activity 1.1: STEM roles quiz" and choose challenge rōpū and roles • Start sourcing challenge materials	What is ice cream? • Learn the five ingredients that make ice cream yum – ice, fat, sugar, air and flavour Our ice cream story • Discuss ice cream innovation in Aotearoa • Explore Fonterra's interactive grass to glass website	Scientific inquiry process • Learn the process ākonga will follow to create their ice creams: the scientific inquiry process • Display the scientific inquiry process poster • Unpack the first step of the scientific inquiry process: ask • Complete "Activity 1.2: Ice cream goals" and unpack the challenge goals	Food microbiology • Learn about microorganisms • Discuss the importance of being food safe • Display the food safety poster • Complete "Activity 1.3: Germ hunter" and explore bacteria growth from different surfaces using petri dishes
Module 2: Chill 120 minutes Purpose: Unpack the first goal "creamy ice cream" and how it's impacted by changes of matter, ice crystals and fat. Explore this with ice cream in a bag.	Goal 1: Creamy • Watch: Goal 1: Creamy Ice video • Understand the first challenge goal: to create a creamy ice cream • Learn the three states of matter and how they change • Learn how the state of matter changes when creating ice cream and how this impacts its creaminess	Ice • Learn about ice crystals and how they impact creaminess • Complete "Activity 2.1: Ice crystal investigation" and inspect microscopic imagery of ice crystals in ice cream	Fat • Watch: Goal 1: Creamy Fat video • Learn how the fat in milk and cream impacts creaminess	Experiment 1: Ice cream in a bag • Watch: Ice cream in a bag video • Complete "Activity 2.2: Ice cream in a bag" and test how fat makes ice cream creamy • Rate each ice cream's creaminess on the "Goal 1: Creamy" poster
Module 3: Whip 120 minutes Purpose: Unpack the second goal "scoopable ice cream" and how it's impacted by sugar and air. Explore this with ice cream on a cold plate.	Goal 2: Scoopable • Watch: Goal 2: Scoopable Sugar video • Understand the second challenge goal: to create a scoopable ice cream	Sugar • Learn how sugar helps make ice cream scoopable through freezing point depression • Demonstrate this by comparing two frozen water samples: one with sugar and one without	Air • Watch: Goal 2: Scoopable Air video • Learn about air and overrun and how they impact scoopability • Complete "Activity 3.1: Light as air" and investigate two cream samples	Experiment 2: Ice cream on a cold plate • Complete "Activity 3.2: Cold plate creations" and test how air makes ice cream scoopable • Rate each ice cream's scoopability on the "Goal 2: Scoopable" poster



Module	Activity sequence			
Module 4: Sense 60 minutes Purpose: Unpack the third goal “flavourful ice cream” and how the 5 senses impact flavour. Explore this with a sensory flavour experiment.	Goal 3: Flavourful • Watch: Goal 3: Flavourful video • Understand the third goal: to create a flavourful ice cream	Flavour • Learn how the five senses impact flavour	Experiment 3: Sensory detectives • Complete “Activity 4.1: Sensory detectives” and test how the five senses impact flavour	
Module 5: Taste 90 minutes Purpose: Unpack ingredient choices and how they impact the performance properties of ice cream. Then, explore flavour combinations and plan the ultimate ice cream.	Ingredient swaps • Learn how using different types of ingredients changes the outcome of the ice cream • Discover the properties of condensed milk and how it changes ice cream • Complete “Activity 5.1: Magic ingredients” and explore how different ingredients impact the challenge goals	Find your flavour • Learn the five basic tastes • Discuss flavour matches and why certain foods taste good together • Complete “Activity 5.2: Flavour chemistry” and create flavour matches using flavour cards	Ice cream quiz • Compete in the ice cream quiz to recap challenge learning	Your ultimate ice cream plan • Complete “Activity 5.3: Ultimate ice cream plan” and plan the ingredients and methods to achieve the three challenge goals
Module 6: Yum! 120 minutes Purpose: Create an ice cream that meets the three challenge goals by harnessing all challenge knowledge. Then, answer the challenge pātai.	STEM meets sweet • Prepare to create the ultimate ice cream	Create your ice cream • Complete “Activity 6.1: Your ultimate ice cream” and create final ice creams in rōpū • Rate each ice cream against the three ice cream goals on the “Ultimate ice cream” poster	Making ice cream yum • Form a conclusion on the challenge pātai – I wonder what makes ice cream yum? • Celebrate and reflect on learning	

Curriculum links

Achievement objectives

Kaiako can make wider curriculum links to other achievement objectives depending on ākonga level and individual learning programmes.

Strand	Ākonga will	Curriculum level/phase	Year level
Science: Investigating in Science	Ask questions and carry out fair tests to investigate how ingredients and processes affect the properties of ice cream.	Level 3	5–6
Science: Material World	Explore how the properties of ingredients change when mixed and cooled.	Level 3	5–6
Technology: Technological Products	Understand how the performance properties of ice cream ingredients affect the final product.	Level 3	5–6
Technology: Outcome Development and Evaluation	Test, evaluate and improve ice cream recipes and processes to create an ice cream that meets their challenge goals.	Level 3	5–6
Mathematics and Statistics: Measurement	Measure ingredients, quantities, and variables using appropriate units and measuring tools.	Phase 2	5–6
Mathematics and Statistics: Statistics	Explain their results by collecting, displaying, and analysing data.	Phase 2	5–6

Your resources

To complete the Ice Cream Challenge, you'll be using the items in your ice cream kit, alongside some items you'll need to source as a school.



Ice cream kit items

Please read me!

First stop, fridge

Refrigerate the agar petri dishes as soon as you receive the kit.

At least 24 hours before use, remove your cold plates from the cooler bag and place them **upside down** in the freezer.

Dairy free resources

You can email us to request dairy free alternatives for ākonga with dietaries.

Perishables

If you're using this kit outside of **Term 3 2026**, please check all expiration and best-before dates on food items before you use them.

Schools to supply

Need help sourcing something? We're here to help with a library of resources you can borrow. Get in touch with what you need at hello@wonderproject.nz

Ingredients



Milk powder
1kg



11 x long-life cream
250ml



4 x sweetened
condensed milk
170g



Icing sugar
500g



Rock salt
3kg

8 x tool sets:



6 x tasting
spoons



1 x measuring
scoop



1 x whisk

Other tools:



8 x measuring jugs



1 x small ziplock
bag pack



2 x large ziplock
bag packs



Stickers

1 x chiller bag:



Chiller bag



4 x cold plates



10 x agar
petri dishes



Cotton buds

Sensory investigation



4 x food colouring



10 x flavours



10 x small cups



Flavour card set

Required



Technology
ambassador's
presentation



Ākonga devices
for research and
challenge surveys



Electric beater



Scales



Tea towels
or gloves



Ice
3kg bag



Bowls



2 x containers
identical



Opaque cup
1 per ākonga



Fridge and freezer



Cleaning supplies



Trays
big enough to hold 1-2 cold
plates (oven or tote tray)

Classroom resources



Pens, pencils
and paper



Sharpie



Label stickers
or masking tape



Soap



Calculator



Timer

Lesson sequences

Module 1: Scoop

 **120 minutes (approximate)**

Purpose

Understand the challenge, the pātai (question) you'll be solving, and the challenge goals before exploring the scientific inquiry process, what's in ice cream, and food microbiology.

Resources

From your ice cream kit:



Agar petri dishes
1 per rōpū + 1 control



Cotton swabs
2 per rōpū

School to supply:



Technology
for the ambassador's
PowerPoint presentation



Sharpie or other marker



Label stickers or
masking tape



Soap, water and
paper towels



Gloves
optional

Print or share online:

- Activity 1.1: STEM roles quiz
(1 per ākongā)
- Activity 1.2: Ice cream goals
(1 per rōpū)
- Activity 1.3: Germ hunter
(1 per rōpū)
- Poster: Scientific inquiry process
(A3, 1 per class)
- Poster: Food safety
(A3, 1 per class)



Module outcomes

- Learn the challenge pātai/question you'll be solving – I wonder what makes ice cream yum?
- Learn the three ice cream goals – creamy, scoopable, flavourful
- Understand STEM skills and how they relate to ice cream
- Form a rōpū and understand the importance of roles and responsibilities
- Understand the five ice cream ingredients that make ice cream yum – ice, fat, sugar, air, and flavour
- Learn the process you'll use to complete the challenge – scientific inquiry process
- Unpack the challenge goals
- Learn about food microbiology and the importance of being food safe
- Predict and test how much bacteria lives on different surfaces

Preparation

Pre-module checklist

Kaiako

- ☐ Completed teacher training
- ☐ Pānui Module 1 of the Student Hub
- ☐ Checked your ice cream kit has arrived
- ☐ Pānui the health and safety guidance
- ☐ Collected challenge resources
- ☐ Completed the teacher pre challenge survey
- ☐ Asked ākongā to complete the student pre challenge survey
- ☐ Joined Wonder Project Facebook group

Ambassadors

- ☐ Completed ambassador training
- ☐ Pānui Module 1 of the Student Hub
- ☐ Ordered free Wonder Project t-shirt to wear on visits
- ☐ Pānui the health and safety guidance
- ☐ Prepared your career presentation
- ☐ Joined Wonder Project Facebook group

Module 1 lesson sequence

Use this lesson sequence to support you as you work through Module 1 of the Student Hub.

Key:	Refers to key concept 	More information in the activity notes 	Ambassador role can be done online 
Explicit teaching:	Knowledge 	Practices 	

Timing	Activity	Teaching sequence	Ambassador role
Block A 30 minutes	Pre challenge surveys		
	Student and teacher pre challenge surveys	All kaiako and ākonga should complete their pre challenge survey before the challenge. They are an important tool for us to improve the programme each year and continue our funding to keep the Wonder Project free for schools.	
	We all scream for ice cream		
	Video: Welcome to the Ice Cream Challenge 	Watch video that introduces the Ice Cream Challenge and establishes the three challenge goals – to create a creamy, scoopable, flavourful ice cream. Understand the challenge pātai (question) ākonga will solve – I wonder what makes ice cream yum?	Support ākonga to understand how STEM relates to ice cream and how exciting it can be. Ask pātai: What do you already know about ice cream? How can you use STEM skills to answer the challenge pātai? How do you think you could use science to make ice cream creamy, scoopable and flavourful?
	Meet your support crew 	Establish the kaiako and ambassador as the support crew. Then, the ambassador will share their career story.	Introduce yourself to the class and share your career story presentation (5 mins). Use the tips provided in the Wonder Project video telling your story . 
	Activity 1.1: STEM roles quiz 	Complete quiz to help ākonga understand which ice cream challenge role might suit them best. Then, get ākonga into a rōpū (team) of around 4 classmates and use their quiz results to choose their Ice Cream Challenge role.	After the quiz, facilitate a wrap-up kōrero on the class's results. Share your knowledge on different STEM roles – including cool STEM projects you're aware of or have been involved with. 
	Unpack your ice cream kit 	Get ākonga to help unpack the kit.	Explain how each item might be used. 
Block B 10 minutes	What is ice cream?		
	Video: What is ice cream? 	Watch video that introduces the five types of ingredients in ice cream that make it yum: ice, fat, sugar, air and flavour.	Discuss the role of ice, fat, sugar, air and flavour in ice cream creation. Ask pātai: How would ice cream taste without ice/fat/sugar/air/flavour?

Timing	Activity	Teaching sequence	Ambassador role
Block C 20 minutes	Our ice cream story		
	Aotearoa ice cream innovation 	Discuss dairy and ice cream innovation within Aotearoa.	Support kōrero by discussing why Aotearoa ice cream is some of the best in the world: • Local ice cream innovators • World-class ingredients • High quality, fresh dairy 
	From grass to glass 	Explore website that covers how Fonterra gathers milk and turns it into ice cream ingredients.	Ask pātai: What did you learn about the milk production process? What did you learn about food safety? What do you think happens after this to turn milk into ice cream? 
Block D 30 minutes	Scientific inquiry process		
	Scientific inquiry process 	Introduce ākonga to the scientific inquiry process that they'll follow to create their ice creams. Print and display the scientific inquiry process poster.	Ask pātai: What do you think a food scientist does? What is important about the ask/predict/test/explain stage? 
	Ask 	Explore the first step of the scientific inquiry process 'ask'. Understand that scientists start experiments by picking something they're curious about and asking pātai to understand it better. Discuss the challenge pātai: I wonder what makes ice cream yum?	Support ākonga to understand how asking pātai at the start of experiments can help with the problem-solving process. Give examples of when you might have done this at mahi. 
	Activity 1.2: Ice cream goals 	Explore the three challenge goals and how they could be achieved.	Discuss why goal setting is an important part of STEM roles. After the activity, ask each rōpū to share one of their reflections. 
Block E 30 minutes	Food microbiology		
	Food microbiology 	Discuss microorganisms (bacteria, yeast, mould, viruses) and food microbiology: the study of microorganisms in food. Understand how microorganisms can make our food unsafe to eat.	Briefly explain the different types of microorganisms and how they can be good and bad. • Good microorganisms: probiotics (yoghurt, pickles), yeast for bread • Bad microorganisms: mouldy bread, bad bacteria. 

Timing	Activity	Teaching sequence	Ambassador role
Block E 30 minutes	Food microbiology (cont)		
	Food safety 	Establish the importance of being food safe and the food safety rules for the Ice Cream Challenge. Print and display the food safety poster and have a class kōrero on the rules.	Review the role of the Hygiene Hero in Activity 1.1 with the class. Ask the Hygiene Hero from each rōpū to pānui one of the rules to the class. 
	Activity 1.3: Germ hunter 	Explore bacteria growth by collecting samples from different surfaces and growing them in petri dishes.	Support ākonga to collect their samples and ensure they are using the petri dishes safely. Ask pātai: Which surface do you think has the most bacteria? Why? 
Remember: Freeze some ice for use in the next module and collect tea towels or gloves to create ice cream in a bag. Please also chill your cream in the fridge overnight.			

Module 2: Chill

 120 minutes (approximate)

Purpose

Unpack the first goal “creamy ice cream” and how it’s impacted by changes of matter, ice crystals and fat. Explore this with ice cream in a bag.

Resources

From your ice cream kit:



Small ziplock bags
2 per rōpū



Big ziplock bags
2 per rōpū



Salt
½ cup per rōpū



Milk powder
2 tbsp per rōpū



Icing sugar
2 tbsp per rōpū



Long-life cream
3 tbsp per rōpū



Measuring jug



Measuring scoops



Tasting spoons



Stickers

School to supply:



Ice
2 cups per rōpū



Water



Tea towels or gloves
2 per rōpū



Cleaning supplies



Timer



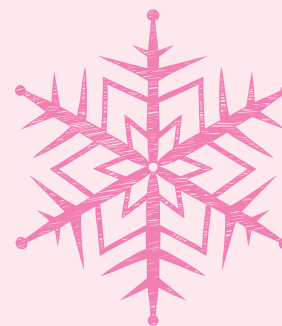
Fridge/freezer



Classroom resources
including pens

Print or share online:

- Activity 2.1: Ice crystal investigation
(1 per rōpū)
- Activity 2.2: Ice cream in a bag
(1 per rōpū)
- Poster: Goal 1: Creamy
(A3, 2 per class)



Module outcomes

- Explore the first ice cream goal – creamy ice cream
- Learn the three states of matter and how they change into different states
- Learn how ice crystals impact creaminess
- Learn how fat impacts creaminess
- Test how fat impacts creaminess by creating ice cream in a bag

Preparation

Pre-module checklist

- ☐ Pānui Module 2 of the Student Hub
- ☐ Collected your resources
- ☐ Chilled the long-life cream in the fridge overnight
- ☐ Frozen ice cubes
- ☐ Pre-cleaned all ice cream creation surfaces

Module 2 lesson sequence

Use this lesson sequence to support you as you work through Module 2 of the Student Hub.

Key:	Refers to key concept 	More information in the activity notes 	Ambassador role can be done online 
Explicit teaching:	Knowledge 	Practices 	

Timing	Activity	Teaching sequence	Ambassador role
Block A 10 minutes	Goal 1: Creamy		
	Video: Goal 1: Creamy Ice 	Watch video that explores the first ice cream goal, creamy ice cream, and how it's impacted by changing states of matter and ice crystals.	Ask pātai: <i>Why is it important for an ice cream to be creamy?</i>
	States of matter 	Discuss the three states of matter (solid, liquid, gas) and how they change from one state into another through heat and cooling.	Lead kōrero on how matter changes states when creating ice cream. Ask pātai: <i>Why do you think changes of matter impacts ice cream's creaminess?</i>
Block B 20 minutes	Ice		
	Ice 	Discuss how ice crystals impact ice cream's creaminess.	Lead kōrero on how big, uneven ice crystals make ice cream icy and rough. And, how small, even ice crystals make ice cream creamy and smooth. 
	Activity 2.1: Ice crystal investigation 	Inspect microscopic imagery of ice crystals in ice cream to understand how they impact creaminess.	Help ākonga understand the images using the activity support notes as a reference. Ask pātai: <i>What clues do the ice crystals give you on each ice cream's creaminess?</i> 
Block C 10 minutes	Fat		
	Video: Goal 1: Creamy Fat 	Watch video that explores how ice cream's creaminess is impacted by fat.	Help ākonga understand that fat coats ice crystals as they form. And, that this stops them from getting too big and uneven. Ask pātai: <i>How do you think fat impacts ice cream's creaminess?</i>
Block D 80 minutes	Experiment 1: Ice cream in a bag		
	Video: Ice cream in a bag 	Watch instructional video on how to create ice cream in a bag.	Support the kaiako to set up the ice cream in a bag activity.



Timing	Activity	Teaching sequence	Ambassador role
Block D 80 minutes	Experiment 1: Ice cream in a bag (cont)		
	Activity 2.2: Ice cream in a bag 	Create two ice creams in a bag to demonstrate how fat makes ice cream creamy. Print and display the “Goal 1: Creamy” poster and rate each test from yuck to yum.	Support ākongā to create their ice creams and help them understand their results: • The test with milk had less fat which meant the ice crystals were bigger, and the ice cream was less creamy. • The test with cream had more fat which kept ice crystals small and produced a creamier ice cream.
Remember: Ask ākongā to start collecting trays and an electric beater for their second ice cream experiment. You'll also need to freeze more ice, chill your cream and freeze your cold plates overnight, and prepare 2 samples of frozen water (one mixed with sugar and one without) and 2 samples of frozen cream ($\frac{1}{2}$ cup whipped and $\frac{1}{2}$ cup unwhipped).			

Module 3: Whip

 **120 minutes (approximate)**

Purpose

Unpack the second goal “scoopable ice cream” and how it’s impacted by sugar and air. Explore this with ice cream on a cold plate.

Resources

From your ice cream kit:



Milk powder
2 tbsp per rōpū



Cold plate
1 per 2 rōpū



Salt
¼ cup per 2 rōpū



Whisk



Measuring jugs



Measuring scoops



Tasting spoons



Ziplock bags
2 per class



Stickers



Icing sugar
2 tbsp per rōpū and 1
tbsp for sugar water
demonstration



Long-life cream
3 tbsp unwhipped and 6
tbsp whipped per rōpū; ½
cup unwhipped and ½ cup
whipped per class

School to supply:



Tray
1 per 2 rōpū,
eg oven or tote tray



Ice
enough to cover the
bottom of each tray



Small containers
2 per class, eg food containers



Electric beater



Scales



Bowls



Water



Fridge/freezer



Cleaning supplies



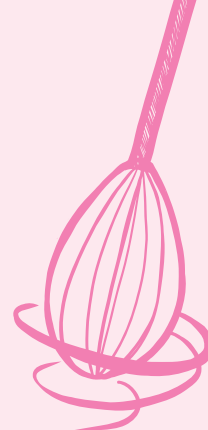
Timer



Classroom resources
including pens

Print or share online:

- Activity 3.1: Light as air (1 per rōpū)
- Activity 3.2: Cold plate creations (1 per rōpū)
- Poster: Goal 2: Scoopable (A3, 2 per class)



Module outcomes

- Explore the second ice cream goal – scoopable ice cream
- Learn how sugar impacts scoopability through freezing point depression
- Learn how air and overrun impact scoopability
- Test how air impacts ice cream’s scoopability by creating ice cream on a cold plate

Preparation

Pre-module checklist

- ☐ Pānui Module 3 of the Student Hub
- ☐ Collected your resources
- ☐ Pre-cleaned all ice cream creation surfaces
- ☐ Chilled the long-life cream in the fridge overnight
- ☐ Frozen cold plates overnight (remove from chiller bag and place upside down in the freezer)
- ☐ Frozen ice cubes
- ☐ Frozen water samples (in one ziplock bag, freeze ¼ cup of water, in another, freeze ¼ cup of water mixed with 1 tablespoon of icing sugar)
- ☐ Frozen cream samples (½ cup whipped cream and ½ cup of unwhipped cream)
- ☐ Pre-whipped cream (6 tablespoons whipped cream per rōpū)

Module 3 lesson sequence

Use this lesson sequence to support you as you work through Module 3 of the Student Hub.

Key:	Refers to key concept 	More information in the activity notes 	Ambassador role can be done online 
Explicit teaching:	Knowledge 	Practices 	

Timing	Activity	Teaching sequence	Ambassador role
Block A 10 minutes	Goal 2: Scoopable		
	Video: Goal 2: Scoopable Sugar 	Watch video that explores the second ice cream goal, scoopable ice cream, and how it's impacted by sugar.	Ask pātai: <i>Why is it important for an ice cream to be scoopable?</i>
Block B 10 minutes	Sugar		
	Freezing point depression 	Discuss how sugar makes ice cream scoopable through freezing point depression. Demonstrate this by preparing and comparing two frozen water samples – one mixed with sugar and one without. The one mixed with sugar should be less solid than the one without. This is because the sugar has lowered the water's freezing point.	Help explain freezing point depression in relation to sugar: Sugar lowers the freezing point of the water in ice cream. This makes it harder for ice crystals to form, so ice cream stays soft and scoopable! Support the demonstration by explaining why the sample with sugar is less solid than the sample without. 
Block C 20 minutes	Air		
	Video: Goal 2: Scoopable Air 	Watch video that explores how air makes ice cream scoopable.	Explain that the measure of how much air gets whipped into ice cream is called overrun.
Block D 80 minutes	Activity 3.1: Light as air 	Investigate two samples of frozen cream to understand how air impacts scoopability.	Support ākongā to weigh the samples – write the answers on the board. Help them understand why one sample was lighter than the other: one sample has air added which is much lighter than cream.
Block D 80 minutes	Experiment 2: Ice cream on a cold plate		
	Video: Ice cream on a cold plate 	Watch instructional video on how to create ice cream on a cold plate.	Support the kaiako to set up the cold plate activity.

Timing	Activity	Teaching sequence	Ambassador role
Block D 80 minutes	Experiment 2: Ice cream on a cold plate (cont)		
	Activity 3.2: Cold plate creations 	Create ice cream on a cold plate to understand how air makes ice cream scoopable. Print and display the “Goal 2: Scoopable” poster and rate each test from yuck to yum.	Support ākonga to create their ice creams and understand their results: • The test with unwhipped cream had less air which meant the ice cream was harder and less scoopable • The test with whipped cream had more air which made the ice cream lighter and more scoopable
Remember: Prepare sugar water before the next module.			

Module 4: Sense

 60 minutes (approximate)



Purpose

Unpack the third goal “flavourful ice cream” and how the 5 senses impact flavour. Explore this with a sensory flavour experiment.

Resources

From your ice cream kit:



Flavour drops



Small plastic cups
10 per class



Icing sugar
4–5 tbsp per class



Food colouring



Tasting spoons



Measuring scoops

School to supply:



Opaque cups
1 per ākonga



Water



Classroom resources
including pens

Print or share online:

- Activity 4.1: Sensory detectives
(1 per rōpū)

Module outcomes

- Explore the third ice cream goal – flavourful ice cream
- Learn the five senses and how they impact flavour perception
- Perform a series of sensory tests to understand how each sense impacts flavour

Preparation

Pre-module checklist

- ☐ Pānui Module 4 of the Student Hub
- ☐ Collected your resources
- ☐ Prepared coloured, sugar water (4 cups per class – instructions in activity notes)

Module 4 lesson sequence

Use this lesson sequence to support you as you work through Module 4 of the Student Hub.

Key:	Refers to key concept 	More information in the activity notes 	Ambassador role can be done online 
Explicit teaching:	Knowledge 	Practices 	

Timing	Activity	Teaching sequence	Ambassador role
Block A 10 minutes	Goal 3: Flavourful		
	Video: Goal 3: Flavourful 	Watch video that explores the third ice cream goal, flavourful ice cream, and how it's impacted by your 5 senses.	Ask pātai: <i>Why is it important for an ice cream to be flavourful?</i>
Block B 10 minutes	Flavour		
	Flavour 	Recap how each sense impacts flavour perception.	Ask pātai: <i>What do you think ice cream would taste like without smell/sight/touch/sound? Why?</i> 
Block C 40 minutes	Experiment 3: Sensory detectives		
	Activity 4.1: Sensory detectives 	Explore how each sense impacts flavour perception by testing flavoured, coloured, sugar water with different combinations of senses.	Optional: Create your own flavour/colour combination to try and trick ākonga. Eg, create banana flavoured water and colour it pink.

Module 5: Taste

 90 minutes (approximate)

Purpose

Unpack ingredient choices and how they impact the performance properties of ice cream. Then, explore flavour combinations and plan the ultimate ice cream.

Resources

From your ice cream kit:



Flavour cards

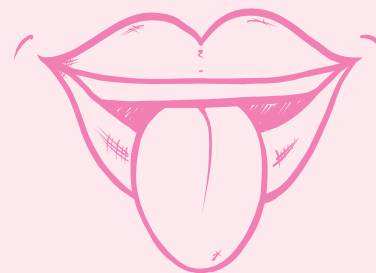
School to supply:



Classroom resources
including pens

Print or share online:

- Activity 5.1: Magic ingredients
(1 per rōpū)
- Activity 5.2: Flavour chemistry
(1 per class)
- Activity 5.3: Ultimate ice cream plan
(1 per rōpū)



Module outcomes

- Learn how the properties of different ingredients impact the performance of ice cream
- Explore ingredient swaps and how they could help achieve the three ice cream goals
- Explore flavour pairings and why flavours taste good together
- Choose the final ingredients and methods for the ultimate ice cream

Preparation

Pre-module checklist

- ☐ Pānui Module 5 of the Student Hub
- ☐ Collected your resources

Module 5 lesson sequence

Use this lesson sequence to support you as you work through Module 5 of the Student Hub.

Key:	Refers to key concept 	More information in the activity notes 	Ambassador role can be done online 
Explicit teaching:	Knowledge 	Practices 	

Timing	Activity	Teaching sequence	Ambassador role
Block A 20 minutes	Ingredient swaps		
	Condensed milk 	Understand that using different types of ingredients will change the ice cream. Introduce condensed milk as a sugar alternative with medium fat, high sugar and low water. Consider how this ingredient might impact the three ice cream goals.	Lead a class discussion on the properties of condensed milk and recap the learnings so far: • Low water, fewer ice crystals, creamier ice cream • High fat, creamier ice cream • High sugar, scoopable ice cream • High air, scoopable ice cream Ask pātai: <i>Why does the extra fat/sugar/low water content in condensed milk help make ice cream creamy and scoopable?</i> 
	Activity 5.1: Magic ingredients 	Unpack the properties of ice cream ingredients and think about how they might change the ice cream.	Circulate the class as ākonga complete the activity. Help them think about the sugar/fat/water/air levels of ingredients and how that might impact their ice cream.
Block B 20 minutes	Find your flavour		
	Find your flavour 	Learn the five basic tastes: sweet, salty, sour, bitter and savoury. Then, explore why certain flavours work well together: • Taste twins (sweet and sweet) • Taste opposites (salty and sweet) • Taste boosters (eg adding salt or lemon)	Call out a flavour and ask ākonga to respond with a good match. Eg, chocolate, strawberry, banana. Ask pātai: <i>Why do you think these flavours are a match?</i> 
	Activity 5.2: Flavour chemistry 	Explore a range of flavour matches with the flavour cards in the kit.	Support ākonga to find flavour matches. Encourage them to think creatively.
Block C 20 minutes	Ice cream quiz		
	Ice cream quiz 	Recap and test challenge learning in a fun, online quiz.	Lead the quiz as the quizmaster.

Timing	Activity	Teaching sequence	Ambassador role
Block D 30 minutes	Your ultimate ice cream plan		
	Activity 5.3: Ultimate ice cream plan 	Decide on the ingredients and methods ākonga will use to meet the three ice cream goals.	Circulate the class as ākonga complete the activity. Ask pātai: <i>Why have you chosen this method/ingredient? How will this plan help make your ice cream yum?</i>
Remember: Ask ākonga to bring in everything they need for their ultimate ice cream – including optional add-ins. You'll also need to freeze more ice, chill your cream and freeze your cold plates overnight.			

Module 6: Yum!

 120 minutes (approximate)

Purpose

Create an ice cream that meets the three challenge goals by harnessing all challenge knowledge. Then, answer the challenge pātai.

Resources

From your ice cream kit:



Milk powder



Long-life cream



Icing sugar



Condensed milk



Flavour drops



Food colouring



Cold plate and/
or small and large
ziplock bags



Salt



Whisk



Measuring scoops



Measuring jugs



Tasting spoons



Stickers

School to supply:



Tray or tea towels/gloves



Ingredient add-ins



Ice



Electric beater



Bowls



Water



Cleaning supplies



Timer



Calculator



Fridge/freezer



Classroom resources
including pens

Print or share online:

- Activity 6.1: Your ultimate ice cream (1 per class)
- Activity 6.2: Scoop showcase (1 per rōpū)
- Poster: Ultimate ice cream (A3, 2 per class)



Module outcomes

- Create the ultimate ice cream
- Score each ice cream on their creaminess, scoopability and flavour
- Form a conclusion on the challenge pātai – I wonder what makes ice cream yum?

Preparation

Pre-module checklist

- ☐ Pānui Module 6 of the Student Hub
- ☐ Collected your resources
- ☐ Pre-cleaned all ice cream creation surfaces
- ☐ Pre-whip cream (6 tablespoons whipped cream per rōpū)
- ☐ Frozen cold plates overnight (place upside down in the freezer)
- ☐ Frozen ice cubes

Post-module checklist

Completed/shared post-challenge surveys:

- ☐ Teacher post-challenge survey
- ☐ Ambassador post-challenge survey
- ☐ Student post-challenge survey

Module 6 lesson sequence

Use this lesson sequence to support you as you work through Module 6 of the Student Hub.

Key:	Refers to key concept 	More information in the activity notes 	Ambassador role can be done online 
Explicit teaching:	Knowledge 	Practices 	

Timing	Activity	Teaching sequence	Ambassador role
Block A 10 minutes	STEM meets sweet		
	STEM meets sweet 	Recap challenge learning and prepare to create the final ice cream.	Support the kaiako to set up the ultimate ice cream activity.
Block B 90 minutes	Create your ice cream		
	Activity 6.1: Your ultimate ice cream 	Create the ultimate ice cream using the plans from activity 5.3. Print and display the “Ultimate ice cream” poster and rate each ice cream from yuck to yum.	Support ākonga to create their final ice creams.
	Activity 6.2: Scoop showcase! 	Create a poster about the ultimate ice cream and form a conclusion on the challenge pātai.	Support ākonga to describe how they met their three challenge goals.
Block C 20 minutes	Making ice cream yum		
	Making ice cream yum 	Reflect on challenge pātai and celebrate challenge successes and failures.	Praise ākonga on their challenge journey. Give each rōpū an example of progress they made throughout the challenge. 
	Whānau showcase	Allow ākonga to take home the cold plate/any other ingredients and tools on a roster and share their ultimate ice cream recipe with their whānau.	
	Post challenge surveys		
	Post challenge surveys	All kaiako, ākonga and ambassadors should complete their post challenge survey. They're an important tool for us to improve the programme each year and continue our funding to keep the Wonder Project free for schools. We supply kaiako with the survey data from their school to show the impact the Ice Cream Challenge has had on ākonga perceptions towards STEM, and how much they've learned.	

Activity notes

Here you'll find support notes and answers for relevant activities. If there's anything else you need help with, please get in touch at hello@wonderproject.nz

Activity 1.3: Germ hunter

Equipment

Each rōpū should have:

From your ice cream kit:



1 agar petri dish



2 cotton swabs

School to supply:



Marker or
masking tape



Soap and
water access



Paper towels



Gloves
optional

Key:

Get ahead



Teacher preparation



In-class work



Get ahead

For kaiako with less time in class

Optional



- Complete steps 1–4 in the preparation section before class.

Instructions

Prepare

1. Choose samples to test. Ideas include:

Bacteria sources	Common locations
Hands	Hands, desks, shared equipment.
Dust/air	Shelves, books, windowsills.
Food	Lunchboxes, crumbs, bins.
Water	Sinks, drink bottles.

2. Draw a line down the middle of the base to separate it into two sections.
3. Add rōpū names and label each side with the sample name.
4. Label one petri dish "control". Open it for a few minutes and then seal without touching the agar.

A control dish is a baseline used for comparison. It strengthens fair testing by showing ākongā what happens when the independent variable is not changed (ie, no samples are swabbed).



Activity 1.3: Germ hunter

Run activity

Collect samples

- Wipe a cotton bud across the first sample surface for 10 seconds.
- Open the petri dish and gently wipe the cotton bud across one half of the agar in a zig zag pattern.
- Repeat with the second sample surface using a new cotton bud. Wipe the opposite side of the agar.
- Put the lid back on the petri dish and do not re-open it. Seal closed with tape.

Store samples

- Store all samples, including the control, upside down, in a cupboard or on a shelf. Avoid storing them in direct sunlight or heat.
- Once stored, wash hands.

Check results

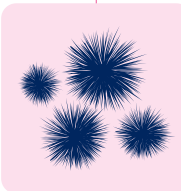
11. Check samples after 1 day, then after 4–6 days. Encourage ākongā to notice:

- Colour (white, yellow, orange, etc.)
- Shape (round, spreading, clustered)
- Texture (smooth, fuzzy, raised, flat)
- Size and amount of growth

It is difficult to determine what is growing on the petri dish with sight alone.
But here are some common observations:

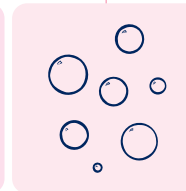
Fungi/mould

Fuzzy growth

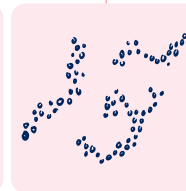


Bacteria

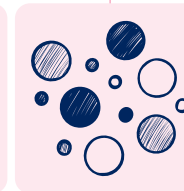
Round and smooth



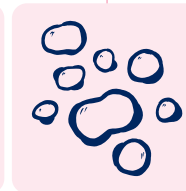
Small dots



Different colours



Different shapes



Activity 1.3: Germ hunter

Health and safety

During the activity

- Clean your work surfaces before starting the activity.
- Do not touch the agar inside the petri dish with anything other than the cotton swab.
- Wash hands after touching the petri dishes.
- Tape the petri dishes closed after sealing them.
- Do not open the petri dishes once they're sealed.
- Handle them using gloves if required by school policy.

After the activity

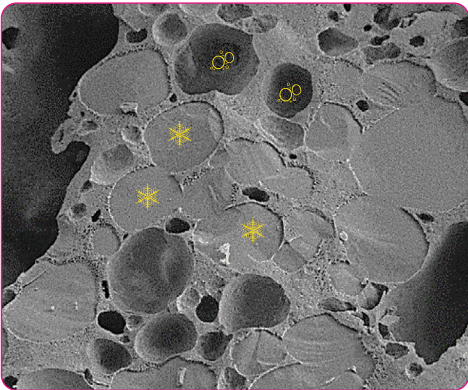
- Kaiako should dispose of the petri dishes safely by:
 - Placing them in a resealable bag or container
 - Adding 1 cup of bleach solution into the bag
 - Sealing the bag and container and then throwing it in a lined rubbish bin or a school biohazard waste system. Do not open the bag or container once it's sealed.
- Dispose of any unused petri dishes after 3 months.

Activity 2.1:

Ice crystal investigation

What to look for

Key



Air bubbles

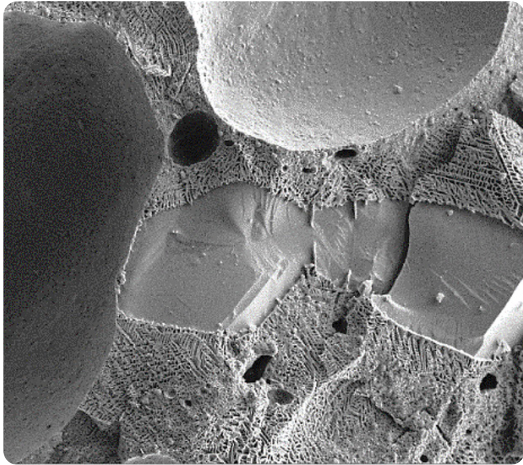
Ice crystals

To help ākongā understand what they're seeing in these images:

- The smooth grey shapes are ice crystals.
- The dark shapes are air bubbles

Answers

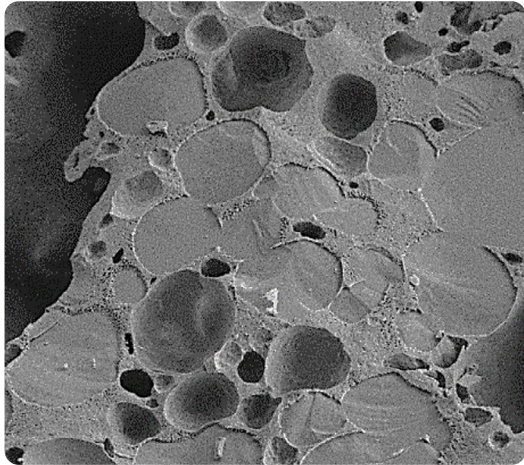
Image 1



This is the less creamy ice cream because the ice crystals are:

- Large
- Uneven
- Rough

Image 2



This is the more creamy ice cream because the ice crystals are:

- Small
- Even
- Smooth

Activity 2.2: Ice cream in a bag

Equipment

Each rōpū should have:

From your ice cream kit:



2 small ziplock bags



2 big ziplock bags



½ cup salt



2 tbsp milk powder



2 tbsp icing sugar



3 tbsp long-life cream



Measuring jug



Measuring spoons



Tasting spoons

School to supply:



2 cups of ice



6 tbsp water



2 tea towels or gloves



Timer

Key:

Get ahead



Teacher preparation



In-class work



Plant-based swaps

Swap any dairy ingredient for the same amount of a plant-based one.



Get ahead

For kaiako with less time in class

Options to maximise time include:

- Pre-mixing milk powder and water
- Preparing mixtures for each test beforehand:

Measurements

Makes enough for 8 rōpū

Test 1: Milk

1 ½ cups

Water

½ cup

Milk powder

½ cup

Icing sugar

Test 2: Milk and cream

1 ½ cups

Water

½ cup

Milk powder

½ cup

Icing sugar

1 ½ cups

Cream

Method

Make sure the cream is chilled in the fridge overnight.

Whisk ingredients for each test in separate bowls or jugs until smooth.

This provides approximately ¼ cup per rōpū for each test.

Optional



Activity 2.2:

Ice cream in a bag

Instructions

Prepare

Choose how you'll run the activity:

Option 1: Demonstration
Good for: Learning the method

Complete the first test as a class before allowing rōpū to complete the second test independently.

Option 2: Sequential
Good for: Direct comparison

Each rōpū completes both tests independently.

Option 3: Split-class
Good for: Big classes, fast rotations

Half the class does test 1 only, half the class does test 2 only.

Prepare your ingredients

1. Chill cream in the fridge overnight.
 2. Follow the “get ahead” steps to pre-mix mixtures OR set up ingredient stations in the classroom.
- Suggested ingredient stations:
 - Pre-mixed milk powder and water
 - Cream
 - Sugar
 - Plant based (if required)

Run activity

Create ice cream

1. Measure ice cream ingredients or a $\frac{1}{4}$ cup of ice cream mixture and place into the small ziplock bag. Give it a good mix
2. Push out any air, then seal the bag tight.
3. Add 1 cup of ice and a $\frac{1}{4}$ of cup of salt into your big ziplock bag.
4. Put the small ziplock bag into the big ziplock bag and seal the big bag up.
5. Wrap the bag in a tea towel or hold it with gloves.
6. Shake the bag for 5 minutes.
7. Take the small bag out of the big bag and rinse off all salt – including anything in the bag's seal.
8. Open the bag and taste test!
9. Rate the ice cream on the “Goal 1: Creamy” poster.



Activity 2.2:

Ice cream in a bag

Expected results

Test	What to expect	Why
Test 1: Milk	This test should produce an icy, crumbly block of ice cream.	There are less fats in milk which means ice crystals grow more freely.
Test 2: Milk and cream	This test should produce a creamier ice cream, but it will still be icy.	The fat in the cream coats the ice crystals as they freeze. This prevents them from getting too big and uneven.

Why does the bag get so cold?

When salt is added to ice, it makes the ice melt at a lower temperature than 0°C.

To melt, ice needs heat energy. So, the ice takes heat from its surroundings. As heat is removed, the temperature gets colder.

So even though it's melting, the mixture gets colder. This is called freezing point depression. This concept will be taught in Module 3 as it relates to sugar in ice cream.

Activity 3.1: Light as air

Equipment

From your ice cream kit:



½ cup of
unwhipped cream



½ cup of
whipped cream



Measuring jug

School to supply:



2 identical
small containers



Beater



Freezer



Scales

Key:

Get ahead



Teacher preparation



In-class work



Instructions

Prepare



Prepare your cream samples

1. Chill cream in fridge overnight.
2. Measure ½ cup of unwhipped cream and place in container.
3. Measure ½ cup of whipped cream and place in container.
4. Freeze for at least 4 hours before the activity.

Run activity



1. Weigh each sample as a class.
2. Cut each sample in half and allow ākongā to inspect.

Expected results

Sample	Weight	What does this mean?
Unwhipped cream	Around 63g	Cream is heavier than air. This sample has less air. This makes it heavier and less scoopable.
Whipped cream	Around 40g	Air is lighter than cream. This sample has more air. This makes it lighter and more scoopable.

Activity 3.2: Cold plate creations

Equipment

Each rōpū should have:

From your ice cream kit:



2 tbsp milk powder



3 tbsp unwhipped cream



6 tbsp whipped cream



2 tbsp icing sugar



Whisk



Measuring jugs



Measuring scoops



Tasting spoons

School to supply:



6 tbsp water



Bowls



Fridge/freezer



Timer



Cleaning supplies

Shared between 2 rōpū:

From your ice cream kit:



1 cold plate
removed from chiller bags and
frozen upside down overnight



¼ cup salt



Tray
big enough for 1–2 cold plates,
eg oven or tote tray



Ice
enough to cover
the bottom of each tray



Electric beater
optional

Key:

Get ahead



Teacher preparation



In-class work



Plant-based swaps

Swap any dairy ingredient for the same amount of a plant-based one.

Coconut cream doesn't double in size when whipped but whipping it will still produce a difference in test outcomes.



Get ahead

For kaiako with less time in class

Options to maximise time include:

- Pre-mixing milk powder and water
- Pre-whipping 1 ½ cups of cream (creates 3 cups whipped)
- Preparing mixtures for each test beforehand

Measurements

Makes enough for 8 rōpū

Test 1: Unwhipped cream

1 ½ cups

Water

½ cup

Milk powder

½ cup

Icing sugar

1 ½ cups

Unwhipped cream

Test 2: Whipped cream

1 ½ cups

Water

½ cup

Milk powder

½ cup

Icing sugar

3 cups

Whipped cream

Method

Make sure the cream is chilled in the fridge overnight.

Whip cream before combining with other ingredients.

Carefully whisk ingredients for each test in separate bowls or jugs until smooth.

This provides approximately ¼ cup per rōpū for each test.

Optional



Activity 3.2: Cold plate creations

Instructions

Prepare

Choose how you'll run the activity:

Option 1: Demonstration
Good for: Learning the method

Complete the first test as a class before allowing rōpū to complete the second test independently.

Option 2: Sequential
Good for: Direct comparison

Each rōpū completes both tests independently.

Option 3: Split-class
Good for: Big classes, fast rotations

Half the class does test 1 only, half the class does test 2 only.

Prepare your ingredients/materials

1. Take cold plates out of chiller bag and freeze upside down overnight.
 2. Chill cream in the fridge overnight.
 3. Follow the “get ahead” steps to pre-mix mixtures OR set up ingredient stations in the classroom.
- Suggested ingredient stations:
 - Pre-mixed milk powder and water
 - Unwhipped cream
 - Whipped cream
 - Sugar
 - Plant based (if required)

Run activity

Create ice cream

1. Measure ice cream ingredients and place into a bowl. Make sure the cream is whipped before you start. If using pre-mixed mixtures, move on to step 5.
2. Carefully mix the ingredients together with an electric beater, whisk or spoon.
3. Prepare your tray by filling it with an even layer of ice, then sprinkling $\frac{1}{4}$ cup of salt over the ice.
4. When you're ready to use the cold plate, remove it from the freezer and place it on top of the ice and salt. If you have to remove the cold plates from the freezer before the activity starts, place them in the chiller bag before bringing them into the classroom.
5. Measure out $\frac{1}{3}$ of a cup of the ice cream mixture. Then, spread it evenly over the cold plate.



Activity 3.2: Cold plate creations

6. Let the mixture freeze for 5 minutes. Clean up the work area while you wait.

7. Scoop the ice cream into a bowl and wipe the cold plate for the next rōpū to use. Put it back on the tray with ice.

8. Taste test the ice cream!

9. Rate the ice cream on the “Goal 2: Scoopable” poster.



Expected results

Test	What to expect	Why
Test 1: Unwhipped cream	This test should produce a hard ice cream that does not scoop easily.	There’s less air in the ice cream which makes it denser.
Test 2: Whipped cream	This test should produce a soft ice cream, that scoops easily.	Whipping the cream adds air into the mixture – making the ice cream lighter and fluffier.

Activity 4.1: Sensory detectives

Equipment

From your ice cream kit:



1 measuring jug



4–5 tbsp icing sugar



Flavour drops



Food colouring

School to supply:



2 cups water



1 opaque cup
per ākonga
not clear/see-through

Key:

Get ahead



Teacher preparation



In-class work



Instructions

Prepare



1. Mix 2 cups of water with 4–5 tbsp of icing sugar.
2. Add 6–8 drops of one flavour and 1–2 drops of food colouring.
 - We recommend pairing “opposite” colours and flavours. Eg, red food colouring + lemon flavour.
3. Portion the sugar water into the cups of each ākonga.
4. Do not allow ākonga to see the coloured, sugar water before they start the test.

Run activity



Test 1: Taste only

1. Instruct ākonga to close their eyes and block their nose. Then place their cup in front of them.
2. Ākonga should taste the water.
3. If possible, ask them to write their results for test 1 before they look at the water.

Test 2: Taste and sight only

4. Instruct ākonga to open their eyes but keep their nose blocked.
5. Ākonga should taste the water again and write down their results for test 2.

Test 3: All senses

6. Instruct ākonga to unblock their nose.
7. Ākonga should taste the water again and write down their results for test 3.



Activity 4.1: Sensory detectives

Expected results

Test	What to expect	Why
Test 1: Taste only	It should be difficult to identify the flavour.	Your tongue helps you identify a basic taste (eg sweet, salty, sour, etc), but your nose helps you identify flavour. So by blocking your nose, your brain loses a lot of the information on flavour.
Test 2: Taste and sight only	It should be difficult to identify the flavour.	As above, when blocking your nose, it is hard to identify flavour. By adding sight, your brain can make assumptions about the flavour. Eg, if the water is red/pink, your brain might decide it's strawberry even if it's lemon.
Test 3: All senses	It should be easier to identify the flavour.	The nose is a powerful flavour identifier. With all three senses working together, it's much easier to figure out the flavour.

Activity 5.1: Magic ingredients

Possible answers

Observe					
What level of sugar, fat and water do these ingredients have?					
Ingredient	Sugar	Fat	Water	Air	How it freezes
Pick from these words:	None Low Medium High	None Low Medium High	None Low Medium High	None Low Medium High	Soft Hard
Milk	Low	Medium	High	None	Hard
Unwhipped cream	Low	High	Medium	None	Medium
Whipped cream	Low	High	Medium	High	Soft
Sugar	High	None	None	None	
Sweetened condensed milk	High	Medium	Low	None	Soft

Complete the sentences

Cream has more fat than milk. This makes ice cream **creamy**.

Whipped cream has more air than unwhipped cream. This makes ice cream **scoopable**.

Sweetened condensed milk has medium fat, high sugar and low water. This makes ice cream:

- ✓ Scoopable
- ✓ Creamy

Which ingredients will perform the best to help you achieve your challenge goals?

- Cream instead of milk because it has higher fat.
- Whipped cream instead of unwhipped cream because it has more air.
- Sweetened condensed milk instead of sugar because it is a source of fat and sugar with low water content. This will help make the ice cream even more creamy and scoopable.

Activity 6.2: Scoop showcase

Example answer

Science behind the scoop

We made ice cream creamy by adding:

- ✓ Cream

Creamy ice cream has small ice crystals.

Fat makes ice cream creamy because it coats the ice crystals as they form. This prevents them from getting too big and uneven.

We made ice cream scoopable by adding:

- ✓ Whipped cream
- ✓ Condensed milk

Sugar makes ice cream scoopable because it lowers the freezing point of ice cream. This prevents it from getting too hard in the freezer.

Air makes ice cream scoopable because it makes the ice cream light and fluffy.

We made ice cream flavourful by adding:

- ✓ Chocolate flavour drops
- ✓ Frozen strawberries

The best ingredient for yum ice cream was condensed milk.

The best method for yum ice cream was ice cream on a cold plate.