

DISCOVER
DAIRY

YEARS
3-4

INQUIRY UNIT
TECHNOLOGY
FROM FARM TO PLATE

HOW IS IT USED
TO PRODUCE MILK?



ACKNOWLEDGEMENTS



This online curriculum-linked resource was produced by Dairy Australia.

The curriculum-linked resource is designed to introduce young people to dairy foods and the dairy industry in Australia.

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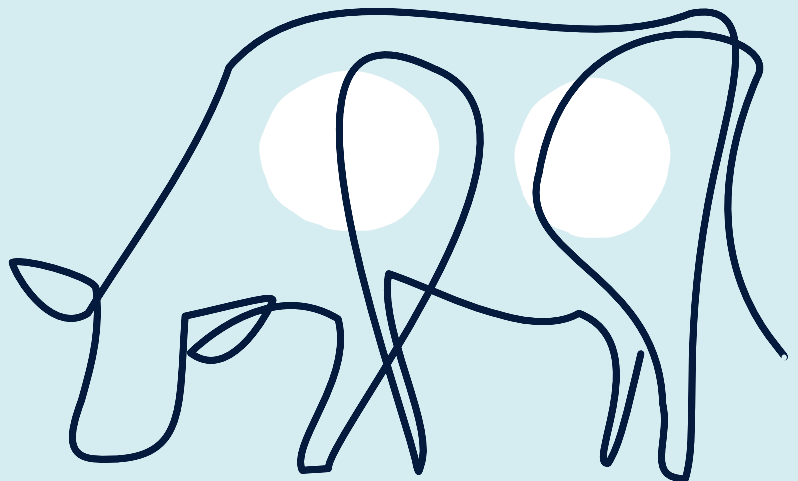
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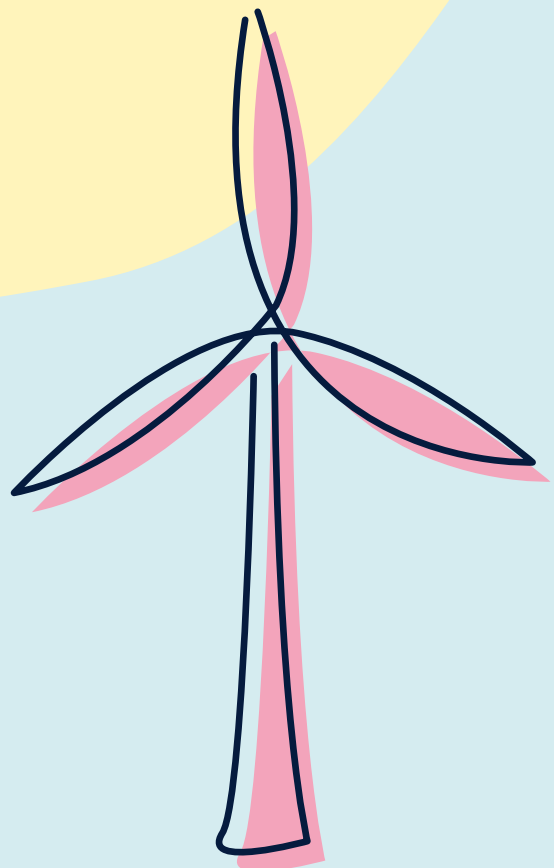
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FACT

AUSTRALIAN DAIRY IS CONSTANTLY INNOVATING TO PROTECT NATURAL RESOURCES FOR FUTURE GENERATIONS. 40 % OF DAIRY FARMS HAVE A RENEWABLE ENERGY SYSTEM, 72 % HAVE FENCED WATERWAYS TO PROTECT RIVER HEALTH, 47 % HAVE IRRIGATION FOR EFFICIENT WATER USE, & 47 % MANAGE THEIR LAND FOR BIODIVERSITY CONSERVATION.



INTRODUCTION

This Year 3 to Year 4 unit of work aims to help teachers and students investigate and understand more about the Australian dairy industry. It follows an inquiry based approach to learning, where the goal is for students to make meaning of their learning. This resource endeavours to use information about dairy farming as stimulus for the learning journey, whereby students become internally motivated to explore, make connections and analyse.

The unit can be taught as presented, or used as inspiration to form an inquiry unit that fits with your school's scope and sequence. Teachers are provided with suggested inquiry-based learning experiences supporting investigation into milk production and the processes farmers use to bring us fresh, great tasting, wholesome milk and dairy products.

We encourage teachers to assess the needs of their class, adapting the content and activities in this unit accordingly. The activities provided aim to spark student curiosity and inspire them to generate their own questions to investigate.

In this unit, students will:

- Investigate where dairy cows are raised and where milk is produced.
- Explore tools, equipment, procedures and systems used to produce milk.
- Explore the knowledge, understandings and skills used by dairy farmers to create their product.
- Explore pasteurisation as a food technology used to extend milk's shelf life and provide for health and food safety.
- Explore homogenisation as a process used to make milk smooth.
- Use and apply concepts and ideas about how milk is produced.
- Design and deliver a presentation to describe production practices.
- Create a simple dairy food.
- Reflect and evaluate on what students know about how milk and other dairy products are produced.

Supporting student and teacher resources mentioned throughout this unit can be found at dairy.edu.au



EDUCATIONAL APPROACH

The activities found in this unit follow the six phases of 'solution fluency', based on the 21st Century Fluencies model created by Crockett et al (2011).



Step one: Define

The 'Define' phase begins with lessons that mentally engage students with a challenge, problem, question and task. This phase captures their interest, provides an opportunity for them to express what they know about the topic and understandings being developed, and helps them to make connections between what they know and the new ideas.



Step four: Design

The 'Design' phase provides opportunities for students to apply what they have learned to new situations, to map production processes and so develop a deeper understanding of the challenge, problem, question or phenomenon. It is important for students to extend explanations and understanding using and integrating different modes such as diagrammatic images, written language and media.



Step two: Discover

The 'Discover' phase includes activities in which they can explore, investigate, research, read, discuss, gather, organise and compare knowledge and data. They grapple with the challenge, problem, question or phenomenon and describe it in their own words. This phase provides a context and enables students to acquire a common set of experiences that they can use to help each other make sense of the new knowledge or understandings.



Step five: Deliver

The 'Deliver' phase has two stages; production and publication (or presentation). In the production phase the task comes to life, this is the doing phase. At the end of this phase, the student task should be completed. Next, they present or publish their work sample to an audience.



Step three: Dream

The 'Dream' phase enables students to imagine and develop possible solutions and explanations for the challenge, problem, question and task they have experienced. The significant aspect of this phase is that the students' explanations follow substantive conversations and higher order thinking experiences



Step six: Debrief

The 'Debrief' phase provides an opportunity for students to revisit, review and reflect on their own learning and new understanding and skills. This is also when students provide evidence for changes to their understanding, beliefs and skills.

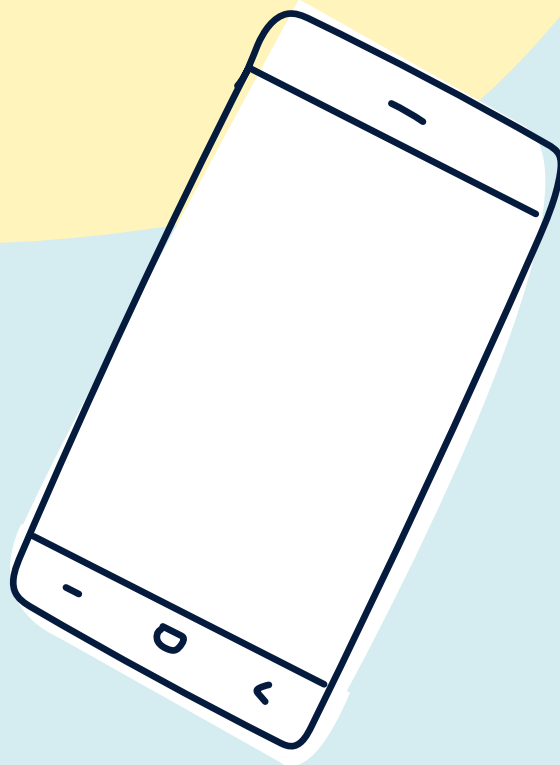
CURRICULUM LINKS

This unit of work has been designed as a series of activities based on the content descriptors of the Australian Curriculum identified in Year 3 and Year 4 Science and Design and Technologies.

	Year 3	Year 4
Science	Science Understandings: Chemical sciences A change of state between solid and liquid can be caused by adding or removing heat (ACSSU046)	Science Understandings: Biological sciences Natural and processed materials have a range of physical properties that can influence their use (ACSSU074)
	Science as a Human Endeavour: Nature and the development of science Science involves making predictions and describing patterns and relationships (ACSHE050)	Science as a Human Endeavour: Nature and the development of science Science involves making predictions and describing patterns and relationships (ACSHE061)
	Science as a Human Endeavour: Use and influence of science Science knowledge helps people to understand the effect of their actions (ACSHE051)	Science as a Human Endeavour: Use and influence of science Science knowledge helps people to understand the effect of their actions (ACSHE062)
Technologies	Design and Technologies: Knowledge and Understanding Investigate food and fibre production and food technologies used in modern and traditional societies (ACTDEK012)	
	Design and Technologies: Processes and Production Skills Generate, develop, and communicate design ideas and decisions using appropriate technical terms and graphical representation techniques (ACTDEP015) Select and use materials, components, tools and equipment using safe work practices to make designed solutions (ACTDEP016)	
Cross-curriculum priorities	Sustainability All life forms, including human life are connected through ecosystems on which they depend for their wellbeing and survival (01.2) Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems (01.3) Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments (01.7) Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts (01.8)	
General capabilities	Literacy Information and Communication Technologies (ICT) Capability Critical and Creative Thinking	

FACT

DAIRY FARMERS HAVE EMBRACED SMART PHONE TECHNOLOGY TO HELP THEM AROUND THE FARM. FREE APPS MONITOR THE HEALTH OF EACH COW AND THE DAILY RUNNING OF THE DAIRY. THEY ARE POWERFUL TOOLS THAT CAN BE USED EVEN WHEN THE FARMER IS AWAY.



STEP 1: DEFINE



Purpose

To provide students with opportunities to:

- Gather information about student's prior knowledge on; dairy farms, different types of dairy cows raised there, and what they produce
- Organise their existing ideas
- Develop skills in making connections between different ideas
- Set directions for an investigation
- Provide data for assessment purposes

What dairy foods do you eat?

Present the following scenario to capture the students' interest and learn about the dairy foods they consume.

This week you may have eaten a cheese sandwich or a tub of yoghurt, poured milk onto your cereal, enjoyed a baby chino at a local cafe, drank a milkshake or smoothie, eaten a piece of cheese as a snack, enjoyed a piece of quiche made with butter, cream and cheese, eaten an ice cream for dessert, eaten a serve of cheese and macaroni, some frittata with ricotta and feta cheese or a piece of cheesecake.

Ask students to:

- Talk about the particular dairy food they eat, the number of times per week that dairy food is eaten; and their favourite dairy food
- Identify where they think dairy foods come from
- Give their opinion about their favourite dairy foods
- Use supermarket catalogues, magazines and newspapers to find pictures of dairy foods. Make a collage using these pictures

Where does milk come from?

Stimulate student curiosity and find out what they know about places where their milk and dairy foods originate from. Ask students the question 'Where does milk come from'?

Note Some students may think it comes from the fridge, supermarket or local shop.

Using some dairy foods that have been sourced from home, the school canteen or staffroom ask students to look at the labelling on milk and dairy food packaging.

Talk about the Australian dairy industry and ask students to consider and discuss whether they think 'country of origin' labelling, or labelling that describes where the product was produced is important? Why or why not? Does it matter?

Introduce students to a map showing where Australia's dairy farming areas are located. Ask students why they think dairy farms are situated where they are? Why are there no dairy farms in the Northern Territory? What does this mean for people living in the Northern Territory? Where do they get their milk and other dairy food from?

Map of dairy farming in Australia

Brainstorm

Ask students to brainstorm everything they already know about where their milk comes from and the processes dairy farmers use to bring us fresh, great tasting, wholesome milk and dairy products. Ask students to share their ideas with a partner.

Create a four-part display. Title the four parts 'What we know about milk production', 'What we want to find out', 'What we have discovered' and 'Other things we would like to explore'. Use 'What we know' as a source for class sharing.

Stimulate thinking by focusing on interesting aspects about the processes used to produce milk and other dairy foods.

For example:

- How do cows turn grass into milk?
- Are tools, equipment and procedures used to produce milk?
- What are the ideal conditions for producing milk?
- What knowledge, understandings and skills might dairy farmers need to produce milk?
- How does milk get from a dairy cow to us?
- What is pasteurisation?
- What other processes are involved in making other dairy foods?

Setting the task

Note This is a suggested assessment task.

Explain to the class that their task will be to work in pairs or small groups, to find out more about the tools, equipment, procedures and systems used in milk production.

Present the scenario to the students and ask them to design and produce a 'grass to glass' presentation using words, labelled sketches or models to communicate their ideas about milk (from the source through to the end product).

Each pair or small group will also be asked to present their ideas to an audience later in the unit.

The scenario

Most people know that milk comes from a cow but many don't know how milk and other dairy foods are produced. Most of us buy our milk and dairy foods from shops, but is that where they came from originally and is that where they are produced?

Before most foods get to a shop they are grown or raised by a farmer. Sometimes the product doesn't change much from the source to our plate (like milk). However, some go through a production process to make it to our plate. Some foods are added to other ingredients to make other types of food, like milk is used to make cream, butter, yoghurt, ice cream and cheese.

Learning logs

Learning logs are useful for assessment purposes. Students can complete an entry at the beginning of the unit and then revisit it regularly during, and again at the end of the unit to demonstrate their changed understandings.

At the end of the activities in the 'define phase', invite students to draw/write/scribe ideas and questions about their task using a table like the one below.

What I know	What I'm not sure about	What I want to know

FACT

**FARMERS USE TECHNOLOGY
TO MONITOR PADDOCKS
AND FERTILISER USE AND
TO STORE DETAILED HEALTH,
MILK PRODUCTION AND
BREEDING INFORMATION
ON EACH COW**



STEP 2: DISCOVER



Purpose

To provide students with opportunities to develop their understanding of:

- Processes used to produce milk
- The tools, equipment, procedures and systems used to milk dairy cows and produce milk
- How to write a simple bibliography
- Pasteurisation and homogenisation processes
- A focus for the forthcoming experiences in the 'Dream' stage of the inquiry.

Where does our milk come from?

Remind the class that they will be designing and producing a 'grass to glass' or 'farm to plate' presentation about milk from, the source through to the end product. Use the [Farm to Plate](#) interactive on Discover Dairy website to help students scaffold what needs to be included in their presentation.

As a class, talk more about dairy cows that produce milk. Explore the ways it is used to produce products such as butter, cream, yoghurt, ice cream and cheese. Discuss the phrase 'from grass to glass' and ask students to predict how cows can turn grass into milk.

Talk about cows having an unusual internal system for turning grass into milk. Explain that they have four stomachs, each of which performs a special function.

Play the animation [How do dairy cows make milk](#).

Create a 'Word Wall' in the class describing the external features of dairy cows.

Undertake some more 'picture research' and ask students to count the eyes and legs, note the colour and shape of the dairy cows and discuss their texture.

Other suggested activities

Create a class 'Word Wall' introducing new vocabulary describing a dairy cow's internal and external features.

As a class design a simple flow chart or storyboard explaining where our milk comes from and the steps involved in the production of milk.

Explore deeper

Introduce students to the Discover Dairy website.

Model how they can navigate and access resources and information about how cows make milk and the tools, equipment, procedures and systems used on dairy farms.

Read information about:

- Why and how cows make milk
- How a cow turns grass into milk
- Milking time
- The tools, equipment, procedures and systems used to milk the cows and produce milk. For example, electronic transponders, the rotary milking system, flexible milking lines, suction cups, stainless steel pipes, refrigerated storage vat, milk tanker, and tests for freshness.

Ask students to record information they might need for their presentation when explaining the process or system that is used to produce milk.

Introduce students to a simple bibliography. Talk with the class about the purpose and basic features – helping the audience to know where students got their information from and providing credit for their sources of information.

Talk about what to include in a bibliography.

For example, a bibliography should list every primary source of information you use such as a book, a movie, a website, an interview, or **any** information that did not come from yourself.

Explain how a bibliography is placed at the end of a work sample.

Model how to source the images and information students may have selected about the tools, equipment, procedures and systems used to produce milk found on the Discover Dairy website.

What happens after milk leaves a dairy farm?

Explore the Discover Dairy resources to learn more about the steps involved in the production of milk.

Talk about Louis Pasteur's research and the development of **pasteurisation**. Discuss the process of heating milk and milk products to destroy disease producing organisms.

Ask students to brainstorm other ways they may have seen family members, teachers or scientists 'sterilise' objects as a way of destroying disease producing organisms. For example:

- baby bottles
- preserved fruits in sterilised jars
- surgical instruments
- if they have their ear's pierced – the tool used to make the hole

Talk about an additional process called **homogenisation** whereby milk is filtered under high pressure through tiny nozzles to create a smooth texture. Explain the process breaks up the fattier globules in the cream of the milk, to such a small size that they remain suspended in the milk, rather than separating out and floating to the surface.

Talk to the students about the different densities between cream and milk. Describe to the class how the milk and cream will completely separate in any milk straight from the cow if allowed to sit in a fridge for a time. Ideally, bring a homogenised and non-homogenised sample from the supermarket to show the students.

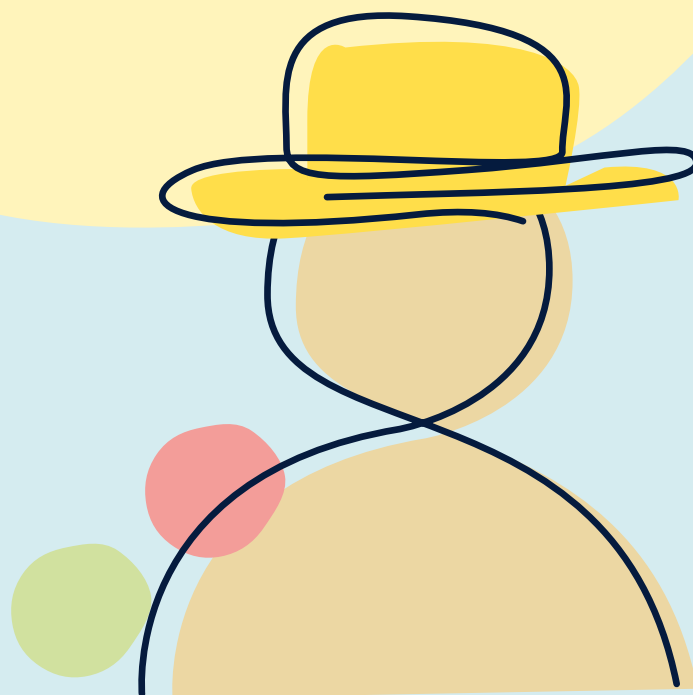
Ask the students to brainstorm other foods with liquid ingredients that separate into layers based on their density. For example: salad dressings.

Conduct hands-on experiences to investigate the concept. In groups, using a juicer and a range of fruit and vegetables make juices, pour them into glasses and set aside to observe their contents separate into layers based on the density of the ingredients.

Invite students to read and view some additional information on the Discover Dairy website.

FACT

ROBOTIC MILKING IS AN AUSTRALIAN-DESIGNED TECHNOLOGY THAT REDUCES THE AMOUNT OF TIME FARMERS SPEND ON MILKING, FREEING UP TIME TO CONCENTRATE ON OTHER ACTIVITIES



STEP 3: DREAM



Purpose

To provide students with opportunities to:

- Envision a solution for their 'grass to glass' presentation
- Brainstorm and share ideas
- Explore possibilities
- Imagine and visualise their product

Visualising the 'Grass to glass' presentation

Ask students to list and order the key concepts that feature in their 'grass to glass' presentation. Whilst listing the concepts encouraged them to:

- Visualise their presentation
- Discuss different ideas on how the concepts will be incorporated into designing their presentation
- Document their ideas and plans.

In groups, ask students to describe for each other what they have visualised.

Confirm ideas

Ask students to share their hopes, dreams and wishes regarding what they might create. Expand on student ideas using questions for clarification.

For example:

- What might you create?
- What do you think it might look like?
- What would you have to do to make it work?
- Where and how will you use labels?
- What mediums and digital tools might you use?
- Who will do what in your group?
- Does your idea meet the original task brief that was set?
- Are your ideas feasible?
- Will it work?
- Can it be accomplished?

Encourage groups to decide on a creative activity to develop their 'grass to glass' presentation.

STEP 4: DESIGN



Purpose

To provide students with opportunities to:

- Describe how milk is produced
- Design and create their presentation
- Explore how other dairy foods are produced
- Create a dairy food
- Develop skills in formulating questions and gathering data
- Develop communication and design skills
- Write a procedural text

Designing the presentation

Using the information gathered, each pair or small group prepares their presentation featuring milk. They must explain the tools, equipment, procedures and systems used to produce it, in addition to the knowledge, understandings and skills used by dairy farmers to produce their product.

Remind students that they can choose their own creative method to deliver their presentation. For example:

- Design and create a digital presentation using digital tools
- Students can design and create a presentation using hand draw graphics and labels, and paste images onto poster board.

Invite students to begin drafting their work sample. Encourage students to use their creativity as part of their presentation.

Explanations

In their pair or small group, ask students to begin drafting their explanation of the processes or systems that are used to produce milk and the knowledge, understandings and skills used by dairy farmers to produce their product.

Remind them to go back and interpret the evidence they have viewed, read and talked about in previous activities, and to keep an accurate bibliography.

Produce your own dairy foods

In their pairs or small groups students research, read and view some additional information about: how the following foods are made:

- cheese
- yoghurt
- butter
- cream
- ice cream

Using personal digital devices, or the class interactive whiteboard, encourage students to find out more about how butter, sour cream, ice cream and smoothies are made and to choose one to re-create! After making, support students to write a procedural text.

To make butter student groups will need:

- an electric whisk
- 2 mixing bowls
- clean perforated kitchen wipe or a freshly washed piece of cheesecloth
- a measuring jug
- a sieve
- wooden spoons
- 500 ml of Australian cream

To make sour cream student groups will need:

- a mixing bowl
- wooden spoons
- a measuring cup
- a tablespoon
- 1¼ cups of Australian cream
- 2 tablespoons of lemon juice

To make ice cream student groups will need:

- a tablespoon and teaspoon
- a measuring cup
- 2 tablespoons of sugar
- ice
- 1 cup of milk
- ½ teaspoon vanilla essence
- 6 tablespoons of rock salt
- a small plastic zip lock bag
- a large plastic zip lock bag

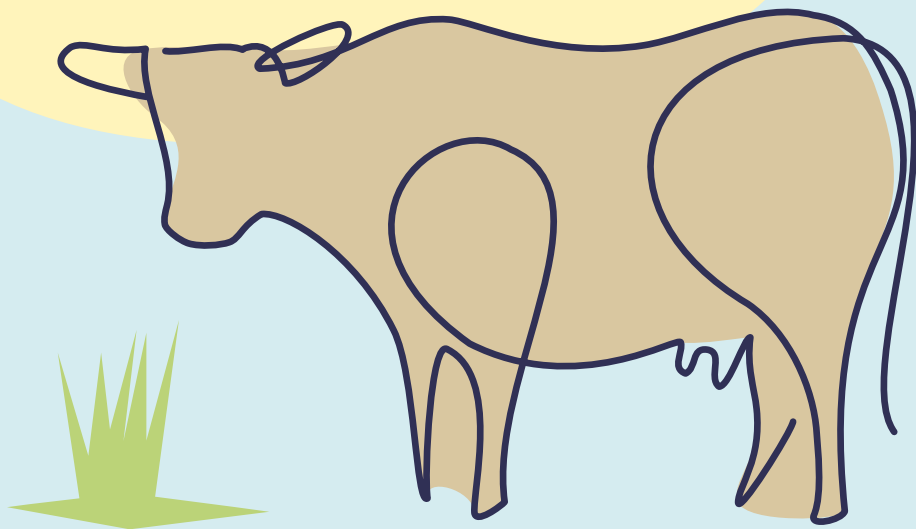
To make a strawberry smoothie student groups will need:

- a measuring jug
- an electric blender
- a large glass
- smaller glasses
- 100 ml of water
- 1½ cups of milk
- 1½ cups of vanilla yoghurt
- strawberries
- a dash of honey



FACT

DAIRY FARMERS USE SENSOR TECHNOLOGY TO KEEP TRACK OF THEIR COWS' HEALTH, MILK PRODUCTION LEVELS AND THE NUMBER OF COWS WHICH HAVE ALREADY BEEN MILKED



STEP 5: DELIVER



Purpose

To provide students with opportunities to:

- Share how milk is produced from 'grass to glass'
- Apply what they have learned
- Plan their presentation of 'Grass to glass'
- Share investigation findings

Almost time to present!

Students confirm the idea planned for their 'Grass to glass' presentation.

Ask students to create a final plan for completing the presentation. They must summarise what they have learned about milk production in a journal log or reflection.

Delivering the presentation

Note This is the suggested assessment activity.

Students are now ready to put their plan into action and present their learning to an audience!

STEP 6: DEBRIEF



Purpose

To provide students with opportunities to:

- Revisit and reflect on their final products and processes used to determine what was done well and what could be improved
- Provide a source of data for assessment

To provide teachers with:

- Insights into students' understandings and attitudes, as well as their perceptions of their own strengths and areas for improvement

Evaluate the presentation

Involve students in a debrief and ask them to review their final products and the processes they used to design and create them.

Ask questions like:

- What worked well?
- What didn't?
- How could it have been improved?
- What were the strengths?
- Were there any limitations in the processes you used?
- What could be done differently next time?

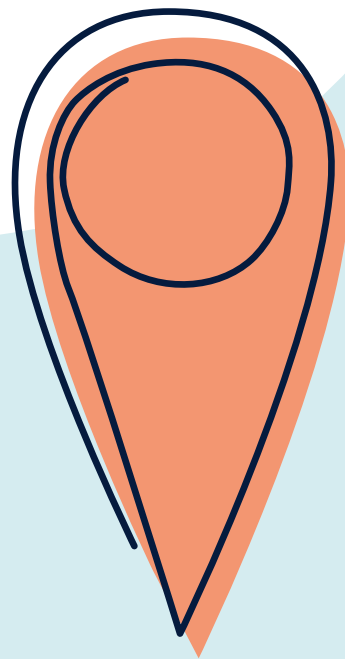
Reflections

Ask students to complete a self-assessment using the following questions as a guide.

- What did you learn in this unit?
- What questions did it make wonder?
- How well did you understand the task that was set?
- What do you now know about the tools, equipment, procedures and systems used to produce milk?
- What do you now know what dairy farmers need to know and do to produce their product?
- How could you have extended your learning further?

FACT

THE USE OF DRONE TECHNOLOGY IS EFFECTIVELY USED TO MONITOR DAIRY ANIMALS. DRONES ARE ABLE TO FLY OVER PROPERTIES AND ENSURE EVERYTHING IS IN ITS RIGHT LOCATION



DISCOVER DAIRY

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