Add the
MIGHTY MUSHIE

Technology, Innovation, and Careers

TEACHER GUIDE

LESSON 2

YEAR 9–10

This resource has been developed by:

Primary Industries Education Foundation Australia

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AMGA Australian Mushroom Growers' Assoc.

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LESSON 2

Technology, Innovation, and Careers

LEARNING AREA

Design and Technologies (Year 9-10)

AUSTRALIAN CURRICULUM CONTENT

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

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

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

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LESSON OBJECTIVE

Students will learn about:

- The people who can be involved in various steps of the supply chain and possible careers in the mushroom industry.
- The importance of technology and innovation.
- Future needs of the industry and examples of emerging production technologies and methods.
- The use of digital technology within the production chain.

Resources and Equipment

1. Access to laptop/digital devices
2. **Worksheet 2.1 – Mushroom Farmer Case Study**
3. **Worksheet 2.2 – Netafim Drip Irrigation**
4. **Worksheet 2.3 – TechBrew Robotics**
5. **Worksheet 2.4 – Mobichamp Smart Harvest**
6. **Worksheet 2.5 – Vandentop Harvest Machine**
7. **Worksheet 2.6 – Digital Technology Report**
8. **Extension – Digital Technology Prototype**
9. Craft materials for the prototyping activity, e.g. bottles, scissors, glue, cardboard, pipe cleaners, pom pom balls etc.

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Lesson Guide

Students will:

- Complete a case study on careers involved in the mushroom supply chain.
- View and record information from a series of workstations (online or printable) focused on innovation and technology within the mushroom industry.
- Create a report centred on digital technology within the supply chain and how this technology improves production.

STARTER

1. Direct students to the following website: https://www.americanmushroom.org/main/mushroom-careers. Watch the video (2:49). Students explore the three career areas associated with the mushroom production chain by clicking on each section.
   a) Mushroom Growing/Harvesting
   b) Packinghouse
   c) Compost Yard
2. Students conduct individual research and take notes about the various careers associated with the mushroom industry.
3. Use a digital collaborative tool, such as Google Jamboard, Miro or Mural to create a table with the various career headings as titles.
4. Students add the careers associated with the mushroom industry to the digital collaborative table from step 3 and include videos, images, and statistics that they discover about the different career areas.

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MAIN

a) Career Case Study:

1. Distribute **Worksheet 2.1 – Mushroom Farmer Case Study**. Students scan the QR code or visit the website to complete the comprehension activity.

   Answers

b) Technological Innovations:

1. Distribute the following four worksheets:
   - **Worksheet 2.2 – Netafim Drip Irrigation**
   - **Worksheet 2.3 – TechBrew Robotics**
   - **Worksheet 2.4 – Mobichamp Smart Harvest**
   - **Worksheet 2.5 – Vandentop Harvest Machine**
2. Students view the source materials linked on the worksheets and explore the company websites to complete the worksheets.
3. Facilitate a class discussion focused on emerging technologies in the mushroom production industry. Take a class poll on what students think is the most effective new technology and the most likely to be implemented.
4. Discuss with students the pros and cons associated with technological innovations in the mushroom production industry.
   - *Pros: automation, higher yields and efficiency, better crop management.*
   - *Cons: low skilled labour being replaced, therefore fewer job opportunities for local employees.*

   Answers:
   - **Worksheet 2.2 – Netafim Drip Irrigation**
   - **Worksheet 2.3 – TechBrew Robotics**
   - **Worksheet 2.4 – Mobichamp Smart Harvest**
   - **Worksheet 2.5 – Vandentop Harvest Machine**

c) Digital Technology Extended response:

1. Students select a technological innovation that they have investigated and discuss the implementation of the innovation. Students may find and use an alternative technology to those from Activity b.
2. Students use **Worksheet 2.6 – Digital Technology Report** as a guide.

   Answers

d) Extension

1. Individually or in groups, students develop a technological innovation to pitch to the mushroom industry.
2. Students complete **Extension – Digital Technology Prototype** worksheets.
3. Students create a physical or digital prototype to pitch to the class.

PLENARY

e) Tweet a friend:

1. Students summarise what they have learned in the lesson in less than 280 characters.

Student Resources

1. **Worksheet 2.1 – Mushroom Farmer Case Study**
2. **Worksheet 2.2 – Netafim Drip Irrigation**
3. **Worksheet 2.3 – TechBrew Robotics**
4. **Worksheet 2.4 – Mobichamp Smart Harvest**
5. **Worksheet 2.5 – Vandentop Harvest Machine**
6. **Worksheet 2.6 – Digital Technology Report**
7. **Extension – Digital Technology Prototype**

Answers

WORKSHEET 2.1 – Mushroom Farmer Case Study

2. Nick has been farming mushrooms since the mid '90s.
3. There were six growing rooms in 1998, which has expanded to 52 growing rooms with plans for further expansion. Expansion is due to increased consumer demand.
4. Employees are located in the compost yard, the mushroom farm, and the wholesale and distribution areas.
5. The farm can produce 50 tonnes of mushrooms per week, an increase from 2.5 tonnes in 1998.
6. Ambient temperature to within 0.1 degrees Celsius, compost temperature, humidity, and carbon dioxide.
7. With rising electricity and water costs, efficiencies are a future challenge.

WORKSHEET 2.2 – Netafim Drip Irrigation

Company Mission: Helping the world grow more with less.
Product: Mushroom substrate irrigation and monitoring.

1. Irrigation tubes are embedded into the substrate to help keep the correct water level in the substrate and casing.
2. Between flushes, the mushroom casing and substrate would dry out, requiring manual watering that was less accurate and wet the mushrooms.
3. Manual watering systems.
4. Improves the yield, quality, and picking rate of mushrooms.

WORKSHEET 2.3 – TechBrew Robotics

Company Mission: Improve throughput, quality, and safety using robotics.
Product: Robotic arm to pick mushrooms.

1. Robotic arm to pick mushrooms with around the clock harvesting, improved quality and yield.
2. Labour shortages in the mushroom industry are crippling production capabilities.
3. Human mushroom pickers.
4. It allows mushrooms to be harvested around the clock which prevents wastage and means mushrooms can be more consistent.

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Answers (continued)

WORKSHEET 2.4 – Mobichamp Smart Harvest

Company Mission: Bring innovative solutions to mushroom farming.

Product: Intelligent camera and analysis system.

1. 'Smart Harvest' system, which continuously monitors and guides a harvest.
2. It can take a long time to train a human mushroom picker to select high quality mushrooms, this system automates the selection of quality mushrooms.
3. As an assistive technology, it is not replacing anything. It supports human pickers to select the correct mushrooms.
4. Technology can help decrease costs and increase profitability by assisting humans.

WORKSHEET 2.5 – Vandentop Harvest Machine

Company Mission: To harvest and collect fresh mushrooms without the need of any person.

Product: Automated mushroom picking.

1. Automated mushroom harvest machine that harvests all mushrooms from a mushroom bed to be used in canned mushrooms.
2. Replaces human pickers and therefore solves the issue of labour shortages.
3. Replaces the need for human harvesters.
4. Quicker harvest rates, therefore greater yield and turnover of growing beds leading to greater yields over time.

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