



Unlocking Orchard Opportunities

TEACHER GUIDE

LESSON 1

YEAR 9–10

This resource has been developed by:



**Hort
Innovation**

LESSON 1

Unlocking Orchard Opportunities

➤ LEARNING AREA

Design and Technologies (Year 9–10)

➤ AUSTRALIAN CURRICULUM CONTENT

Analyse and make judgements on the ethical, secure and sustainable production and marketing of food and fibre enterprises (**AC9TDE10K04**)

Analyse the impact of innovation, enterprise and emerging technologies on designed solutions for global preferred futures (**AC9TDE10K02**)

Analyse how people in design and technologies occupations consider ethical, security and sustainability factors to innovate and improve products, services and environments (**AC9TDE10K01**)

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Contents

Learning Area/Year Level.....	Page 2
Australian Curriculum Content	Page 2
Lesson Objective	Page 3
Lesson Overview	Page 3
Resources and Equipment	Page 4
Lesson Guide	Pages 5–8
Answers.....	Page 9
References	Page 10
<u>Student Worksheets</u> 	Pages 11–20

➤ LESSON OBJECTIVE

Students will learn about the significance of Australia’s apple industry to producers, consumers, and the economy. Through collaborative tasks and guided research, they will learn how stakeholders in the industry are implementing innovations and technology to address social, economic, and environmental challenges to meet the needs of consumers while working towards global preferred futures.

➤ LESSON OVERVIEW

Activity 1.1 – Introduction to Aussie Apples (30 minutes)

Activity 1.2 – Circle of Concern (30 minutes)

Activity 1.3 – An Innovative Industry (60 minutes)

Activity 1.4 – Advancements in Apple Production (60–90 minutes)

Resources and Equipment

➤ **ACTIVITY 1.1 – Introduction to Aussie Apples**

1. [Australian apples and pears – delivering quality](#) (6:32)
2. **Worksheet 1.1a – Aussie Apples Fast Facts**
3. [Industry stats](#)
4. Access to computer/digital devices

➤ **Activity 1.2 – Circle of Concern**

1. Butchers paper
2. Markers

➤ **Activity 1.3 – An Innovative Industry**

1. [Apple pack house production technology](#) (0:59)
2. **Worksheet 1.3a – Apple Innovation Case Studies**
3. Access to computer/digital devices

➤ **Activity 1.4 – Advancements in Apple Production**

1. Butchers paper
2. **Worksheet 1.4a – Problem Solving Scenario Cards**
3. **Worksheet 1.4b – Advancements in the Apple Industry**
4. Materials for the design process (e.g. cardboard boxes, tin foil, straws, paper, scissors, glue, etc.)

Lesson Guide

➤ ACTIVITY 1.1 – Introduction to Aussie Apples

Students will learn about the significance of Australia’s apple industry to both domestic and international stakeholders.

1. Facilitate a class discussion about apple production in Australia. Engage students by posing the following questions to tap into their understanding:
 - Where are apples produced in Australia?
 - Are all varieties of apples produced in the same locations? Why/why not?
 - What are the stages of the apple supply chain?
 - Is the Australian apple industry sustainable?
 - What are some of the challenges faced by Australia’s apple industry?
2. View [Australian apples and pears – delivering quality](#) (6:32) to learn about the occupations and processes involved in apple production in Australia.
3. Facilitate a class discussion about the significance of the Australian apple industry to different stakeholders in Australia and abroad. Encourage students to identify the industry stakeholders observed throughout the video, recording their suggestions in a central area. Explain that the apple industry plays an important role in Australia’s economy, food security, and the environment. It supports rural communities, contributes to international trade, and provides a nutritious and widely consumed food source to the population.
4. Distribute **Worksheet 1.1a – Aussie Apples Fast Facts** and provide students with access to computers or digital devices.
5. Students access the Australian apple industry statistics via the link <https://apal.org.au/programs/industry-data/industry-stats> and record answers to the questions on the worksheet.

Answers

5. Reconvene as a class and discuss what students have learned about the Australian apple industry.

➤ ACTIVITY 1.2 – Circle of Concern

Students will learn about environmental, economic, and social concerns faced by the Australian apple industry and will consider the different control measures implemented by the industry to manage these challenges.

1. Record the word ‘flood’ in a central area and ask students about the negative impacts of floods in Australia. Encourage them to think about the environmental, economic, and social impacts. Record their ideas as ‘concerns’.
2. For each of the ‘concerns’, collaborate to record a possible ‘control’ or management strategy to prevent each problem from occurring or reduce the likelihood of them happening.

For example:

Concern: *Australia’s agricultural sector is vulnerable to flooding, causing damage to crops and livestock. This can disrupt the food supply chain and lead to food shortages and price increases.*

Control: *Building flood barriers, levees, and embankments in vulnerable areas to prevent floodwaters from reaching farms.*

3. Draw a circle of concern in a central area and divide students into groups of four. Distribute a piece of butchers paper and markers to each group and ask them to draw a large circle and consider any ‘concerns’ that students know relating to apple production. Students record ideas in the outer ‘concerns’ circle.

Suggested answers:

Climate change, pests and diseases, changing consumer demand, labour shortages, etc.

4. Allow groups to share their ‘concerns’ with the class and then consider any possible ‘controls’ that could reduce or eliminate the concern using technology, innovation, or production methods, recording these controls in the inner circle.

Suggested answers:

Machinery automation, selective breeding of pest and disease resistant rootstocks, protected orchards, new apple varieties, etc.

5. Reconvene as a class and encourage groups to share the concerns and controls identified during the activity.
6. Explain that factors such as climate change, pests and diseases, changing consumer demand, and labour shortages can significantly impact Australia’s apple industry. Building resilience within the sector involves effective management and adapting to changing conditions. Technology, innovation, and management practices can be implemented along the apple value supply chain to address challenges within the industry and ensure continued economic, environmental, and social sustainability for industry stakeholders.

➤ ACTIVITY 1.3 – An Innovative Industry

Students will learn about the use of innovation and technology to address concerns in the apple industry. Students will engage with source materials to complete two case studies exploring robotics and genetic breeding in apple production.

1. Explain that students will investigate the use of innovation and digital technologies to address concerns and their controls in the apple industry. View the [Apple pack house production technology](#) (0.59) video about robotic production technology used in an Australian apple packing house to understand the current use of technology in the industry.
2. As a class, brainstorm the possible concerns that this technology may have addressed in the apple packing house.
3. Explain that automated production technology has been adopted in this Australian packing house to improve efficiency, product quality, and competitiveness while also addressing labour shortages and meeting the demands of modern consumers and global markets. The footage shows the machine visually grading and rotating apples to ensure consistency of colour and presentation when packaged. The apples are handled individually by the machine to prevent the fruit from bruising.
4. Provide students access to computers or digital devices, and distribute a copy of **Worksheet 1.3a – Apple Innovation Case Studies**.
5. Students access the source materials and complete the two case studies focused on robotics and specialised apple breeding.

Answers 

➤ ACTIVITY 1.4 – Advancements in Apple Production

Students will collaborate to respond to concerns faced by Australia's apple industry. They will follow the Design Thinking process to design a solution to an industry challenge, applying their understanding of current innovations and technology being adopted in the sector to improve social, economic, and environmental sustainability.

1. Allocate students into groups of four or five and distribute a sheet of butchers paper and a problem solving scenario card from **Worksheet 1.4a – Problem Solving Scenario Cards** to each group.
2. In their groups, students collaborate to read the information on their problem solving scenario card, recording their responses to the questions on the sheet of butchers paper.
3. Reconvene as a class and discuss the problems that groups were presented with. Facilitate a discussion about the technologies, innovations, and management practices that have been explored throughout the lesson. Encourage students to identify which problems could be addressed using existing technology or innovations. As a class, identify any advantages and disadvantages in adopting the innovations or technologies explored throughout the lesson.
4. Explain that in their groups, students will follow the Design Thinking process to create an innovation to solve the problem on their problem solving challenge card. Groups may wish to improve upon an existing technology or innovation or design a new management practice or device to solve the problem.
5. Distribute a copy of **Worksheet 1.4b – Advancements in the Apple Industry** to each group and present students with materials for the design process (e.g. cardboard boxes, tin foil, straws, paper, scissors, glue, etc.).
6. Groups follow the Design Thinking process to design an innovation or technology to solve the problem on their problem solving scenario cards.

Answers

▶ ACTIVITY 1.1 – Introduction to Aussie Apples

WORKSHEET 1.1a – Aussie Apples Fast Facts

Answers will vary annually, visit <https://apal.org.au/programs/industry-data/industry-stats/> to access current industry statistics.

▶ ACTIVITY 1.3 – An Innovative Industry

WORKSHEET 1.3a – Apple Innovation Case Studies

Case Study One:

1. Monash Apple Retrieving System.
2. The MARS system can autonomously pick apples at a rate of seven seconds per apple. It is able to address challenges such as labour shortages by helping to pick apples and making work more efficient and easier for other fruit pickers by harvesting in bad weather or at night and reaching apples that may be too high for humans to reach easily.
3. Student answers will vary. Possible answers include: Addressing labour shortages, making work easier or more efficient, picking apples faster (during the night and in bad weather), and making work safer for human apple pickers.

Case Study Two:

1. Bravo™ Apples.
2. This specially bred variety provides growers with a new product to appeal to consumers and improve orchard profitability.
3. Student answers will vary. Possible answers include: A new variety of apples may address challenges around changing consumer demands and provide producers with a new revenue stream. As the Bravo™ variety grows well in regions with long warm to hot summers, it could be a beneficial variety to adopt in orchards to adapt and become more resilient to climate change as it is able to withstand warmer weather than many traditional varieties of apple.

References

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Aussie Apple Fast Facts



Scan the QR codes or click on the [link](#) to access Australia’s apple and pear industry statistics. Record your answers to the questions below.

➤ Industry stats: <https://apal.org.au/programs/industry-data/industry-stats/>

Question	Answer
1. What was the most recent annual value of the Australian apple industry?	_____
2. What percentage of Australia’s apples are exported annually?	_____
3. How many commercial apple and/or pear growers are there in Australia?	_____
4. Which Australian state produced the greatest percentage of apples in the last twelve months?	_____
5. List the five most common varieties of apples produced in Australia.	1. _____ 2. _____ 3. _____ 4. _____ 5. _____
6. Which variety of apple was purchased the most by Australian households in the last twelve months?	_____
7. Identify a possible reason that some varieties of apples decreased in purchase value in the last twelve months.	_____ _____ _____ _____ _____

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Apple Innovation Case Studies

Technology and innovation in agriculture improve productivity, profitability, and sustainability, addressing challenges along the value supply chain of food and fibre products. In Australia's apple industry, innovations and technology allow growers to produce higher-quality apples, reduce environmental impacts, and adapt to changing consumer demands.



Case Study 1: MARS – The Monash robotic apple-picker



1.

Scan the QR code or click on the [link](#) to read the article about automation in apple production.

▶ Life in MARS? The Monash robotic apple-picker
<https://apal.org.au/life-in-mars-the-monash-robotic-apple-picker/>



2.

Scan the QR code or click on the [link](#) to view the source material about automation in apple production.

▶ Life in MARS? Meet the Monash Apple Retrieving System (0:32)
<https://youtu.be/gnFWmKMCCWQ>



3.

Answer the questions on the following page about the focus innovation.

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Apple Innovation Case Studies

– Case Study 1 (cont'd)



Answer the following questions after researching Case Study 1.

1. Identify the name of the technology/innovation.

2. Describe how the technology/innovation improves an area of apple production.

3. Justify why apple producers would incorporate technology/innovation in their production systems.

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Apple Innovation Case Studies (cont'd)

Case Study 2: Bravo™ Apple Variety



1.

Scan the QR code or click on the [link](#) to read the article about the Bravo™ apple variety.

- ▶ New generation burgundy coloured apple – Bravo™
<https://www.agric.wa.gov.au/new-generation-burgundy-coloured-apple-bravo%E2%84%A2>



2.

Scan the QR code or click on the links to view the source materials about the Bravo™ apple variety.

- ▶ Discover Bravo™ Apples! (0:49)
<https://www.youtube.com/watch?v=oB5OWZ2r-4c>
- ▶ Bravo™ New apple name announced | Department of Agriculture and Food WA (1:42)
https://www.youtube.com/watch?v=TYjYea2I_uc



3.

Answer the questions on the following page about the focus innovation.

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Apple Innovation Case Studies – Case Study 2 (cont'd)



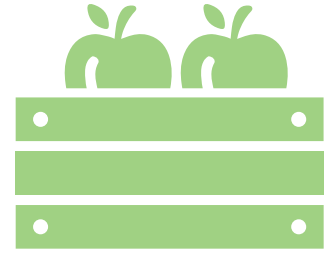
Answer the following questions after researching Case Study 2.

1. Identify the name of the technology/innovation.

2. Describe how the technology/innovation improves an area of apple production.

3. Justify why apple producers would incorporate technology/innovation in their production systems.

Problem Solving Scenario Cards



Read the problem solving scenario card and collaborate with your group to record your answers to the challenge questions. Your responses may involve using current management practices and technologies or creating innovative new solutions for addressing these problems.

Scenario One: Climate Crunch

1.



Problem:

Over the past few years, you have noticed significant climate changes in the region where your apple farm is located. More extreme weather events, such as droughts and heat waves, affect your apple production. The fruit is not maturing properly, and you are struggling to meet consumer demands.



Challenge:

- How could you modify your orchard to cope with the changing climate?
- What technology or innovations could you implement to protect your apple trees from extreme weather conditions?
- How could you educate consumers about the challenges faced by apple growers due to climate change?



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Problem Solving Scenario Cards (cont'd)

2.

Scenario Two: The Harvest Helper Crisis



Problem:

You manage an apple farm, and every year you rely on a team of seasonal workers to help with the apple harvest. This year, many of your regular workers cannot make it due to travel restrictions and other issues, and you are struggling to find enough workers to pick the apples in time.



Challenge:

- What management practices could you implement on your farm to address the challenge of labour shortages during harvest?
- What technologies or machinery could you implement to streamline the harvest process and reduce the need for manual labour?
- How could engaging with the local community help to address this concern?



3.

Scenario Three: The Pest Threat



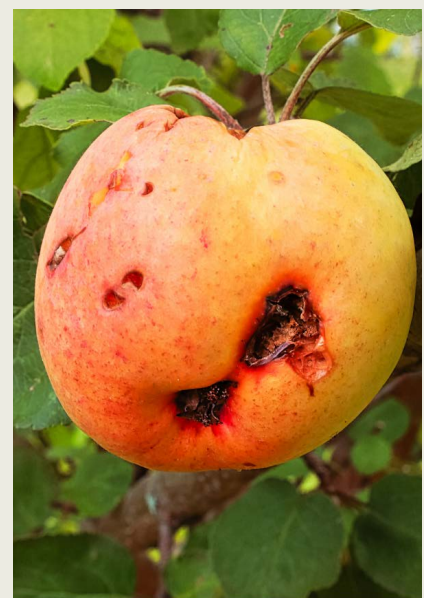
Problem:

A new invasive pest species that damages apples on trees and reduces crop yields has recently been identified at a nearby apple orchard. You need to develop a strategy to protect your orchard and the local apple industry from this threat.



Challenge:

- How could you manage your production system so that the apples were more resistant to this threat?
- What biosecurity measures can you implement to safeguard your apple trees without harming the environment?
- What technology or innovations could you implement to protect your apple trees from the invasive pest species?



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Problem Solving Scenario Cards (cont'd)

4.

Scenario Four: Taste Trend Transformation



Problem:

You have noticed a shift in consumer preferences. People are now looking for unique and exotic apple varieties, and demand for traditional varieties is declining. You have an orchard full of traditional apple trees and worry about staying competitive in the changing market.



Challenge:

- How could you modify your orchard to meet changing consumer demands for unique apple varieties?
- What marketing strategies could you use to promote your traditional apple varieties?
- How could you diversify your production (e.g. value-added products such as apple-based snacks or beverages) to diversify your income?



5.

Scenario Five: The Sustainable Orchard Challenge



Problem:

You manage an apple orchard and would like to improve the environmental sustainability of your production system to ensure the long-term health of your orchard and meet consumer demand for environmentally responsible products.



Challenge:

- How could you transition your orchard to more sustainable farming practices while maintaining or increasing apple production?
- What steps could you take to reduce the use of chemical pesticides and fertilisers and promote biodiversity?
- How could you communicate your commitment to sustainability to consumers?



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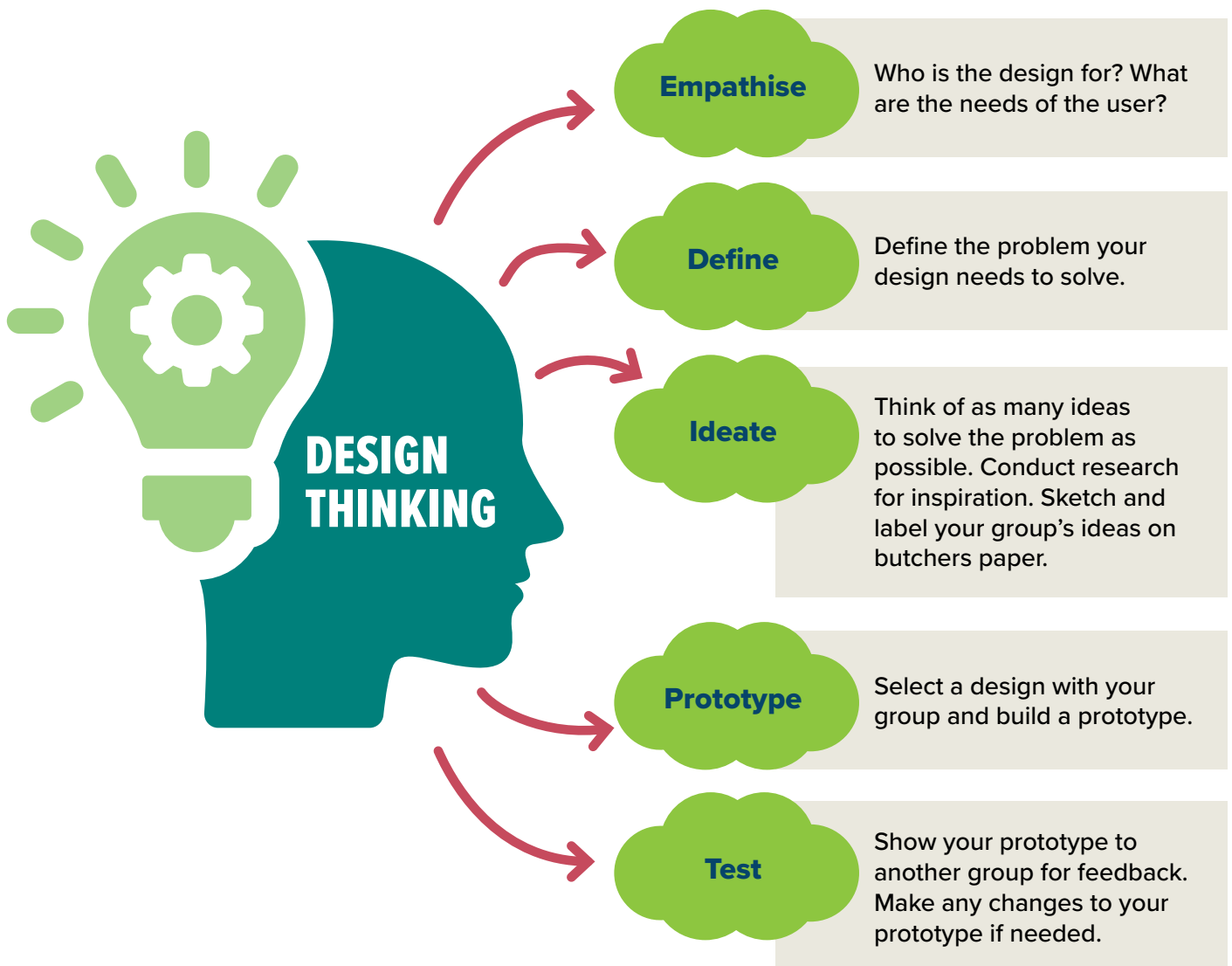
Advancements in the Apple Industry

Follow the Design Thinking process below and use the provided materials to **empathise**, **define**, **ideate**, and **create a prototype** to solve a concern in Australia's apple industry. Your innovation may be an original concept or improve an existing product or management practice.

Collaborate with your group to record your responses to the Design Thinking prompts on a piece of butchers paper.



Image source: Montague Orchards



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Advancements in the Apple Industry (cont'd)

Feedback plays an important role in the Design Thinking process as it helps identify the design's effective aspects and those needing modification to meet the design criteria.

Use the feedback form below to provide feedback on another group's design.



Group name:

1. Identify the problem in Australia's apple industry that this design is solving.

2. Describe how the design meets the design criteria.

3. Identify one aspect of the design that could be improved. Provide your reasons why.

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