Dairy Australia

Primary Industries Education Foundation Australia

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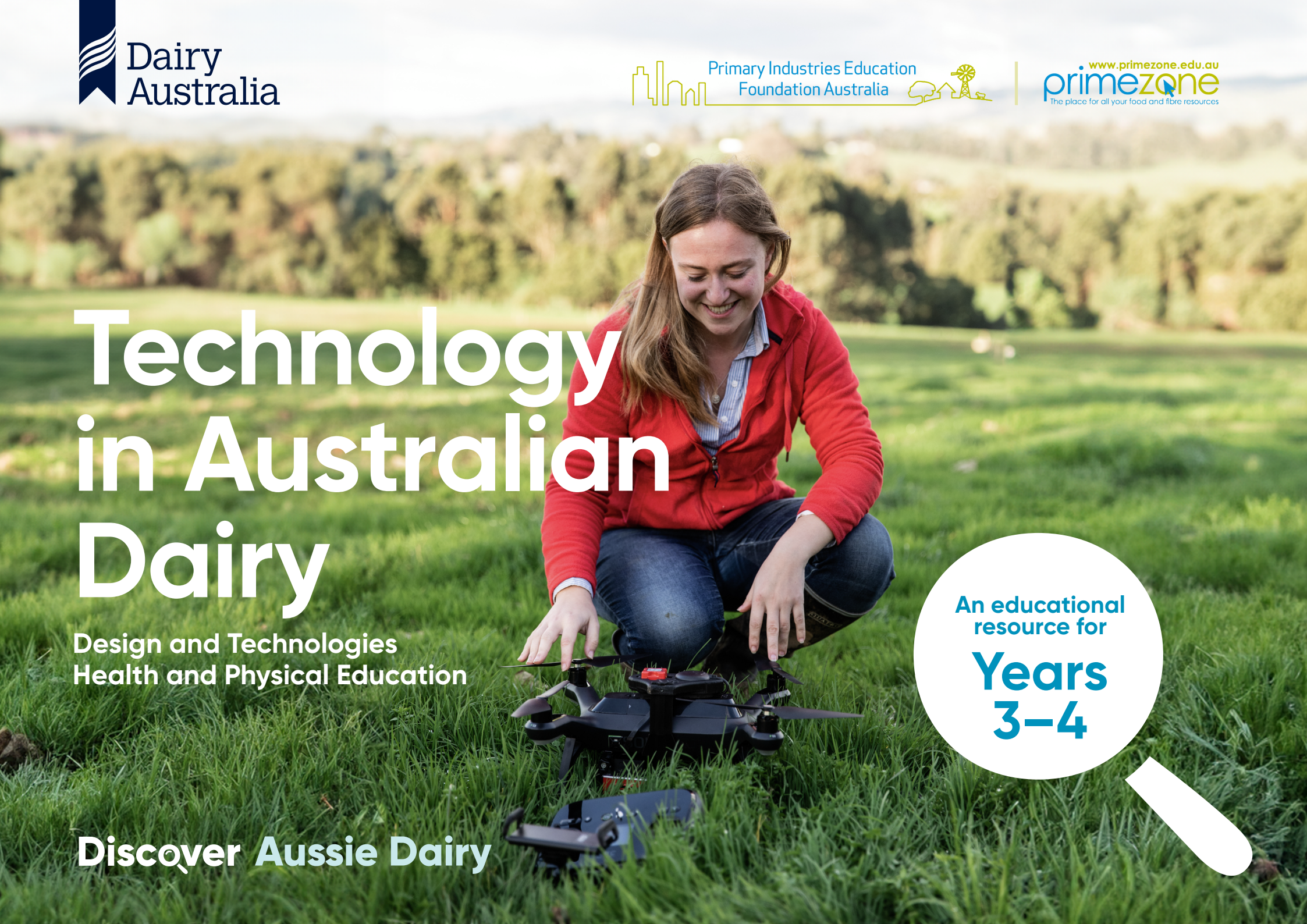

Technology in Australian Dairy

Design and Technologies
Health and Physical Education

An educational resource for

Years 3–4

Discover Aussie Dairy

Learning Areas and Australian Curriculum Content

Teacher guide

Design and Technologies

Examine design and technologies occupations and factors including sustainability that impact on the design of products, services and environments to meet community needs. (AC9TDE4K01). Describe the ways of producing food and fibre. (AC9TDE4K03).

English

Use interaction skills to contribute to conversations and discussions to share information and ideas. (AC9E3LY02).

Use comprehension strategies when listening and viewing to build literal and inferred meaning, and begin to evaluate texts by drawing on a growing knowledge of context, text structures and language features. (AC9E3LY05).

Listen for key points and information to carry out tasks and contribute to discussions, acknowledging another opinion, linking a response to the topic, and sharing and extending ideas and information. (AC9E4LY02).

Use comprehension strategies such as visualising, predicting, connecting, summarising, monitoring and questioning to build literal and inferred meaning, to expand topic knowledge and ideas, and evaluate texts. (AC9E4LY05).

Science

Construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show simple relationships and identify patterns. (AC9S3I04, AC9S4I04).

Lesson Objective

In this lesson, students will learn about the technologies and innovations used in the Australian dairy industry to improve sustainability and efficiency. They will engage in hands-on activities to explore these concepts through discussions, collaborative tasks, and a STEM design challenge.

Lesson Overview

Activity 1 - Technology and Innovation on the Farm (15 mins)

Activity 2 - Technology and Innovation Code Breaker (40 mins)

Activity 3 - Irrigation STEM Challenge (40-55 mins)

Contents

ATTRIBUTION, CREDIT & SHARING

This resource was produced by Primary Industries Education Foundation Australia (PIEFA) in collaboration with Dairy Australia. Primary Industries Education Foundation Australia's resources support and facilitate effective teaching and learning about Australia's food and fibre industries. We are grateful for the support of our industry and member organisations for assisting in our research efforts and providing industry-specific information and imagery to benefit the development and accuracy of this educational resource.

Primary Industries Education Foundation Australia

Dairy Australia

Teacher guide

Resources and Equipment

Teacher guide

Activity 1 - Technology and Innovation on the Farm

1 Digital devices
2 Headphones (if students watch independently)
3 Discover Dairy 360 Virtual Farm Tour (6:53)
4 **Worksheet 1a - Technology and Innovation Checklist**

Activity 2 - Technology and Innovation Code Breaker

1 **Worksheet 2a - Technology and Innovation Code Breaker** (printed on A3)
2 **Worksheet 2b - Technology and Innovation Code Breaker: Response Sheet**
3 Digital devices
4 Caring for the Environment on a Farm (2:21)
5 How Farmers Use Microchips on Dairy Farms (2:13)
6 How Dairy Farmers Care For Their Cows (2:41)
7 Discover How Milk is Made (2:39)

Activity 3 - Irrigation STEM Challenge

1 **Worksheet 3a - STEM Challenge - Irrigation for Sustainable Pastures**
2 Digital devices
3 Design materials (e.g. plastic/paper cups, straws, plastic bottles, lego, modelling clay, scissors, sticky tape, glue, etc.)
4 One cup full of water per student pair
5 Indoor plants or a school garden area
6 Optional: How to Make a Model Irrigation System (STEM Education Activity) (6:18)

Lesson Guide

Teacher guide

Activity 1 - Technology and Innovation on the Farm

Students will investigate the role of technology in modern dairy farming using the Discover Dairy 360 Virtual Farm Tour video.

a Facilitate a class discussion about how and why people use technology in their daily lives. Encourage students to share their ideas about the types of technologies they use regularly and the function of these technologies. (Suggested answer: Using a smartphone to communicate with people, navigate to new locations, source information online, etc.)

b Explain that innovations are new ideas, inventions (technologies), or ways of doing things. Innovations and technologies make our lives better, safer, easier, or more enjoyable. On farms, technology and innovation are used to make tasks (operations) safer, faster, and easier for producers and make food and fibre production more sustainable.

c As a class, brainstorm the types of technologies that might be used on dairy farms to make tasks (operations) safer, faster, and easier for producers, and make dairy production more sustainable. Record student ideas in a central area. (Suggested answers page 8)

d Distribute a copy of **Worksheet 1a - Technology and Innovation Checklist** to each student.

e View the Discover Dairy 360 Virtual Farm Tour video (6:53) either individually or as a class. The video was filmed in 360 degrees, allowing viewers to pan around using a mouse for a fully immersive experience. Students tick the people, technologies, and innovations off their checklist as they see or hear about them during the virtual tour.

f After viewing the tour, reflect on the brainstorm to add any additional technologies or innovations that students identified throughout the activity.

Lesson Guide

Teacher guide

Activity 2 - Technology and Innovation Code Breaker

Students will work collaboratively to read and view information about the role of technology and innovation in the dairy industry, completing a series of comprehension questions to reveal a secret code word.

a Set up four workstations around the classroom, each containing one page of **Worksheet 2a - Technology and Innovation Code Breaker** (printed on A3) and digital device access.

b Allocate students into groups and provide them with a copy of **Worksheet 2b - Technology and Innovation Code Breaker: Response Shee**t. Designate one workstation per group to commence the activity.

c In their groups, students collaborate to read and view the source materials before answering the questions on the corresponding page of their response worksheet.

d Allow groups up to ten minutes at each workstation before asking them to rotate to the next workstation.

e When each group has completed the tasks at each workstation, reconvene as a class and ask groups to share the code breaker codeword before reviewing the answers for each question from the response worksheet. (Answers page 8)

f After viewing the tour, reflect on the brainstorm to add any additional technologies or innovations that students identified throughout the activity.

Lesson Guide

Teacher guide

Activity 3 - Irrigation STEM Challenge

Students will work in pairs to plan, design, and construct a model irrigation system to collect and transport water to a plant efficiently.

Note: Before commencing this activity, teachers may wish to view the How to Make a Model Irrigation System (STEM Education Activity) (6:18) video with their class to provide them with an example of a method that could be used to design and build a model irrigation system. When testing their designs, teachers may wish to select plants outside of the classroom in a school garden, etc., or may choose several indoor plants for use during the testing stage of the design process.

Schools are responsible for carrying out risk assessments before this task.

a Allocate students into pairs and distribute **Worksheet 3a - STEM Challenge - Irrigation for Sustainable Pastures**. Read the information as a class.

b Provide students with access to digital devices and allow them to work in pairs to research different irrigation types to inform their design planning.

c Provide students with design materials (e.g. plastic/paper cups, straws, plastic bottles, lego, modelling clay, scissors, sticky tape, glue, etc.) and one cup full of water per pair to test their prototype.

d Students work in pairs following the design process to design and build a model irrigation system that can efficiently collect and transport water to a plant. (Example answer page 8).

e Students test the efficiency of their model irrigation systems using water before making any modifications to improve their design.

f Allow students to record their design reflections on **Worksheet 3a - STEM Challenge - Irrigation for Sustainable Pastures**.

g Students present their completed designs to the class, sharing what worked well and any modifications required to improve their irrigation system's design.

Answers

Answer

Activity 1 - Technology and Innovation on the Farm

c) Suggested answers include: Automated milking machinery, electric fences, ATV vehicles (side-by-sides), refrigerated milk tankers, Electronic Identification (EID) tags, etc.

Worksheet 1a - Technology and Innovation Checklist

All boxes should be ticked.

Activity 2 - Technology and Innovation Code Breaker

Worksheet 2b - Technology and Innovation Code Breaker: Response Sheet

Workstation one: Sustainability on dairy farms

Question one: Solar panels and wind turbines

Question two: Water

Clue one: P

Clue two: A

Workstation two: Accuracy and efficiency on dairy farms

Question one: Scanner

Question two: Drafting gate

Clue one: S

Clue two: T

Workstation three: Caring for cows

Question one: Automated feeding systems

Question two: Litres

Clue one: U

Clue two: R

Workstation four: Safe and healthy milk

Question one: Bacteria

Question two: Homogenisation

Clue one: E

Clue two: S

Activity 3 - Irrigation STEM Challenge

Worksheet 3a - STEM Challenge - Irrigation for Sustainable Pastures

Student answers will vary. See How to Make a Model Irrigation System (STEM Education Activity (6:18) video, for example.

References

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Worksheet 1a

Technology and Innovation Checklist

Activity

Technology and innovation help Australian dairy producers to perform tasks (operations) on their farms more safely, quickly, and easily. They also help reduce waste and protect the environment, making dairy farming more sustainable for the future. By using technology, farmers can take better care of their cattle, protect their farm landscape, save time and money, and ensure that farms continue to provide safe, healthy dairy products for consumers.

Scan the QR code or click on the link to watch the video.

Discover Dairy 360 Virtual Farm Tour (6:53)

Tick the people, technologies, and innovations as you see or hear about them in the virtual tour.

	Homogenisation equipment		Stainless steel milk pipes		Milk processing worker
	Producer		Soil testing		Pasteurisation equipment
	Electrfonic identification tags		Agronomist		Automatic feeders
	Using recycled water on pastures		Refrigerated milk vats		Chilled milk tankers
	Irrigation		Robotic pallet system		Vet

Worksheet 2a

Technology and Innovation Code Breaker

Activity

Workstation one: Sustainability on dairy farms

Scan the QR code or click on the link to watch the video.

Caring for the Environment on a Farm (2:21)

Read

Environmental sustainability means using natural resources (**water, air,** and **land**) in a way that will allow there to be enough available for future generations to use. Technology and innovation are used to improve the sustainability of dairy farms, helping producers to reduce the waste of natural resources and care for the farming ecosystem.

Water is used on dairy farms to clean the areas where cows wait before milking. Effluent water (the water that has been used for cleaning) contains cow manure, which is rich in nutrients similar to compost. This water can be recycled and used to water and fertilise the paddocks. This process helps to reduce waste and save water while giving the soil natural nutrients to help grow pastures for cattle to eat.

Renewable energy, such as **solar panels** and **wind turbines** are used on some dairy farms to power equipment such as the automatic milking systems and the large refrigerated vats used to cool and store milk before it is collected by milk tankers. Solar panels use sunlight to generate electricity, and wind turbines use the wind to produce power. By using renewable energy, dairy farms can reduce their dependence on non-renewable energy sources like coal, which helps reduce greenhouse gas emissions and makes the farm more sustainable.

Worksheet 2a

Technology and Innovation Code Breaker

Activity

Workstation two: Accuracy and efficiency on dairy farms

Scan the QR code or click on the link to watch the video.

How Farmers Use Microchips on Dairy Farms (2:13)

Read

Technology and innovation help to make operations on dairy farms more efficient, which means making work **easier, faster,** and **more accurate**.

Electronic identification (EID) tags are small microchips attached to each cow's ear. These tags are scanned when cows enter and leave the milking shed, sending important data about the cows to the farm's computer system, including how much milk they produce and the type and amount of food they need. This helps dairy producers make more accurate decisions about managing their farm and caring for their cattle.

Automated milking machines, or robotic milking machines, allow cows to be milked automatically without human help. Cows can walk into the milking station when they want, and the machine reads the electronic tag on the cow to start milking. The milking equipment includes cup removers that automatically detach from the cow's teats once milking is complete, preventing harm to the teats. This makes milking faster and easier, giving producers more time to perform other important jobs on the farm.

Worksheet 2a

Technology and Innovation Code Breaker

Activity

Workstation three: Caring for cows

Read

Innovation and technology are used to help farmers care for the cows on their dairy farms.

Automated feeding systems use technology to give each cow the right amount of food based on its needs. By providing the exact amount and type of food each cow needs, these systems reduce waste, keep cows healthy, and help dairy producers notice any changes in a cow's diet that might be a sign that they are sick. This allows farmers and vets to quickly treat any illnesses or injuries cows may have.

Cow brushes are another helpful innovation sometimes used on dairy farms. These large rolling brushes (a bit like the ones at a car wash) are sometimes set up in milking sheds so that the cows can scratch any itches they might have and rub against them to feel calm and comfortable. Keeping cows calm and happy helps improve their health and the quality of the milk they produce.

Scan the QR code or click on the link to watch the video.

How Dairy Farmers Care For Their Cows (2:41)

Worksheet 2a

Technology and Innovation Code Breaker

Activity

Scan the QR code or click on the link to watch the video.

Discover How Milk is Made (2:39)

Workstation four: Safe and healthy milk

Read

Technology and innovation help to make milk safe for consumers to drink and stop milk products from spoiling quickly.

Pasteurisation is a process where milk is heated to 72°C for 15 seconds or longer, then cooled down quickly to kill any harmful bacteria. This makes the milk safe to drink and helps it stay fresh for longer.

Homogenisation is a process that mixes the cream evenly throughout the milk so it doesn't separate and float to the top. This makes the milk smooth and consistent, and it improves its taste and quality.

Refrigeration technology helps to keep milk safe and extends its shelf life (how long it stays fresh after processing). On farms, milk is quickly cooled to below 5°C after milking to prevent the growth of harmful bacteria. **Refrigerated trucks** keep the milk at the same cool temperature during transportation for processing and distribution to retailers (e.g. supermarkets). Consumers need to store milk in their **refrigerators** at home to keep it fresh, safe, and nutritious to drink.

Worksheet 2b

Technology and Innovation Code Breaker Response Sheet

Activity

Visit each workstation and read the fact sheets and watch the videos provided. Answer the questions at each station to reveal the clues. Record your answers and the clues in the spaces provided below. Once you have completed all four workstations, use the clues to crack the final code.

Workstation one: Sustainability on dairy farms

Question	Answer / Notes
Question one: Name two types of renewable energy mentioned that help power dairy farms.	
Question two: What natural resource is recycled after cleaning the areas where cows wait to be milked on dairy farms?	

Code clues	Answer / Notes
Clue one: The sixth letter of the name of the technology that collects energy from the sun.	
Clue two: The second letter of the answer to question two.	

Worksheet 2b

Technology and Innovation Code Breaker Response Sheet

Activity

Workstation two: Accuracy and efficiency on dairy farms

Question	Answer / Notes
Question one: What technology is used to detect each cow's Electronic Identification (EID) tag as it enters the milking shed?	
Question two: What equipment is used to guide cows in different directions after they have been milked?	

Code clues	Answer / Notes
Clue one: The first letter of the answer to question one.	
Clue two: The fifth letter of the answer to question two.	

Worksheet 2b

Technology and Innovation Code Breaker Response Sheet

Activity

Workstation three: Caring for cows

Question	Answer / Notes
Question one: What technology provides cows with the exact amount of food they need to stay healthy? milking shed?	
Question two: Complete the missing word: Cows need to drink approximately 100 __ __ __ __ __ __ of water every day.	

Code clues	Answer / Notes
Clue one: The second letter of the answer to question one.	
Clue two: The fourth letter of the answer to question two.	

Worksheet 2b

Technology and Innovation Code Breaker Response Sheet

Activity

Workstation four: Safe and healthy milk

Question	Answer / Notes
Question one: Complete the sentence: Pasteurisation is a process where milk is heated and then cooled down quickly to kill any harmful __ __ __ __ __ __ __ __	
Question two: What process pushes milk through fine nozzles to ensure it has a smooth and consistent texture?	

Code clues	Answer / Notes
Clue one: The fifth letter of the answer to question one.	
Clue two: The ninth letter of the answer to question two.	
Crack the Code! Use the clues from each workstation to form the dairy industry final codeword. __ __ __ __ __ __ __ __	

Discover Aussie Dairy

Worksheet 3a

STEM Challenge – Irrigation for Sustainable Pastures

Activity

Irrigation is watering crops and pastures when there is not enough rainfall for plants to grow well. It involves using systems like **sprinklers, hoses**, and **channels** to give plants the water they need to grow.

In the dairy industry, producers often recycle water used for cleaning to irrigate their paddocks, helping to reduce water waste and grow healthy pastures for their cows to eat.

Instructions

Plan, design, and construct a model irrigation system that can efficiently collect and transport water to a plant. You will need to think about how water will be delivered to the plant, how much water it will need, and how to avoid wasting water. Test your design using water to observe how it delivers water to your chosen plant. Make any changes to improve your design if needed.

Can you design an irrigation system that could be used to irrigate pastures on a dairy farm?

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Worksheet 3a

STEM Challenge – Irrigation for Sustainable Pastures

Activity

a) Research different types of irrigation, take notes, and sketch as many ways to design your irrigation model as possible.

Worksheet 3a

STEM Challenge – Irrigation for Sustainable Pastures

b) Pick your best idea and draw and label your design.

Worksheet 3a

STEM Challenge – Irrigation for Sustainable Pastures

c) List the materials you will need.

Worksheet 3a

STEM Challenge – Irrigation for Sustainable Pastures

d) List the steps needed to create your model.

Worksheet 3a

STEM Challenge - Irrigation for Sustainable Pastures

e) Test your irrigation system. Was it able to water the plant? YES / NO. Make modifications if required.

f) What would you do to improve it next time?

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Acknowledgement
Dairy Australia acknowledges the funding from levy payers and contribution by Commonwealth Government.

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5779.1 | May 2025