AN EDUCATIONAL UNIT FOR PRIMARY SCHOOLS

Investigating technologies in agriculture

YEARS 5 & 6

Design and Technologies

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Contents

Cover photo courtesy of Angela Colliver

Acknowledgements

The Primary Industries Education Foundation Australia in conjunction with the Australian Government produced this educational resource for the Agriculture in Education Initiative. This resource is designed to introduce young people to food and fibre production and primary industries in Australia.

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As content of the websites used in this unit is updated or moved, hyperlinks may not always function.

Introduction

Rationale

This resource material aims to help teachers and students in primary schools investigate and understand more about primary industries in Australia.

The objectives of the educational resources are to:

- Support Primary Industries Education Foundation Australia and its members in expanding awareness about primary industries in Australia by engaging and informing teachers and students about the role and importance of primary industries in the Australian economy, environment and wider community.
- Provide resources which help build leadership skills amongst teachers and students in communicating about food and fibre production and primary industries in Australia.
- Develop educational resources that can be used across Australia to provide encouragement, information and practical teaching advice that will support efforts to teach about food and fibre production and the primary industries sector.
- Educate school students on ways food and animals are raised and grown.
- Demonstrate to students that everyone can consider careers in primary industries and along the supply chain of food and fibre products.
- Assist school students to spread this message to their families and the broader community.
- Develop engaging learning programs using an inquiry process aligned with the Australian Curriculum.
- Develop in school communities, an integrated primary industries education program that emphasises the relationship between food and fibre industries, individuals, communities, the environment and our economy.

These educational resources are an effort to provide practical support to teachers and students learning about food and fibre production and primary industries in schools.

An integrated primary industries education program that emphasises the relationship between food and fibre industries, individuals, communities, the environment and our economy.

About the approach

The approach used, is the inquiry approach through five phases: Engage, Explore, Explain, Elaborate and Evaluate.

Several key principles underpin the theoretical and practical application to this unit.

In providing an integrated *framework for inquiry*, complemented by rich explorations of texts that are, in turn, supported by an emphasis on undertaking a challenge or task, the unit requires students to:

- Search for information using both digital and non-digital means
- Use research techniques and strategies
- Use thinking and analysis techniques
- Present findings to a real audience, and
- Reflect both on the product created and the process undertaken.

Rather than seeing knowledge as something that *is taught,* the emphasis in this unit is on knowledge and understanding that *is learned*.

The unit involves students in:

- Working from a basis of their prior knowledge and experience
- Seeing a real task or purpose for their learning
- Being directly involved in gathering information firsthand
- Constructing their knowledge in different ways
- Presenting their learning to a real audience
- Reflecting on their learning.

The approach used, is the inquiry approach through five phases: **Engage**, **Explore**, **Explain**, **Elaborate** and **Evaluate**. The phases of the model are based on the 5Es instructional model (Bybee, 1997). This unit of work containing student activities assists students to raise questions, gather and process data, make conclusions and take action. These phases are:

- **Engage**: The 'Engage' phase begins with lessons that mentally engage students with an activity or question. It captures their interest, provides an opportunity for them to express what they know about the concept or skill being developed, and helps them to make connections between what they know and the new ideas.
- **Explore**: The 'Explore' phase includes activities in which they can explore the concept or skill. They grapple with the problem or phenomenon and describe it in their own words. This phase allows students to acquire a common set of experiences that they can use to help each other make sense of the new concept or skill.
- **Explain**: The 'Explain' phase enables students to develop explanations for the phenomenon they have experienced. The significant aspect of this phase is that explanation follows experience.
- **Elaborate**: The 'Elaborate' phase provides opportunities for students to apply what they have learned to new situations and so develop a deeper understanding of the concept or greater use of the skill. It is important for students to discuss and compare their ideas with each other during this phase.
- **Evaluate**: The 'Evaluate' phase provides an opportunity for students to review and reflect on their own learning and new understanding and skills. It is also when students provide evidence for changes to their understanding, beliefs and skills.

Source: Primary Connections http://www.primaryconnections.org.au/about/teaching

Teacher notes

Resource description

This is a unit with five inquiry teaching sequences about some of the diverse primary industries in Australia and roles that technologies play in producing food and fibre.

This unit encourages students to explore a range of primary industry sectors that produce food and fibre and the innovative methods and equipment involved.

As the unit progresses, the emphasis shifts to creating a designed solution for a technologies context that is valued in the Australian Curriculum, namely 'Food and fibre production'.

Students are invited to choose a do-it-yourself project to research and create a model or a design that could assist with the production of a type of food or fibre. Options are also provided for students to create their own model or design featuring any aspect of food or fibre production.

Having undertaken a design brief, students share their model or design in a mock 'Meet the Inventors' Television presentation.

Year levels: 5 and 6

Students explore a range of primary industry sectors that produce food and fibre and the innovative methods and equipment involved.

Curriculum focus

In this unit, students:

- Explore technologies used on farms and forests to produce food and fibre
- Explore a range of technologies invented in the past and present that are used in primary industries
- Examine technologies used to produce pigs, mussels, cotton, and fences used in sheep and cattle farming
- Examine technologies used to produce timber, timber poles and paper goods
- Examine technologies used in milk production
- Research technologies used in some primary industry sectors
- Design and make a model of a technology used in a primary industry
- Create a design of technologies used in a primary industry
- Present these models or designs to an audience following the study
- Reflect and evaluate what they have learned about technologies used in primary industries.

Australian Curriculum content descriptions

Design and Technologies

Strand: Design and Technologies Knowledge and Understanding

Investigate how and why food and fibre are produced in managed environments ACTDEK021

Strand: Design and Technologies Processes and Production Skills

Generate, develop, communicate and document design ideas and processes for audiences using appropriate technical terms and graphical representation techniques ACTDEP025

Apply safe procedures when using a variety of materials, components, tools, equipment and techniques to make designed solutions ACTDEP026

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), downloaded from the Australian Curriculum website on February 2015.

Implementing the unit and activities in the classroom

Using the unit

The unit can be used in a number of ways. It will be of most benefit to teachers who wish to implement a sustained sequence of activities following the inquiry stages identified in the ***About the approach*** section of this unit and content descriptions in the primary years in Design and Technologies as stated in the Australian Curriculum.

Selecting activities

At each stage several activities are suggested from which you are encouraged to select the most appropriate for your purposes. Not all activities in each stage of the unit need to be used. Alternatively, you may add to or complement the suggested activities with ideas of your own.

It is suggested that teachers create a hyperlinked unit. Organise the digital resources for your class's use on a website or wiki or provide them on your interactive whiteboard.

Resourcing the unit

The resources suggested are on the whole, general rather than specific. Schools and the contexts in which they exist vary widely as does the availability of some resources – particularly in remote areas. There is a strong emphasis in the unit on gathering information and data; research and observations also feature strongly as these methods develop important skills and ensure that the exploration of the topics are grounded in a relevant context.

Some YouTube and online videos in addition to Internet based resources are suggested in the unit. You will need to investigate what is available in your school.

Adapting the unit

The unit is targeted at primary students. This is a suggested age range only and teachers are encouraged to modify activities to suit the needs of the students with whom they are working.

The unit's topics are based on content descriptions of the Australian Curriculum and on the key cross curriculum priority of sustainability. They embrace content that we believe is of relevance and significance to all students. We encourage you to explore ways in which the content can be adjusted to the context in which you are working.

Many of the activities contain the following icons offering a suggestion on how many students should be involved:

 Suggested for individuals

 Suggested for pairs or small groups

 Suggested for larger groups or entire classes

Resource sheets are provided for some activities. Most are for photocopying and distribution to students. They are identified within units in bold italic: ***Resource 1.1***.

The resource sheets are designed to assist teachers to facilitate learning without having to access a range of other resources.

What about assessment?

Rather than being a task carried out at the end of the unit, assessment is viewed as integral to the entire unit sequence. Each activity should be regarded as a context for assessment of student learning.

When planning and implementing the unit of work make clear decisions on what you will focus on in assessing learning. The unit provides an opportunity for a range of skills and understandings to be observed. We encourage you to devise an assessment plan or assessment rubric that features areas to be assessed over subsequent lessons.

In planning for assessment, student learning in the following areas can be considered:

- Understandings about the topic.
- Development of skills.
- Exploration and clarification of values.
- Use of language in relation to content.
- Ability to use and critically analyse a range of texts.
- Ability to analyse and solve problems.
- Ability to interpret information, perceive its meaning and significance, and use it to complete real-world tasks.
- Ability to work cooperatively with others.
- Approach to learning (independence, confidence, participation and enthusiasm).

For this unit, the following understandings are provided to assist teachers in planning for assessment.

Assessment strategies

Each stage in the inquiry sequence provides information about student learning. There are, however, two stages in the unit that are central to assessment: the **Engage** stage and the **Evaluate** stage. Work that is undertaken in these stages can assist teachers to monitor growth and observe concrete examples of the way student ideas have been refined or have changed through the unit sequence. Work samples should be retained for this purpose.

Each unit contains a 'Student Task' which is well suited for assessment, as it is the summation of the work undertaken by the students in this unit.

Some questions and possible answers

Should I do all the activities?

At each stage of a unit, a number of activities are listed. You would not be expected to do them all. Instead, the unit is designed so that a selection of activities can be made at each stage. You should select the activities according to the needs and interests of your students and the time, relevance to the existing school curriculum and resources available to you.

While you are encouraged to follow the suggested inquiry sequence for each unit, it is quite possible to pick and choose from the range of activity ideas throughout the unit. It may also be used in conjunction with other programs you use.

How do these units fit into my weekly program?

Although the unit integrates a range of key subject areas, it is not designed to be a total program. It is assumed that regular routines that operate in your classroom will continue to run alongside your unit of work. For example, you may have regular times for use of the library, for maths, physical education etc. These things don't change – although student's writing topics or choice of topics to research in the library or in Information and Communication Technology classes may be influenced by this unit.

How long should the unit run?

This will of course depend on your particular circumstances but generally, a few weeks to a term are suggested.

I don't know much about food and fibre production myself – will I be able to teach it effectively?

Yes! The unit is designed in such a way that you, as the teacher are a co-learner, and you are therefore provided with teacher notes, plus readily available resources that are mainly web-based. Most importantly, you will find that you learn with the students and make discoveries with them.

Fast facts about Australian agriculture

National Farmers' Federation Farm Facts 2012

This page provides basic food and fibre production information that may be helpful when you interact with the school students.

- Agriculture plays a vital role in Australia, contributing to our social, economic and environmental sustainability.
- In 2011, there were 157,000 farmers in Australia. Around half of these were mixed crop and livestock farmers (22 percent), beef cattle farmers (20 percent) or dairy farmers (8 percent).
  Sources: Australian Bureau of Statistics, 2010-11 Agricultural Census; Australian Bureau of Statistics, Australian Social Trends, Australian Farming and Farmers, December 2012, Catalogue No. 4102.0.
- These farmers own or manage Australia's 135,000 farm businesses – 99 percent of which are Australian owned.
  Sources: Australian Bureau of Statistics, 2010–11 Agricultural Census; Australian Bureau of Statistics, Agricultural Land and Water Ownership, December 2010, Catalogue No. 7127.0.

In 2011, there were 157,000 farmers in Australia.

- Each Australian farmer produces enough food to feed 600 people, 150 at home and 450 overseas. Australian farmers produce 93 percent of Australia's daily domestic food supply.
  Sources: Keogh M, Australian Farm Institute, 2009, "Australia's response to world food security concerns", Address to the 1st National Farmers' Federation Annual Congress – Prime Minister's Science, Engineering and Innovation Council (2010); Australia and Food Security in a Changing World. The Prime Minister's Science, Engineering and Innovation Council, Canberra, Australia.
- The average Australian farmer is male (72 percent), 53 years old (compared with 40 years old for people in other occupations), and a self-employed owner manager (56 percent).
  Sources: Australian Bureau of Statistics, 2010–11 Agricultural Census; Australian Bureau of Statistics, Australian Social Trends, Australian Farming and Farmers, December 2012, Catalogue No. 4102.0.
- As of June 2012, there were 290,000 people employed in Australian agriculture. The complete agricultural supply chain, including the affiliated food and fibre industries, provide over 1.6 million jobs to the Australian economy.
  Sources: Australian Bureau of Agricultural & Resource Economics and Sciences (ABARES), Australian Commodity Statistics, 2012; Australia's Farm Dependent Economy: Analysis of the role of Agriculture in the Australian Economy. Modelling undertaken by Econtech.
- The agricultural sector, at farm-gate, contributes 2.4 percent to Australia's total gross domestic product. The gross value of Australian farm production in 2011–12 was $46.7 billion.
  Sources: Australian Bureau of Statistics, Value of Agricultural Commodities Produced, 2011–12, Catalogue No. 7503.0; Australian Bureau of Statistics, 2010–11, Australian System of National Accounts, Catalogue No. 5204.0; ABARES, Australian Commodity Statistics, 2012.

The gross value of Australian farm production in 2011-12 was $46.7 billion.

- Australian farmers are environmental stewards, owning, managing and caring for 59 percent of Australia's land mass.
  Sources: Australian Government Department of Agriculture, Fisheries and Forestry, At a Glance, 2012.
- Farmers are at the frontline of delivering environmental outcomes on behalf of the Australian community, with 94 percent of Australian farmers actively undertaking natural resource management.
  Source: Australian Bureau of Statistics, Natural Resource Management on Australian Farms 2006–07.
- Australia's primary industries have led the nation in reducing greenhouse gas emissions: a massive 40 percent reduction between 1990 and 2006.
  Source: Australian Government Department of Climate Change, National Inventory by Economic Sector 2006.

Source: National Farmers' Federation Farm Facts 2012 at http://www.nff.org.au/farm-facts.html

Meat and Livestock Industry

- Australia's national cattle herd stands at 28.5 million head with the beef industry accounting for 57 percent of all farms with agricultural activity.
- Australia produced around 2.2 million tonnes of beef and veal in 2012–13 directly contributing to 1 percent of Australia's gross domestic product.
- Australia's national sheep flock is 74.7 million head with the sheep industry accounting for 32 percent of all farms with agricultural activity.
- Australia produces approximately 6 percent of the world's lamb and mutton supply and in 2012–13 exported 51 percent of all lamb and 96 percent of all mutton produced.
- Australia's beef and lamb industry employs approximately 200,000 workers across farm, processing and retail.
- Australian cattle and sheep farmers are the custodians of almost half of Australia's land.
- Australia's beef and lamb industry is committed to ensuring a sustainable food supply for future generations with ongoing research and development projects relating to water, soil, biodiversity, animal welfare, energy, emissions and more.

Source: Meat and Livestock Australia http://mla.com.au

Fishing and Aquaculture Industry

Australia's marine domain, our Exclusive Economic Zone, is one of the largest in the world, covering around 10 million square kilometres. This is larger than mainland Australia (7.69 million square kilometres). Despite the size of this zone Australia ranks 46th in the world for seafood production.

Australia has progressively adopted a more ecosystem-based approach to fisheries management which looks at the effect of fishing practices not just on the target species, but also on the environment and other related species. Fisheries managers monitor both stock and fishing levels as well as a range of other environmental factors to ensure the amount of seafood harvested every year does not deplete stocks. In addition, government observers travel regularly on fishing boats to ensure compliance to quotas, bycatch limits and other regulations.

Source: Fisheries Research and Development Corporation, 2013 http://frdc.com.au/

Australia's marine domain covers around 10 million square kilometres.

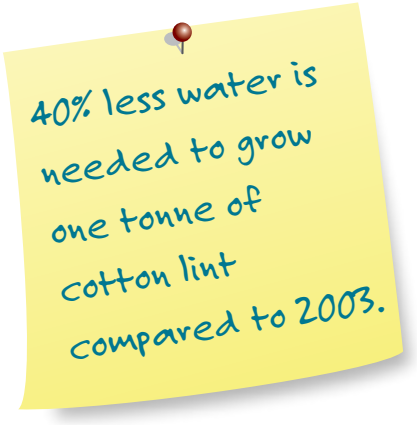
During 2011–12 in Australia:

- There were 6,991 people directly employed in the commercial fishing, hunting and trapping sector, and 3,642 in aquaculture enterprises.
- The sector comprises approximately 120 wild catch fisheries and 70 aquaculture species.
- The gross value of Australian commercial seafood and products (e.g. pearls) was valued at $2.3 billion, an increase of 3 percent on the previous year.
- Australian imports of fisheries products increased by 5 percent.
- The value of production for the wild-catch sector declined by 1 percent to $1.3 billion and production volume decreased by 4 percent to 157,505 tonnes. While the gross value of aquaculture production rose by 10 percent ($100 million) to $1.1 billion.
- The largest contributor to Australian aquaculture production in 2011–12 was salmonids, which make up 52 percent of the total aquaculture production volume and 49 percent of the value.
- Tasmania accounted for the largest share of gross value of production (30 percent), followed by South Australia (19 percent) and Western Australia (17 percent). Commonwealth fisheries accounted for 13 percent of the gross value of production.

Source: ABARES, 2013 http://data.daff.gov.au/data/warehouse/9aam/afstad9aamd003/2012/AustFishStats_2012_v1.0.0.pdf

Cotton Industry

- Every year cotton farmers make an important social and economic contribution to the nation creating jobs for 8,000 people (in Northern New South Wales and Southern Queensland alone), support for more than 4,000 businesses and over $2 billion for the national economy in export earnings.
  Sources: Cotton Australia Pocket Guide to Cotton, Judith Stubbs and Associates Report 2011.
- In 2013, there were 1,181 cotton farms. 63 percent were in New South Wales and 37 percent were in Queensland. Of those farms cotton makes up 17 percent of land area on farm.
  Source: Cotton Annual 2014
- Australia's cotton growers produce enough cotton to provide jeans, socks, underwear and a shirt for 450 million people. The overall yield in 2012 was 10.37 bales per hectare – the first time in history that average yields have exceeded 10 bales per hectare. Australia's cotton growers produce yields almost three times the world average.
  Sources: Cotton Australia tables (compilation of industry sources), ABARES Crop Report, December 2012, Pocket Guide to Cotton 2014.
- The average Australian cotton farmer is 39 years old, has a family owned and operated farm, employs on average six or more people, grows other crops like sorghum, soybeans, wheat and canola, has 496 hectares of cotton and is not only a farmer but also a builder, mechanic meteorologist, agronomist, conservationist, scientist and marketer.
  Sources: Pocket Guide to Cotton 2014, Monsanto audited numbers 20.12.13, 2013 Cotton Practices Grower Survey, Cotton Research and Development Corporation.
- The Australian cotton crop was worth almost $2.3 billion at the farm gate.
  Source: Cotton Australia tables (compilation of industry sources), Cotton Compass.
- The Australian cotton industry has achieved a 40 percent increase in water productivity over the last decade i.e. 40 percent less water is now needed to grow one tonne of cotton lint, compared to 2003.
  Source: The Australian Cotton Water Story 2011.



- The ratio of dryland cotton (rain grown) to irrigated cotton varies depending on the market and conditions. Of the 2011–12 crop 5 percent was dryland and 95 percent irrigated. Favourable grain and sorghum prices meant many dryland farmers opted not to plant cotton at that time.
  Sources: Cotton Australia tables (compilation of industry sources), ABARES Crop Report December 2012.
- Australian cotton growers have reduced their insecticide use by 95 percent over the past 15 years. *Source: Monsanto Audited numbers 20.12.2013.*
- Cotton growers are good environmental stewards, owning and caring for native vegetation equivalent to 40 percent of the area of their cotton farms, on average.
  Source: 2011 Cotton Grower Survey (Cotton Research and Development Corporation and Cotton Catchment Communities Co-operative Research Centre).

Source: Cotton Australia http://www.cottonaustralia.com.au

Pork Industry

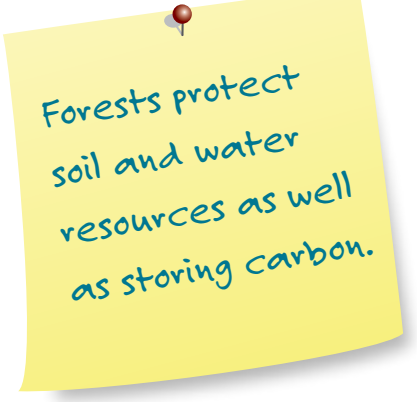
- Australia is the first nation in the world to introduce the voluntary phase-out of gestation stalls.
- Pork accounts for approximately 0.4 percent of the national greenhouse gas emissions – significantly lower than other agricultural sectors, including beef at 11.2 percent, sheep at 3.4 percent, and cattle at 2.7 percent.

Source: Garnaut, R. 2008, The Garnaut climate change review – final report, available at: http://www.garnautreview.org.au/index.htm

- Whether housed indoors or outdoors, a pig spends more time resting than any other domestic animal.
- Australia's pig herd health is one of the cleanest in the world, free from many detrimental diseases found in most other pig producing countries
- The feed component (mainly grains such as wheat, barley and sorghum) makes up about 60 percent of the total cost of producing pork.
- Pigs have a very wide angle of vision (310 degrees) and are therefore easily distracted.
- On average, a sow will produce 10–12 piglets per litter.
- The average growth rate of Australian pigs is around 600–650 grams a day from birth to sale.
- Pigs have colour vision but they can't focus both eyes on the same spot.
- Pigs are unable to perspire and they lose heat through their mouths. Their ideal growing temperature is 20–22˚C.

Source: Australian Pork Limited http://www.australianpork.com.au

Forestry Industry



- Forestry plays a vital role in Australia, contributing to our social, economic and environmental sustainability.
- Forests are also the foundation for a broad range of cultural and spiritual experiences for diverse groups of people. They are a major tourist attraction for Australian and overseas visitors, providing for a vast array of recreational and educational activities.
- In 2010–11, the total turnover of Australia's forest product industries was more than $24 billion.
- Australia has 125 million hectares of forest, equivalent to 16 percent of Australia's land area. Australia has about 3 percent of the world's forest area, and the seventh largest reported forest area of any country worldwide.
- Australia's 123 million hectares of native forests are dominated by eucalypt forests and acacia forests.
- 32 percent of all Australia's native forests (private and public land) are protected for biodiversity conservation. With 73 percent of Australia's identified old growth forests in formal or informal nature conservation reserves.
- 9 percent (36.6 million hectares) of the native forests were available and suitable for commercial wood production in 2010–11 comprising 7.5 million hectares of multiple-use public forests and 29.1 million hectares of leasehold and private forests.
- Forests protect soil and water resources and are increasingly being recognised for their carbon storage and sequestration capability. The total carbon stored in forests, wood and wood products and paper products was in the order of 400 million tonnes in 2010.
- Australia's native and plantation forests provide the majority of the timber and a significant proportion of the paper products used by Australians.
- On average, each year, every Australian consumes the equivalent of about 1 cubic metre of harvested log in the form of timber products, including timber for home building, joinery and furniture and paper products.
- Australia's forest management is among the best in the world in terms of conservation reserves and codes of practice for production forests.
- Australia has two forestry certification schemes that enable users of wood and wooden products to know the source of the wood.
- The sector directly employs 73,267 people in the forest and wood products industry in Australia (2011). This includes full and part time employees with 1.5 percent of all employees being Indigenous.

Sources: *http://www.agriculture.gov.au/forestry*
http://au.fsc.org/
http://www.forestrystandard.org.au/
http://www.naturallybetter.com.au/
http://www.forestlearning.edu.au

Dairy Industry

Every year the average Australian drinks around 107 litres of milk.

- Australian dairy is a $13 billion farm, manufacturing and export industry, directly employing 43,000 Australians on farms and in dairy processing.
- Australia's 6,400 dairy farms with over 1.65 million dairy cows produce around 9.24 billion litres of milk a year. On average a dairy cow produces 5,525 litres of milk every year.
- Every year the average Australian drinks around 107 litres of milk, eats around 13.5 kilograms of cheese, uses nearly 4 kilograms of butter and consumes 7.6 kilograms of yogurt.
- More than 100,000 Australians rely on dairy for their livelihoods, including vets, scientists, mechanics, financial advisers and feed suppliers.
- 98 percent of Australian dairy farms are family-owned businesses.
- Australian dairy quality and safety processes are among the best in the world.
- Australia is the fourth largest dairy exporter in the world, exporting approximately 40 percent of dairy products produced to more than 100 countries. Major export markets include China, Japan, Singapore, Malaysia and Indonesia.
- Australian dairy is a highly skilled industry. Dairy farmers need more than 170 different skills to run a successful farm business.
- Australian dairy relies on innovation to boost profitability and productivity. More than $2.3 billion has been invested in farm technologies and innovation since 1980, resulting in more than twice as much milk per cow and a tripling in production from improved pasture. Investment includes ways to save water, lower greenhouse gas emissions and reduce fertiliser use.
- Australian dairy is constantly investing, adapting and innovating to protect natural resources for future generations. 40 percent of dairy farms have a renewable energy system such as solar panels or solar hot water, 72 percent have fenced off some or all waterways to protect river health, 47 percent have some level of irrigation automation for more efficient water use, and 47 percent manage part of their land for biodiversity conservation.

Australian dairy is a $13 billion farm, manufacturing and export industry.

- Cows belong to a group of animals called ruminants, which have four stomach compartments that play different roles in digesting food and making milk. Other ruminants include goats, sheep, giraffes and camels. It takes 50 to 70 hours for a cow to turn grass into milk. Depending on the breed, a cow can make between 25 and 40 litres of milk a day. Before a cow can start producing milk, she must have delivered a calf.
- Cows eat about 40 kilograms of nutritious food a day – equivalent to 206 baked potatoes or 1,440 slices of bread! Cows can drink about 100 litres of water (a bathtub full) in a day.

Source: Dairy Australia: www.legendairy.com.au and www.dairyaustralia.com.au

Step 1: Engage with the topic

Getting started

Purpose

To provide students with opportunities to:

- gather information about student's prior knowledge about farms and different types of technologies used
- pool ideas and share with others
- build an interest in technologies
- learn about technologies used on some farms
- develop skills in making connections between ideas
- help set directions for an investigation
- provide data for assessment purposes.

Ask students to record what they know about farms, what technologies they use, what they produce, and for whom?

Farms

Much of the food and materials our community relies upon started as some form of agriculture on a farm. Whether it came from a field, a forest, a fishery, a piggery or a cattle and sheep farm, there was a natural or managed environment responsible for its growth.

CAPTURE student interest and **FIND OUT** what they know about farms and the technologies used on them.

TALK with students about what they know about farms, whether they have ever visited one, have a family member who owns one or know of someone who farms and uses a range of technologies to help in the production of a food or fibre.

DISCUSS the diversity of farms that exist in Australia. Introduce terms like fishery; forest; plantation; piggery; cattle station; dairy farm; sheep farm; oyster farm; tree farm; cotton farm; vineyard; cherry farm, worm farm, macadamia nut farm, potato farm, blueberry farm, mixed farm etc.

Ask students to **RECORD** what they know about farms, what technologies they use, what they produce, and for whom?

Use videos

VIEW the following videos and investigate farms that produce some of our food and fibre sources and the technologies that can be involved.

CHECK OUT what technologies are used on a dairy farm...find at least four different technologies that are used.
See: https://open.abc.net.au/explore/59300

FIND OUT more about electric fencing used on some farms.
See: https://open.abc.net.au/explore/49781

INVESTIGATE technologies on a remote cattle station.
See: https://www.youtube.com/watch?v=pdISOUfd4fo

VIEW the videos and use clues from the stories shared and student's background knowledge to **TALK** about these farms and the technologies used there.

Immerse the students in the topic of 'technologies'

INTRODUCE the term 'technology'. Ask students what a technology might be.

SHARE different examples of technology, for example:

- Scientists designing and producing the Hubble space telescope.
- An architect designing a home using an iPad and digital tools.
- A chef creating a new recipe.
- Foresters using satellites to oversee the growth of trees.
- A farmer using zero tillage cropping.
- A flower grower using liquid fertiliser in overhead sprinklers.
- An irrigation specialist designing a water efficient drip system.

INTRODUCE the terms 'new technologies', 'appropriate technologies', shelter technologies', 'food technologies', 'clothing technologies', Aboriginal and Torres Strait Islander Peoples technologies', 'colonial technologies', 'communication technologies', 'digital technologies'.

ESTABLISH an area of the classroom which can be set aside for an evolving visual display of different categories of technologies.

Approaching design and technology

TALK with the students about how exciting technology is as a subject to study. **DESCRIBE** how it provides opportunities to solve all sorts of problems in a practical way by designing and making things and also changing and adapting things that are already in existence.

EXPLORE how five schools in the Junior Landcare program designed and made a range of different things after exploring needs and opportunities at their school.

FIND OUT how students at Youngtown Primary School in Tasmania designed and built a food garden.
http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Creating-a-food-garden-12.9-LR.pdf

READ about how Gordonvale State School students in North Queensland designed and built a native habitat or frog pond.
http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Creating-a-frog-pond-12.9-LR.pdf

FIND OUT how students at Girraween Primary School in the Northern Territory designed and built a worm farm.
http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Building-a-worm-farm-12.9-LR.pdf

LEARN how students from Waikerie Primary School in South Australia enhanced habitats in and around the school.
http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Enhancing-habitats-12.9-LR.pdf

CHECK OUT how students at Saints Peter and Paul Primary School in the Australian Capital Territory designed and made a natural pesticide for use on the plants they grow for food.
http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Using-natural-pesticides-12.9-LR.pdf

TALK with the students about how learning in 'Design and Technologies' involves creating designed solutions. Reflect back on the designed solutions created by the students at Youngtown, Gordonvale, Waikerie, Girraween and Saints Peter and Paul School and the many steps involved in their work.

Describe how technology provides opportunities to solve all sorts of problems in a practical way by designing and making things and also changing and adapting things that are already in existence.

Introduce the term 'design thinking' and the five phases of the design process: Discovery, Interpretation, Ideation, Experimentation and Evolution.

Also **INTRODUCE** the term 'design thinking' and the five phases of the design process: Discovery, Interpretation, Ideation, Experimentation and Evolution. See: http://www.ideo.com/work/toolkit-for-educators http://www.designthinkingforeducators.com/design-thinking/

INTRODUCE students to some of the steps involved in designing and making in 'Technologies'.

TALK about:

- Deciding on an need.
- Defining the scope of what is going to be designed and made, and planning a sequence of production steps.
- Developing the design.
- Selecting and using materials, tools and equipment to make the designed solution.
- Making the design solution.
- Evaluating the design, its ideas, processes and solution.

Add the steps involved in designing and making in 'Technologies' to the visual **DISPLAY** of different categories of technologies.

Brainstorm

BRAINSTORM ideas about how technologies might be used on farms; in fishing and aquaculture; and in forests. **LIST** key words and create a flow chart to show links between them.

COLLATE the ideas and add these to the class visual display of different categories of technologies.

Setting the task

Note: This is a suggested assessment task.

Explain to the class that their task will be to work in small groups to **FIND OUT** more about technologies used on farms, in fishing and aquaculture or in forests.

EXPLAIN that each group will:

- Use the task sheets located in ***Resource 1.1*** to **RECORD** understandings about technologies used on farms, in fishing and aquaculture or in forests.
- Choose a design task to **EXPLORE** features of a technology.
- Use these understandings to **DESIGN** and make a model of a technology that could assist with or actually produce a type of food or fibre.

Explain that later in the unit each student will also **SHARE** and **EXPLAIN** their design as part of a 'Meet the Inventors' television show, in which they explain the key features of their chosen design or technology.

Explore maps and some primary industry sectors

Purpose

To provide students with opportunities to:

- an insight into significant technological innovations developed in the past and present
- opportunities to learn more about technologies used on farms, in fishing, aquaculture and in forests
- hands-on experiences of designing and making models
- a focus for the forthcoming experiences in the 'Explain' stage of the inquiry.

Talk about inventions and how they solved many needs in days gone by.

Technologies used on farms in the past

In pairs or small groups, **VIEW** a selection of technologies used in the past.

VIEW *'Food Stories'* which uses objects from the National Museum of Australia's collection to share stories about productive places, food gardeners, farmers and cooking. See: http://www.nma.gov.au/online_features/food_stories

Ask students to **EXPLORE** the Hmong crossbow, knife blade and timber dibble and their various uses.
See http://www.nma.gov.au/online_features/food_stories/moonah_tasmania/history

EXPLAIN to students how the stump-jump-plough was designed in 1876 by Robert and Clarence Smith. Look at one up close at: http://www.nma.gov.au/online_features/food_stories/majura_act/food_history and read more about its use by farmers many centuries ago.

Everyone has eaten jam. **EXPLORE** more about the technologies used by jam makers at: http://www.nma.gov.au/online_features/food_stories/monbulk,_victoria/monbulk_food_history

DISCOVER a wealth of technologies used many years ago in a cook's galley or mobile kitchen. See: http://www.nma.gov.au/online_features/food_stories/collingullie_nsw/collingullie_food_history

Encourage students in pairs to **TALK** about these inventions and how they solved many needs in days gone by. Ask each pair to **DESCRIBE** and **LIST** the technologies used today to plough land with, to capture an animal with, to make holes in the ground with, to cook food on, to grind foods with, to heat water with, to cut chaff with, and to refrigerate foods with.

Explore other Australian technological innovations

OUTLINE to students some of the technological innovations developed in the agricultural sector in the past, for example:

- John Ridley's wheat stripper (1843)
- James Harrison's rack wool press (1865)
- J.A.B. Higham's mechanical shearing machine (1866)
- Robert and Clarence Smith's stump-jump-plough (1876)
- James Alston's self-operating windmill for pumping sub-artesian water (1880s)
- H.V. McKay's harvester (1885)

Ask students to **RESEARCH** one of the above or find out about more recent innovations and see:

- Jeff Esidale and Chris Holland's 'Two Wheel Tractor Seed Drill' http://www.abc.net.au/tv/newinventors/txt/s3273783.htm
- Ray Harrington's 'Seed Destructor' http://www.abc.net.au/tv/newinventors/txt/s3273853.htm

- John Gargula and Greg McLeod's 'Bull Ant Irrigation' http://www.abc.net.au/tv/newinventors/txt/s3230463.htm
- The use of Geographical Information Systems in Forestry http://forestlearning.edu.au/find-a-resource/article/25/geographical-information-systems.html
- The Smart Hook that makes long line fishing safer for seabirds and turtles http://www.abc.net.au/tv/newinventors/txt/s2331630.htm
- *'Million dollar tuna babies'* - The Seafood Cooperative Research Centre http://www.youtube.com/watch?v=g84TwtxcZr0
- Transgenic or genetically modified cotton http://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-biotechnology

TALK with the class about the inventions and their implications for producing food and fibre.

ASK questions like:

- Who gets what?
- Who/what gives what?
- At what cost?

ADD ideas and responses to the class's visual display of different ideas about technologies.

Develop understandings about technologies used on farms, in fishing and aquaculture or in forests.

RESEARCH TASK PART 1:

Investigate technologies used on farms, in fishing and aquaculture or in forests

RE-STATE to the class that they will be using a range of activities and websites to develop understandings about technologies used on farms, in fishing and aquaculture or in forests.

ASK students to form small groups or pairs and:

- Use the task sheets located in ***Resource 1.1*** to record understandings about technologies used on farms, in fishing and aquaculture or in forests.
- Choose a design task to explore features of a technology.
- Use these understandings to design and make a model of a technology that could assist with or actually produce a type of food or fibre.

Note: ***Resource 1.1*** features the following primary industries:

- Piggeries that use technologies to produce pigs.
- A cattle and sheep farm that uses solar energy to power fences.
- A cotton farm that uses a range of technologies to grow cotton including an irrigation system to effectively water the crop.
- An aquaculture farm that uses a range of technologies to grow mussels.
- A forest that requires a range of technologies to produce timber.
- Dairy farms that use technology to produce milk.

Ask students in groups or in pairs, to **VIEW** all video presentations and answer their associated questions, on each task sheet in ***Resource 1.1***, and then **CHOOSE** one design task to **UNDERTAKE** and **SHARE** with an audience as part of a 'Meet the Inventors' television show.

Note: Students can also design and make an entirely different model or design that is used in the production of other foods and fibres too!

RESEARCH TASK: PART 2

REMIND students of the remaining focus of their task: to **SHARE** and **EXPLAIN** their chosen design or model as part of a 'Meet the Inventors' television show, in which they explain its key features.

Design and make a model of a technology that could assist with or actually produce a type of food or fibre.

Step 3: Explain understandings

Purpose

To provide students with opportunities to:

- research a particular design
- develop skills of formulating questions and gathering ideas
- develop the understanding of how we can learn from others
- develop a model or design
- explain how their chosen design or model works.

Design and produce a scale model of a fence that will keep sheep and cattle in a paddock.

Safety requirements

REVIEW rules on personal safety, group safety, and classroom and furniture safety with the students.

Ask each pair or group to establish a work station based on their selected design task and to **GATHER** the materials and tools they require.

TALK about safely storing their model or design and keeping a **RECORD** of the processes they undertake.

Designing and producing

Ask students to **CHOOSE** a design brief and begin their model or design. Remind students that they can **CREATE** any original design or model that has links to food or fibre production.

Students can also choose to:

- Design a model of a pig farm.
- Design a new 'Free-Range Pork' brand.
- Design and make a solar oven.
- Design and produce a scale model of a fence that will keep sheep and cattle in a paddock.
- Design and make a water filter.
- Design and make a long handled dip net for picking up fish out of the water after having been caught.
- Design a model to simulate the process of moving water from a source to an irrigation channel.
- Design a tree-planting program for the school grounds.
- Design a forest plantation for a farmer.
- Design and make a nesting box.
- Design and make their own paper.
- Design some environmentally friendly packaging.
- Design a marketing campaign for dairy products.
- Design a new process to do an everyday thing that relates to food and fibre production.

Decide on what to present and how to do so

Re-state the purposes of the task and ask students to **CONSIDER** how they are going to bring their model or design together and **PRESENT** it as part of a television show, so that the main points come across clearly.

SHARE episodes of 'The New Inventors' television show at: http://www.abc.net.au/tv/newinventors/specials/ and **REVIEW** presentation techniques used on the show.

Presentation planning

Purpose

To provide students with opportunities to:

- share their designs and models
- plan their presentation
- conduct their presentation.

Going further with the planning of the presentation

Invite students to **CONFIRM** the idea planned for their presentation as part of the 'Meet the Inventors' television show.

Ask students to **CREATE** a final plan for completing their presentation. Students may need to **DOCUMENT** their key messages, create a **SCRIPT** to assist talking about their model or design. Invite them to **DRAFT** these and the learning achieved in a journal, log or reflection.

Meet the Inventors

Note: This is a suggested assessment task.

Invite students to **REHEARSE** and **FINE-TUNE** their presentation.

INVITE parents and other classes to the presentation of the 'Meet the Inventors' television show in which students **EXPLAIN** the key features of their models or designs.

Think back and evaluate

Purpose

To provide students with opportunities to:

- Reflect on their own learning
- 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 weaknesses.

Reflective writing

Provide students with a set of focus questions for their writing:

- Write about a technology you learnt about in this unit.
- Critique your design or model. Did it work?
- How might you help others know more about the technologies used by Australian farmers to produce fibre and food?
- What have you learned about the primary industries sector and its use of technologies?
- What would you still like to find out about the sector and its use of technologies?
- How well did I/we participate in any group/team learning activities?
- What questions do you have about the topic at the moment?
- What piece of work are you most satisfied with?

References

Australian Academy of Science. (2005) *Primary Connections*, Canberra, Australia.
Australian Pork Limited. (2014). *An Educational Unit for Primary Schools. Enterprising pig farmers*, Canberra, Australia.
Cecil, N. (1995) *The Art of Inquiry: questioning strategies for K-6 classrooms*, Peguis, Canada.
Gardner, H. (1985) *Frames of Mind: the theory of multiple intelligences*, Basic Books, New York.
Hamston, J. and Murdock, K. (1996) *Integrating Socially: units of work for social education*, Eleanor Curtain, Melbourne.
Hill, S. and Hill, T. (1990) *The Collaborative Classroom*, Eleanor Curtin, Melbourne.
Wilks, S. (1992) *Critical and Creative Thinking: strategies for classroom inquiry*, Eleanor Curtin, Melbourne.

Websites (viewed February 2015)

This is a list of websites used in the unit for teacher use. As content of the websites in this unit is updated or moved, hyperlinks may not always function.

Australian Bureau of Statistics
http://www.abs.gov.au/ausstats/abs@.nsf/mf/7121.0

Australian Broadcasting Corporation
The New Inventors: Inventions: Bull Ant Irrigation http://www.abc.net.au/tv/newinventors/txt/s3230463.htm
The New Inventors: Inventions: Harrington Seed Destructor http://www.abc.net.au/tv/newinventors/txt/s3273853.htm
The New Inventors: Inventions: Smart Hook System http://www.abc.net.au/tv/newinventors/txt/s2331630.htm
The New Inventors: Inventions: Two Wheel Tractor Seed Drill http://www.abc.net.au/tv/newinventors/txt/s3273783.htm
The New Inventors: Special Episodes http://www.abc.net.au/tv/newinventors/specials/
Open Video Postcards
Legend of the dairy by James https://open.abc.net.au/explore/59300
Sustainable farming in Coolamon https://open.abc.net.au/explore/49781
Down on the mussel farm in Tasmania http://splash.abc.net.au/home#!/media/525687/down-on-the-mussel-farm-in-tasmania

Australian Curriculum, Assessment and Reporting Authority: Australian Curriculum
http://www.australiancurriculum.edu.au

Australian Forestry Standard
http://www.forestrystandard.org.au

Australian Government Department of Agriculture
http://www.agriculture.gov.au/fisheries/aquaculture
Australian fisheries statistics 2012 http://data.daff.gov.au/data/warehouse/9aam/afstad9aamd003/2012/AustFishStats_2012_v1.0.0.pdf

Australian Pork Limited
http://www.australianpork.com.au
Aussie Pig Farmers. Types of Farming: Free Range http://www.aussiepigfarmers.com.au/types-of-farming/free-range/
Aussie Pig Farmers. Types of Farming: Indoor Intensive Breeding http://www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing/
Aussie Pig Farmers. Types of Farming: Outdoor Bred http://www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing/

Cotton Australia
http://www.cottonaustralia.com.au
Cotton and Biotechnology http://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-biotechnology
How to grow a pair of jeans http://cottonaustralia.com.au/cotton-classroom/grow-a-pair-of-jeans
The water cycle and responsible water use http://cottonaustralia.com.au/uploads/resources/The_water_cycle.pdf

Creative Commons
http://creativecommons.org/licenses/by/3.0/au/deed.en

Design Thinking for Educators
http://www.designthinkingforeducators.com/design-thinking/

Design Thinking for Educators Toolkit
http://www.ideo.com/work/toolkit-for-educators

Discover Dairy
http://www.dairy.edu.au/discoverdairy/
Milk Cycle http://www.dairy.edu.au/discoverdairy/learning-resources/games/milk-cycle

Fisheries Research Development Corporation
http://frdc.com.au/

References

Forest Learning
http://www.forestlearning.edu.au
Geographical information systems http://forestlearning.edu.au/find-a-resource/article/25/geographical-information-systems.html
Going bush – tracing the power poles back to North East Tasmania's forests http://forestlearning.edu.au/find-a-resource/article/26/going-bush-tracing-the-power-poles-back-to-north-east-tasmania-s-forests.html
Going bush – various demand for plantation and native forests http://forestlearning.edu.au/find-a-resource/article/28/going-bush-various-demand-for-plantation-and-native-forests.html

Forest Stewardship Council Australia
http://au.fsc.org

Garnaut Climate Change Review
http://www.garnautreview.org.au/

Junior Landcare Australia
Building a worm farm...it's fun and easy http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Building-a-worm-farm-12.9-LR.pdf
Creating a food garden...it's fun and easy http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Creating-a-food-garden-12.9-LR.pdf
Creating a frog pond...it's fun and easy http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Creating-a-frog-pond-12.9-LR.pdf
Enhancing habitats...it's fun and easy http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Enhancing-habitats-12.9-LR.pdf
Growing healthy plants using natural pesticide...it's fun and easy http://www.juniorlandcare.com.au/wp-content/uploads/2014/10/Using-natural-pesticides-12.9-LR.pdf

Legendairy
http://www.legendairy.com.au/dairy-farming/our-people/farmer-stories

Meat & Livestock Australia
http://www.mla.com.au
The Virtual Farm Visit http://virtualfarm.mla.com.au/

National Farmers' Federation. Farm Facts 2012
http://www.nff.org.au/farm-facts.html

National Museum of Australia. Food Stories
http://www.nma.gov.au/online_features/food_stories
A food history of Moonah http://www.nma.gov.au/online_features/food_stories/moonah_tasmania/history
Collingullie food history http://www.nma.gov.au/online_features/food_stories/collingullie_nsw/collingullie_food_history
Majura food history http://www.nma.gov.au/online_features/food_stories/majura_act/food_history
A taste of Monbulk's food history http://www.nma.gov.au/online_features/food_stories/monbulk,_victoria/monbulk_food_history

Primary Connections
http://www.primaryconnections.org.au/about/teaching

Questacon. Solar powered oven https://www.questacon.edu.au/outreach/programs/science-circus/videos/solar-powered-oven

Target 100. Pests http://www.target100.com.au/Environment/Pests-weeds/Pests

Wood Naturally Better
http://www.naturallybetter.com.au/

YouTube videos:
Fourth Grade Paper Making http://www.youtube.com/watch?v=aQoz1pkKmdA
Graham Mair: 'Million dollar tuna babies' – The Seafood CRC http://www.youtube.com/watch?v=g84TwtxcZr0
Roger Wilk: Paper making at home http://www.youtube.com/watch?v=87w8kdhjFvU
Target 100 channel. Innovative Cattle Stations in Australia. TEDxSydney https://www.youtube.com/watch?v=pdISOUfd4fo

Resource 1.1

Task sheet

Explore pig farms and the technologies used to produce pigs

VIEW the video about free range pig farming http://www.aussiepigfarmers.com.au/types-of-farming/free-range/

Use the space below to keep a **RECORD** and **COLLECT** information about the pig farm and its use of technologies in the production of healthy pigs.

DRAW a flow chart to describe the processes used.

VIEW a second video about pig production where eco-shelters are used to house the pigs
http://www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing/

DRAW a sketch of an eco-shelter.

Note: Some eco-shelters have optional ends including canvas panels, louvers and blinds.
Some eco-shelters have side blinds that wind up and down.
Some eco-shelters are made from Ultra Violet protecting materials that eliminate sunburn too.

VIEW a third video about the production of pigs and list the technologies used in indoor housing approaches.
http://www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing/

DRAW a sketch of how pigs are farmed on this farm too.

Optional design brief:

Design and make a model pig farm

Your task is to **DESIGN** and **PRODUCE** a model of a pig farm. **DISCUSS** ideas with your group. What type of pig farm will you design and create?

SKETCH some ideas you have. **DECIDE** on the best idea and **COMPLETE** a labelled design and list all the parts needed to make it.

IDENTIFY criteria for success using visual representations such as a flowchart.

EVALUATE your design and **WRITE** a paragraph about the tasks that were involved. Include details on the quality of your planning, your finished model and how well you worked with other students and if you enjoyed the task.

Optional design brief:

Design a 'Free Range Pork' brand

Your task is to **DESIGN** a new 'Free Range Pork' brand label for a new line of free-range pork products that are soon to be released in Australian supermarkets and butchers. The free-range pork will include cuts such as pork fillets, pork loin steaks, mince, pork cutlets and easy carve leg roast.

The Board managing the new product line requests that the brand and its label must have a unique design – one that will be attractive to the public and communicates accurate information about the product and how it was produced.

The following aspects need to be taken into account when making your design:

- The words 'Australian Free Range Pork' must appear as part of the design.
- The visual aspect of the total design must be inclusive of Australian pig breeds that are sourced from free-range farms in Australia.
- The words 'Accredited by the Australian Pork Industry Quality Assurance Program (APIQ✓®) and endorsed by the RSPCA' must appear as part of the design.

On paper/card or using digital technologies including Apps, **DESIGN** and **COLOUR** the brand label.

EVALUATE your design and **WRITE** a paragraph about this task. Include details on the quality of your planning, your finished design and how well you worked with other students and if you enjoyed the task.

Task sheet

Explore some cattle and sheep farms and the technologies used

VIEW a virtual farm at http://virtualfarm.mla.com.au/

SELECT *'Malabar Farm'* and then click on the solar panel featured on the right hand side of the page.

WATCH two city dwellers visit a cattle station and discover the technology being used to make station life easier: https://www.youtube.com/watch?v=pdISOUfd4fo

Use the space below to keep a **RECORD** and **COLLECT** information about the cattle and sheep farms and their use of technologies.

Optional design brief:

Simulate the process of using the sun to create power

VIEW the Questacon website and make a solar powered oven. https://www.questacon.edu.au/outreach/programs/science-circus/videos/solar-powered-oven

RECORD the materials required to make a solar oven, the processes you need to undertake and then **DESIGN** and **MAKE** a solar oven. **IDENTIFY** criteria for success using visual representations such as a flowchart.

EVALUATE your solar powered oven and **WRITE** a paragraph about what you have learnt, how you worked with your partners and the quality of your solar oven.

Optional design brief:

Design and produce a scale model of a feral proof fence

Your challenge is to **DESIGN** a fencing system to keep out feral animals from a cattle and sheep farm and allow the occasional entrance of farm vehicles.

You can **LEARN** more about feral animals here: http://www.target100.com.au/Environment/Pests-weeds/Pests

Foxes and rabbits like to dig under fences and cats are good climbers. **SUGGEST** some ways of preventing these animals from entering the paddocks. **DRAW** some sketches to show your ideas. **LABEL** these.

DECIDE on a solution and **COMPLETE** a scale drawing of it.

MAKE your scale model. **EXPLAIN** why you believe your fence will be effective.

EVALUATE your scale model and **WRITE** a paragraph about the tasks you were involved in. Include details on the quality of your planning, your finished model and how well you worked with other students and if you enjoyed the task.

Task sheet

Explore an aquaculture farm and the technologies used to produce mussels

The systems used for aquaculture include but are not limited to ponds, fibreglass or concrete tanks, pens, suspended ropes, and floating cages.

CHECK OUT how mussels are grown and list six technologies involved in mussel production.
See http://splash.abc.net.au/media/-/m/525687/down-on-the-mussel-farm-in-tasmania

Six technologies involved in mussel production include:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Optional design brief:

Design and make a water filter

Mussel growing begins in a tank and these tanks have filters that keep the water clean.

Your challenge is to **DESIGN** and **CONSTRUCT** a simple water filtration system.

You will need some 2 litre plastic bottles, some yoghurt or margarine containers, tubing and filtering materials, for example: some cotton wool, fine sand, charcoal, coarse sand, fine gravel, coarse gravel and water.

DRAW a labelled drawing of the water filter you made and **DESCRIBE** how it works. **IDENTIFY** criteria for success using visual representations such as a flowchart.

EVALUATE your water filtration system and **WRITE** a paragraph about the processes involved in designing the system and how it filters water. Include details on the quality of your planning, your finished model and labelled drawing, and how well you worked with other students and if you enjoyed the task.

Optional design brief:

Design and make a long handled net for catching fish

Your challenge is to **DESIGN** and **MAKE** a net for catching fish in tanks.

You will need tools for cutting wire and netting plus some fabric net, plastic flywire, stocking or pantyhose, a length of wooden broomstick, and some wire.

IDENTIFY criteria for success using visual representations such as a flowchart.

THINK about the safety precautions you need to take when using wire. **CHOOSE** a tool suitable for cutting and bending wire. **SUGGEST** some methods of joining your material to the wire.

DRAW designs for your net and label the parts.

SELECT your best design and make your net.

USE your net. Was it successful? How could you improve on it?

EVALUATE your net and **WRITE** a paragraph about the tasks you were involved in. Include details on the quality of your planning, your finished model and how well you worked with other students and if you enjoyed the task.

Task sheet

Explore a cotton farm and the technologies used to plant, grow, water, maintain and then pick the cotton

Use the space below to keep a **RECORD** and **COLLECT** information about the cotton farm and its use of technologies. **DRAW** a flow chart to **DESCRIBE** the processes used to prepare the soil before the crop goes in, plant the seed, give it a drink, maintain it and pick the cotton bolls.

Then **THINK** about how the cotton bolls are separated from the cotton seeds, how the cotton bolls are pressed into bales, transported and then sent overseas. **EXPLORE** how cotton is combed, spun into thread, bleached and dyed a colour.

VIEW http://cottonaustralia.com.au/cotton-classroom/grow-a-pair-of-jeans to find your information.

Optional design brief:

Simulate the process of moving water from a source to an irrigation channel

Your challenge is to **MAKE** a simple model and **USE** it to move water. To do this you can use tubing, containers, tube connectors, duct tape, rubber bands, a foot pump or bike pump and water.

In planning how to make your model, you will need to do some **RESEARCH**.

Some ideas to **CONSIDER** as you plan your work are:

- How do cotton farmers move water from a source to an irrigation channel?
- How is water moved to a water tower?
- How do water treatment plants move water from a source to a tank?

VIEW the following presentation for inspiration http://cottonaustralia.com.au/uploads/resources/The_water_cycle.pdf for how others have created pumps and systems for moving water.

WRITE a record of your work including information about your planning, predictions, and conducting your investigation (include a diagram).

EVALUATE your model and **WRITE** a paragraph about the tasks you were involved in. Include details on the quality of your planning, your finished model and how well you worked with other students and if you enjoyed the task.

Task sheet

Explore a range of forests and the technologies used to provide timber products

Native forests and plantations are forests of trees which are planted to produce wood. In forestry, trees are the crop being grown.

VIEW a video about native and plantation forests and the different uses for wood sourced from these forests at: http://forestlearning.edu.au/find-a-resource/article/28/going-bush-various-demand-for-plantation-and-native-forests.html

RECORD what type of timber is best for producing cardboard, paper and tissues, and used in the different elements of housing construction.

FIND OUT about the production of timber power poles http://forestlearning.edu.au/find-a-resource/article/26/going-bush-tracing-the-power-poles-back-to-north-east-tasmania-s-forests.html

USE the space below to keep a **RECORD** and **COLLECT** information about technologies used to harvest wood from a Tasmanian forest and produce power poles. **DRAW** a flow chart to describe the processes used.

Optional design brief:

Design a tree planting project

Your challenge is to **DESIGN** and **PRODUCE** a plan for a tree planting area within the school grounds.

DECIDE on a good area for a 'revegetation project' and **CREATE** a site plan for the proposed area (1:25 is a good scale to draw your design ideas. This is 4 centimetres represents 1 metre).

THINK about what trees need to grow and what species are able to survive in your region then **RESEARCH** the ideal location where good soil and water can be found within the school.

IDENTIFY human influences affecting the site (for example, foot traffic) and plan how to minimise these.

SELECT vegetation for multiple levels – canopy, shrubs and ground cover including native grasses.

RECORD plant choices and **DISPLAY** the design for school community feedback. **CALCULATE** the numbers of each type of plant needed and compile a **LIST** of materials required to develop the site. Decide the details of the design and seek feedback on any final design choices.

EVALUATE your plan and **WRITE** a paragraph about the tasks you were involved in. Include details on the quality of your planning, your finished design and how well you worked with other students and if you enjoyed the task.

Optional design brief:

Design and make a 'Nesting Box'

DESIGN and **MAKE** a bird, possum or bat box to place into trees in the school grounds

CHOOSE a bird, possum or bat that is native to your area and **RESEARCH** its dimensions and what type of tree it lives in. **EXPLORE** that place within the tree that it likes to live in too in addition to what it eats and the typical things that might threaten it.

RESEARCH nesting box sizes, designs and appropriate timber and investigate various methods of joining wood.

CONSIDER how the bird or animal will enter the box, how it can be cleaned out and how it might be secured to a tree.

SKETCH drawings of the front and side views of your selected nesting box and draw up a list of the materials and parts you will need to make it.

Produce a full size **MODEL** using recycled cardboard and then **MAKE** it and paint it for weather proofing.

EVALUATE your nesting box and **WRITE** a paragraph about the tasks you were involved in. Include details on the quality of your planning, your finished model and how well you worked with other students and if you enjoyed the task.

Optional design brief:

Make some paper

Pulp from Eucalyptus trees, predominantly grown in plantations, can be mixed with recycled paper to make photocopy paper, newspapers and books.

MAKE your own paper using water, shredded used paper, a blender, scissors, spoon, ladle, trays, and screen.

SEE how others have made paper at: http://www.youtube.com/watch?v=87w8kdhjFvU or http://www.youtube.com/watch?v=aQoz1pkKmdA

EVALUATE the processes you used to make some paper and **WRITE** a paragraph about steps involved in this task. Include details on the quality of your planning, your finished paper and how well you worked with other students and if you enjoyed the task.

Task sheet

Explore a range of Australian dairy farms and the technologies used to produce milk

VIEW a range of 'Farmer Stories' in the dairy industry around Australia
http://www.legendairy.com.au/dairy-farming/our-people/farmer-stories

Remember to use the 'drop-down' tool and **VIEW** information about different dairy farms in Victoria, Queensland, New South Wales, Tasmania and South Australia.

EXPLORE more of the technologies involved in producing milk. **USE** the Discover Dairy interactive titled *'Milk from Farm to Plate. What's it all about?'* http://www.dairy.edu.au/discoverdairy/learning-resources/games/milk-cycle

Use the space below to keep a **RECORD** and **COLLECT** information about dairy farms and how dairy farmers use a range of technologies to care for their land and their animals to ensure quality milk production.

DRAW a flow chart to describe the processes used.

Optional design brief:

Design some environmentally friendly packaging

Dairy foods are packaged differently all over the world.

Your task is to **DESIGN** packaging that is effective and environmentally friendly for a suite of two dairy foods.

INVESTIGATE the ways that milk, cheese, yogurt, cream, ice cream or butter are packaged. **VISIT** the local supermarket and take note of the materials that are used to support the contents, the size and shape of the package and the information that is provided for consumers (Nutrition Information Panel).

Resources: dairy foods; packaging; Google SketchUp

PRODUCE packaging for two different types of dairy foods. **LABEL** your design and include any relevant information including what material it is made from, the size (in grams or millilitres) and a Nutrition Information Panel. Give your product a **NAME** and **ILLUSTRATE** it.

Extension: **CREATE** a marketing slogan to advertise your product.

WRITE a paragraph about this task. Include details on the quality of your planning, your finished product and how well you worked with other students and if you enjoyed the task.

Source: Discover Dairy http://www.dairy.edu.au/discoverdairy/

Optional design brief:

Design a marketing campaign

Dairy cows produce milk. Once the milk leaves the farm, it goes through a series of processes before it can be sold

Your task is to **FIND OUT** what happens to milk when it leaves the farm and to sequence the process of converting 'on farm' milk into a product suitable for retail sale.

RESEARCH what happens to milk when it leaves the farm on the Discover Dairy website.
See: http://www.dairy.edu.au/discoverdairy/

EXPLORE the processes of converting milk produced on the farm into a product available for sale and **EXPLAIN** why it's packaged.

PRODUCE a marketing campaign that communicates your **RESEARCH** about the processes involved in producing dairy products.

Extension: What size milk cartons/bottles are available in Australia? A supermarket website or brochure may help you find the answer. Why do you think we need a choice in size? What would happen if there was only one option in size?

Source: Discover Dairy http://www.dairy.edu.au/discoverdairy/

primezone
The place for all your primary industry resources
www.primezone.edu.au