

Cream, cheese and the dairy COW...

A Stage 3 unit of work.

Rationale

Many of the foods available in supermarkets and restaurants are purchased and consumed without thought for the systems involved in growing, harvesting, processing and delivering them to our homes. This unit of work guides students through the processes involved in a range of dairy products with a focus on systems and an underlying message about developments in the dairy industry as a result of scientific and technological endeavour.

NSW syllabus outcomes addressed in the unit

Science and Technology:

A student:

- explains how food and fibre are produced sustainably in managed environments for health and nutrition ST3-5LW-T

Geography:

A student:

- explains interactions and connections between people, places and environments GE3-2
- Geographical skill: Acquiring geographical information (gather geographical information from secondary sources and record information)

History:

A student:

- describes and explains the significance of people, groups, places and events to the development of Australia HT3-1

English

A student:

- uses an integrated range of skills, strategies and knowledge to read, view and comprehend a wide range of texts in different media and technologies EN3-3A
- composes, edits and presents well-structured and coherent texts EN3-2A;
- thinks imaginatively, creatively, interpretively and critically about information and ideas and identifies connections between texts when responding to and composing texts EN3-7C

Maths

A student:

- uses 24-hour time and am and pm notation in real-life situations, and constructs timelines MA3-13MG

Unit at a glance

Learning experience	Location	Activities	Resources
1	Classroom	Know your dairy—class brainstorm their knowledge of dairy products; view milk production diagram; students prepare their own version of diagram.	Internet access Interactive whiteboard or sticky notes and clear wall space Learning journals
2	Classroom	Geography of Belgenny - identify natural features and resources on aerial photographs and/or maps.	Internet access Interactive whiteboard or printed copies of maps from our website Learning journals
3	Classroom	The People of Belgenny—produce a timeline of people (including Aboriginal people of the area) and industries that the Macarthurs pioneered in Australia—particularly those based at Belgenny.	Interactive timeline or pdf version Learning journals
4	Onsite or online	Site visit	Learning journals
5	Classroom	Review of the site visit; review the idea of food production as a process.	Learning journals Diagrams from learning experience 1
6	Classroom	Apply understanding of milk production to research and explain production of a food selected by students.	Internet access Software to produce a diagram or learning journals Copies of diagrams (some examples in Appendix)
7	Classroom	Prepare a media campaign (eg BTN segment, newspaper article, blog entry) about common misunderstandings of the dairy industry and explaining the production process of different milk products.	Mind maps from learning experience 1 Video equipment or iPads for news segment or computers with software for laying out a newspaper article.

Learning sequence

Learning experience 1: Know your dairy

**Learning
experience 1:**
Science and
Technology
background

Aim: This learning experience encourages students to think of milk production as a process from cow intake, to milking, transport and processing for sale. It also asks students to think about the large range of products that are or contain dairy products.

Learning intention

Students can identify and describe the milk production process and name five products found in supermarkets that come from dairy farms.



Activate prior knowledge

Brainstorm dairy products and production. Can students identify the inputs to milk production ie food for cows (pasture and grains), fertiliser, water, what is required to harvest the milk—time and labour, hand, mechanical or robotic milking systems, how does it get to the factory? What happens at the factory? How are the other identified dairy products made?



Discuss / Investigate / View

Ask students to arrange products they identified above in order from raw materials to processed foods. Encourage discussion to arrange in order along the production process.

Resources to help the students understand the production chain include:

- Milk from farm to table (published by Food Insight, Food Education Organization at International Food Information Council Foundation) [link](#).
- Dairy product infographic in the Appendix of this document.
- Making dairy products



Suggested activities

View the milk production diagram available on our website ([link](#))—either as a group or individually. Using the information from the earlier class brainstorm students can now draw a diagram of their understanding of the milk production process from raw materials through to processed end products. Students may choose to concentrate on one dairy type ie robotic, hand milking or mechanical. To be recorded in learning journals if you are using them.



Take it further

Can students identify some common misconceptions about dairy products or the dairy industry after viewing the interactive milk production diagram?

Save the original class mind map for learning experience 7 where students will have a chance to think about their learning of the course of the unit.

Next

Next students will look at the geography at Belgenny and how this has influenced agriculture since colonisation.

Learning experience 2: Geography of the Belgenny Farm

Learning
experience 2:
Place

Aim: This learning experience looks at the area around Belgenny to encourage students to think about reasons why the site would have been appealing as a farm in colonial Australia.

Learning intention

Students can identify natural features and resources on aerial photographs and/or maps and can talk about advantages of being close or distant from these features.

Review

Review the previous lesson about dairy products. Ask students where they think dairy farms are located.

Discuss / Investigate / View

View an area familiar to students on either Google Maps, Maps on iPad or Six Maps (NSW only) and ask them to tell you what they can see. They may be able to see buildings and identify them eg the school buildings, local landmarks, the pool, river or ocean, lakes, parks, residential areas compared to commercial.

Zoom out and ask them what are the most obvious features from further away—depending on your local area it will probably be major roads, rivers and lakes, areas of vegetation compared to urban areas.

Next, search for Belgenny Farm and ask students to identify features that they recognise. On some websites eg Google Maps it is possible to swap between aerial view and maps which will show students how different features are represented on the two platforms. Alternatively you can compare the aerial photos and the topographic maps from our website.

Ask students why they think this area might have been appealing for a farm—and for an area for the Dharawal traditional owners eg is there easy access to fresh water? Is there vegetation present that might be good food or shelter for people or farm animals? Or does the area look like a desert? Is the area mountainous or does it have rolling hills? Which features would have been present before colonisation and settlement by the Macarthurs? Which features have been added or modified since colonisation?

Listen to the audio file on SoundCloud ([link](#)) or read the transcript in the Appendix. Does the information contained in the passage give them more insight into the choice of location?

Suggested activities

Ask students to label the maps in the learning journal with advantages and disadvantages of locating Belgenny Farm here. On one page use a modern perspective considering transport and urban sprawl and on the other page use an historical perspective considering what the land was like at the time of—or before—settlement.

Next

Wrap up the lesson by sharing students ideas. Next students consider the role of the Macarthurs in the early Australian colony.

Note before starting the lesson consider downloading the following:

- Interactive timeline file ([link](#)) and viewer (free from [link](#)) or
- Alternatively you can use the pdf version ([link](#)).

Learning experience 3: The people of Belgenny

Learning
experience 3:
People

Aim: This learning experience introduces students to the Macarthurs of Belgenny Farm and their role in the early colony.

Learning intention

Students will be able to name at least three of the industries that the Macarthurs pioneered in Australia, particularly those based at Belgenny, and discuss the significance in the development of a colony. They will also be able to name the traditional owners.

Review

Review the discussion from the previous learning experiences about dairy products and the location of Belgenny Farm—now we will consider the people involved.

Discuss / Investigate / View

View the video ‘Macquarie bicentennial commemoration’ on Belgenny Farm’s website ([link](#)). This video was made to commemorate the 200th anniversary of Governor Macquarie’s visit to the Macarthurs at Belgenny. It acknowledges the traditional owners, the Darawal people, and provides a good introduction to the people of Belgenny. Before watching the video, explain to students that there is information in the video that will help them to complete the learning journal activity (if you are using them).

View the interactive timeline—on tiki-toki or the pdf version ([link](#))—to see where Belgenny fits into the development of agriculture in the Australian colony. Focus on technological changes in the dairy industry to maintain focus on product outcomes.

Suggested activities

Record the role that the Macarthurs played in the early development of Australian agriculture on a timeline. Include recognition that Belgenny Farm is located on land traditionally inhabited by the Dharawal people. Keep in mind the learning intention and make sure that students include at least three enterprises that were trialled and developed at Belgenny. A blank timeline is available in student learning journals.

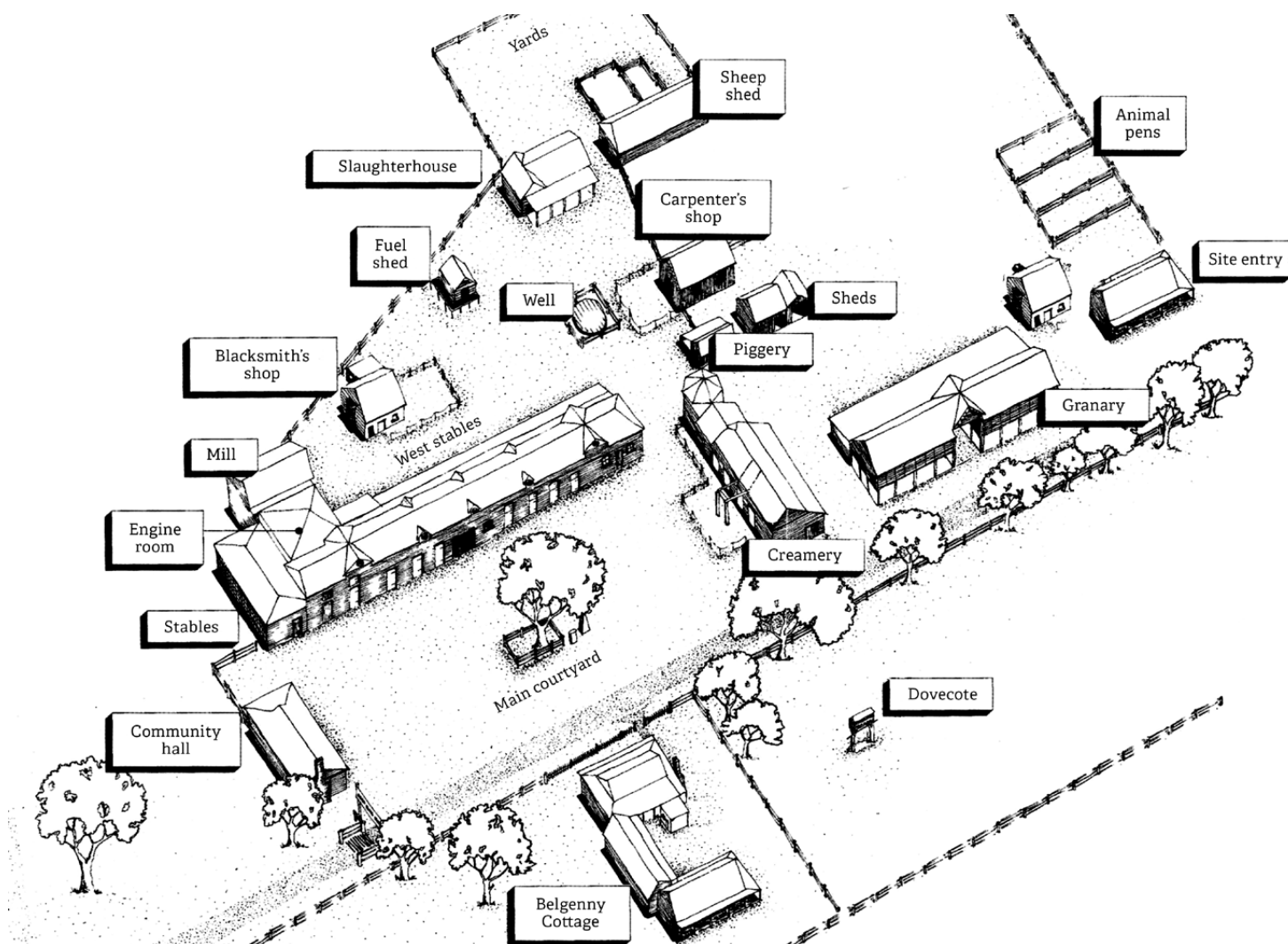
Take it further

Ask students to review / discuss the enterprise that most interested them with a colleague or the whole class.

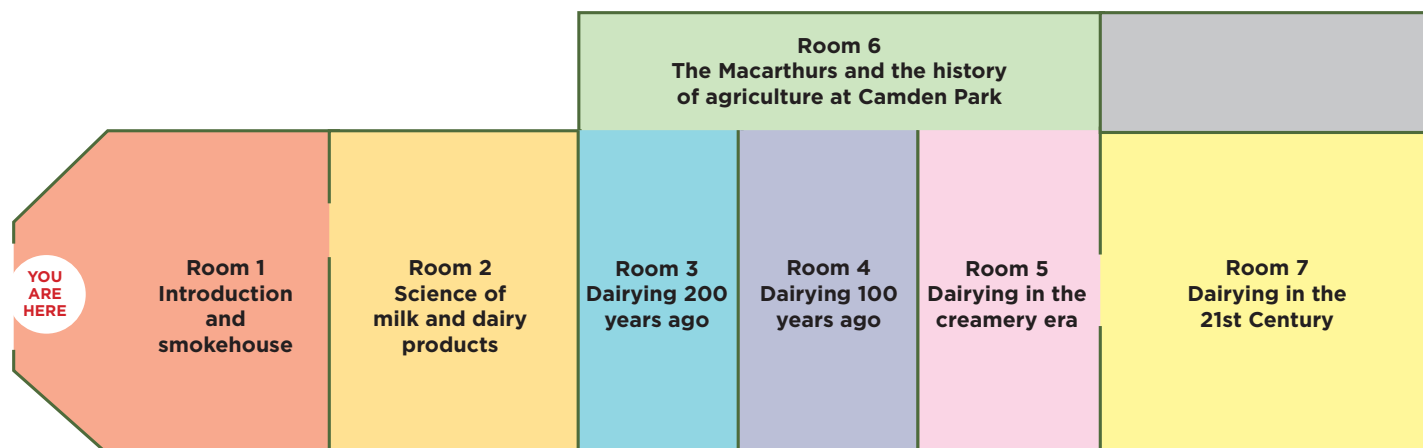
Next

The next learning experience is the site visit.

Learning experience 4: Map of site



Guide to Creamery



Learning experience 4: The site visit

Learning experience 4: Site visit

Room 1 - Smokehouse

The smokehouse. There is a poster on the wall that shows how this building has changed as the Macarthurs used it for different purposes. The coach house at the other end of this building was built for horse drawn carriages to be stored in the 1820s. This room is the smokehouse and it was built in the 1830s or 1840s and the two buildings were joined later. Meat was smoked to preserve it by hanging the meat in the roof and lighting a slow burning fire that burnt for a week or two. This room was not originally connected to the buildings next to it because of the risk of it burning down when they were smoking meat.

Optional learning journal activity

In your learning journals you will be able to label the diagram of meat smoking to explain how the process works.

Room 2 - Science of milk

Milk is a natural product produced by mammals to feed their young. Humans use milk from animals including cows to meet their nutritional needs, but did you know you could be consuming milk and not even realise it? Milk, or parts of milk, are made into lots of different products. Can you think of some? Have a look at the posters in this room to see if you can identify products that we eat and you didn't know are made from milk.

Optional learning journal activity

Have a look at the poster 'Making Dairy Products' that explains the main dairy processes; record this in your learning journal to show how different dairy products are made. This can be a written record or a visual record/ illustration.

Room 3 - Dairying 200 years ago

Two hundred years ago farmers needed to provide their own milk and vegetables and they also consumed meat from their property. All of the farmer's jobs were centred around making sure they could meet their own needs of food, water and shelter. So all of the parts of the production process took place on the property and any extra food produced was sold. They didn't have access to a lot of the tools that dairy farmers have today, in fact some of the things that they used look a bit strange.

Have a look at the objects around the room and discuss the following questions. What do you think they were used for? What are they made of? What part of the production process do you think they were used in? Objects include: skimmer, settling pan, wooden bucket.

Encourage students to work out the answers without reading the information. After students have observed and predicted what they think the objects are, read the information about each object.

Optional learning journal activity

In your learning journal label the production process diagram with the names of the objects.

Room 4 - Dairying 100 years ago

One hundred years ago dairy farmers started to get better access to machines to help them do their work. In the late 1800s a mechanical cream separator was installed here at Belgenny and, in the 1900s farmers got access to milking machines. These developments meant that fewer people needed to keep cows as dairy farms were able to milk more cows per day and therefore produce more milk that could then be sold off-farm. At this time there were also developments in transport that meant that farmer's produce could be sent to markets faster. Look at the objects in the room and discuss what you think some of these objects were used for. Encourage students to work out the answers without reading the information. After students have observed and predicted what they think the objects are, read the information about each object.

Objects include: steam engine, milk jug, dipper, milk bottles.



Optional learning journal activity

Record some observations about how the developments in this room contribute to changes in the dairy industry and modern dairy production.

Room 5 - Dairying in the creamery era

This end of the building was built before the smokehouse (in the 1820s) as a coach house for horse-drawn vehicles. Look up, this upper level was added in 1898 so the building could be used as a creamery. Cans of milk were hauled to the top floor from carts parked outside underneath the part of the roof that juts out. The milk was tipped into a vat and flowed into a machine called a 'separator'. After separation the cream was taken to Menangle Central Creamery to be sold or made into butter. The remaining skim milk was fed to pigs on Camden Park. The pigs were eaten by the people living here or sold.



Optional learning journal activity

In your learning journal there is a diagram of the creamery, add some detail to explain the process.

Room 6 - The Macarthurs

These are all members of the Macarthur family; the first ones that lived here are John and Elizabeth Macarthur with their children. Members of the current generation of Macarthur's still live in a house nearby and lots of the Macarthurs over the years since settlement have worked and lived here. Many of them made changes to the way the farm ran, what they grew and sold from the farm and what their buildings were used for.



Optional learning journal activity

In your learning journal record some details of the achievements of one of the people highlighted here. When you return to school you may have a chance to research them in more detail.

Room 7 - Dairying in the 21st century

The Macarthurs often tried new ways of farming, usually early in its development; this room includes modern methods of dairying that have evolved since the Macarthurs settled here. Have a look at the objects in this room, how have things changed? What do you see in this room that you didn't in other rooms? Read the information about each of the objects and think about what they are made of ie robotic arm, rotolactor.

There is a model of the rotolactor in this room. It was one of only three in the world and was the start of rotary dairying that many modern dairies use now. Edward Macarthur Onslow, who was responsible for building the rotolactor here in the 1950s, would probably never have believed

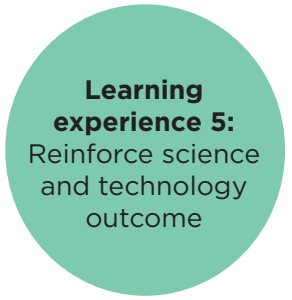
that one day robots would milk cows, but they do in some dairies. At one stage there was also a robotic dairy on Camden Park. Robotic dairies are a gentle way of milking cows as the computer that operates the milking machines can tell (by reading the cows identification tag) which cow is in the stall, how long she needs to be milked and how much feed she needs. The computer can also tell if she is getting sick by testing the milk, which is then diverted from the milk tanker for disposal. If a cow is getting sick the farmer can arrange for the vet to come and treat her so she gets well again soon.



Optional learning journal activity

On the diagram of the milk production process in your journal, add interesting information that you have discovered in this room about producing milk and use arrows to illustrate which part of the production process your information relates to.

Learning experience 5



Aim: This learning experience draws together the parts of the unit so far—ensuring students have understood the dairy production process and reinforces the underlying message of the importance and relevance of agriculture.

Learning intention

Students will be able to name three technological advancements in dairy operation and talk about the role of primary industries in the production of food.

Review

Talk about the comparison between different ‘eras’ of production represented in the different rooms and on the different pages of their journals.

If you are using the learning journals review them with students to ensure that they have a chance to ask questions about things they didn’t understand or didn’t find out at the time of their visit.

Discuss / Investigate / View

Be explicit about the connection between human endeavour, scientific and technological developments and improvements in production. Use the examples highlighted at Belgenny Creamery, such as, the introduction of the mechanical separator, pasteurisation, refrigerated milk vats, railway transport, robotic milking, breeding techniques, pasture improvement, cultivation.

View the Milk Paddock to Plate video on the NSW DPI website ([link](#)).

Take another look at the process diagrams you have looked at so far in the unit—either on the interactive whiteboard, online or in student’s learning journals. Help students to see the flow from left to right as a production, process, and consumption flow—with the origin on the left being in agriculture. They will need to understand this clearly to be able to draw their own version of the food of their choice in learning experience 6.

Ask students to think of a food that does not originate with agriculture. This discussion requires students to consider the ingredients of foods to see that most foods we consume regularly originate with agriculture—this will highlight how broad the agricultural industry is.

The NSW Department of Primary Industries website ([link](#)), the Queensland Department of Agriculture and Fisheries ([link](#)) and the Australian Department of Agriculture ([link](#)) website also give an indication of how broad the industry is.

Suggested activities

Record this discussion in students’ notebooks. Ask students to choose a food that they like to eat and think about how many sectors of agricultural industries contribute to producing that food.

There is a page in the learning journal that considers some of the sectors within the agriculture industry that produce foods.

Take it further

As a class have a look at a definition of 'primary' and 'industry' and discuss how the definitions explain the fundamental nature of agriculture in our society—particularly food production:

Primary; adj

1. first in importance, degree, rank, etc
2. first in position or time, as in a series
3. fundamental; basic
4. being the first stage; elementary

Source: Collins English Dictionary—Complete and Unabridged © HarperCollins Publishers 1991, 1994, 1998, 2000, 2003

Industry; n

1. (Economics) organized economic activity concerned with manufacture, extraction and processing of raw materials, or construction
2. (Commerce) a branch of commercial enterprise concerned with the output of a specified product or service: the steel industry.
3. (Sociology)
 - a. industrial ownership and management interests collectively, as contrasted with labour interests
 - b. manufacturing enterprise collectively, as opposed to agriculture

Source: Collins English Dictionary—Complete and Unabridged © HarperCollins Publishers 1991, 1994, 1998, 2000, 2003

Next

Next students will use their understanding of the dairy production process to research the production process of a different food.

Learning experience 6



Aim: The aim of this learning experience is for students to apply their understanding of the dairy production process to research and inform classmates about the production of a food of their choice. This will not only show you how well students have understood the unit but will also broaden their appreciation of the role of agriculture in providing for their needs.

The texts created in Learning experiences 6 and 7 can be stand-alone items or a two-part text.

Learning intention

Students will be able to explain and report on the process involved in producing a food of their choice.

Review

Review student's dairy production diagrams.

Discuss / Investigate / View

Using the flowcharts in the [Appendix](#) as a visual prompt, consider as a class the raw materials or origin of their food, how it is processed and how it is delivered to them.

Another good example is the Cotton Australia poster showing the production process from field to fashion ([link](#)).

Ask students to research a food of their choice. The simpler processes would be fresh fruit and vegetables and more complex processes would be highly processed foods like packets of chips or ice-cream.

Students can then present the information to the class; verbally, a hand drawn flowchart, a written explanation or a computer generated diagram.

Suggested activities

In the learning journals there is space for a mind map. Once completed, students need access to research materials to investigate production and record it in learning journals, student notebooks or another mode.

Next

Next students will consider their learning in this unit of work.

Learning experience 7

Learning experience 7:
Application of learning to a creative endeavour

Aim: Students will evaluate their learning in the unit as they identify their own misconceptions at the start of the unit and communicate this to a range of audiences.

Learning intention

Students will be able to explain three misconceptions about food production that they know to be false.

Review

Review the diagrams students created before researching a food and their production process diagrams. Students should be able to identify some misconceptions or surprising discoveries that they can discuss.

Discuss / Investigate / View

Have students watch a BTN episode ([link](#)) or read newspaper articles to provide model texts.

Give students a choice in the way they present their learning either in the form of a news story for television, a written article for a newspaper or magazine or a Blog entry.

Ideally students will consider where the misconception comes from and provide a way for those viewing their text to remember the facts of production.

Model texts:

BTN: www.abc.net.au/btn/

Sydney Morning Herald: www.smh.com.au/

Appendix 1

Australian Curriculum outcomes

Science:

Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions AC9S5H02

English

Plan, create, edit and publish written and multimodal imaginative, informative and persuasive texts, using visual features, relevant linked ideas, complex sentences, appropriate tense, synonyms and antonyms, correct spelling of multisyllabic words and simple punctuation AC9E4LY06

Geography

The impact of the development of British colonies in Australia on the lives of First Nations Australians, the colonists and convicts, and on the natural environment AC9HS5K02

History

The role of a significant individual or group, including First Nations Australians and those who migrated to Australia, in the development of events in an Australian colony AC9HS5K03

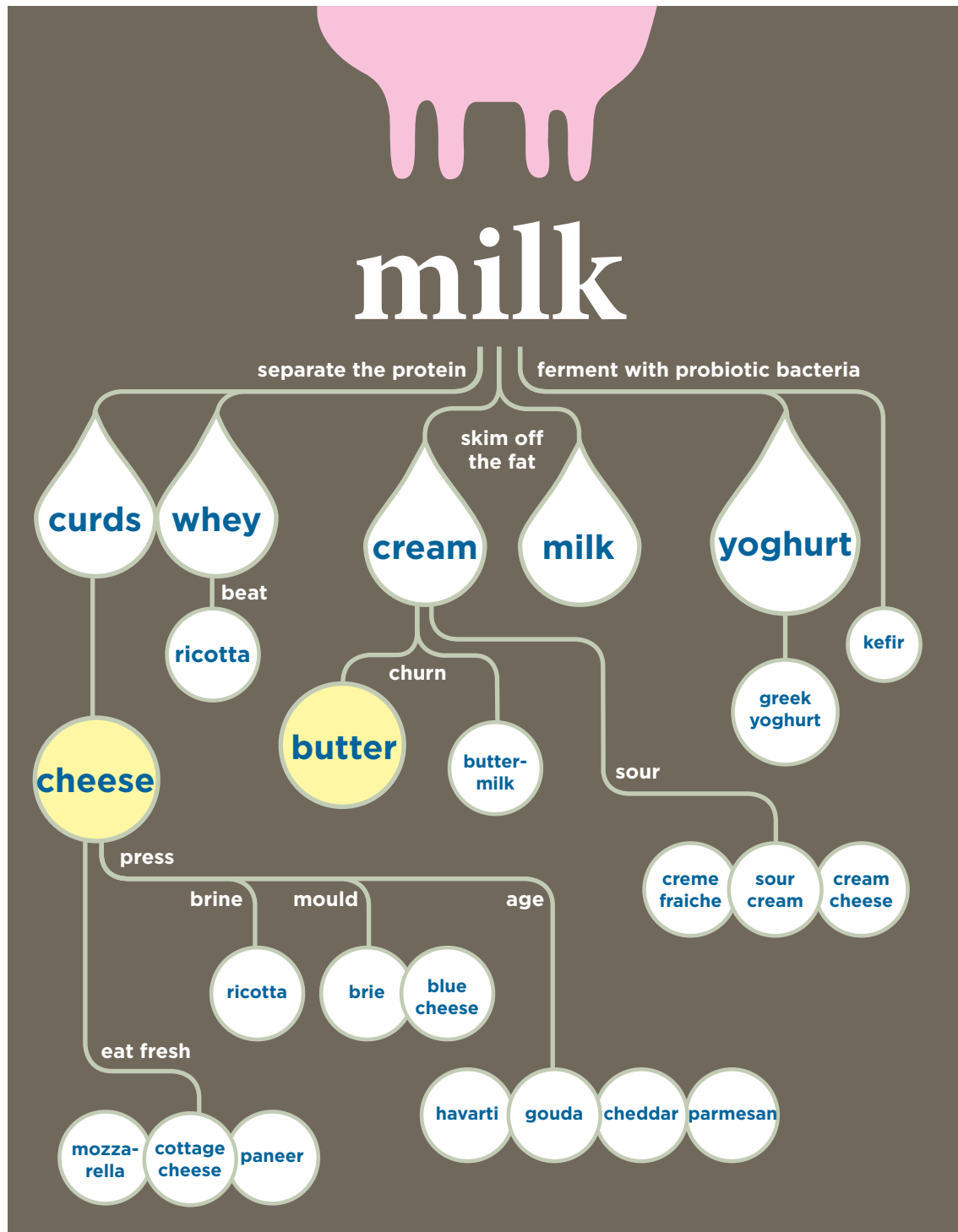
The arts—media arts

Experiment with, document and reflect on ways to use a range of visual conventions, visual arts processes, and materials AC9AVA6D01

Appendix 2

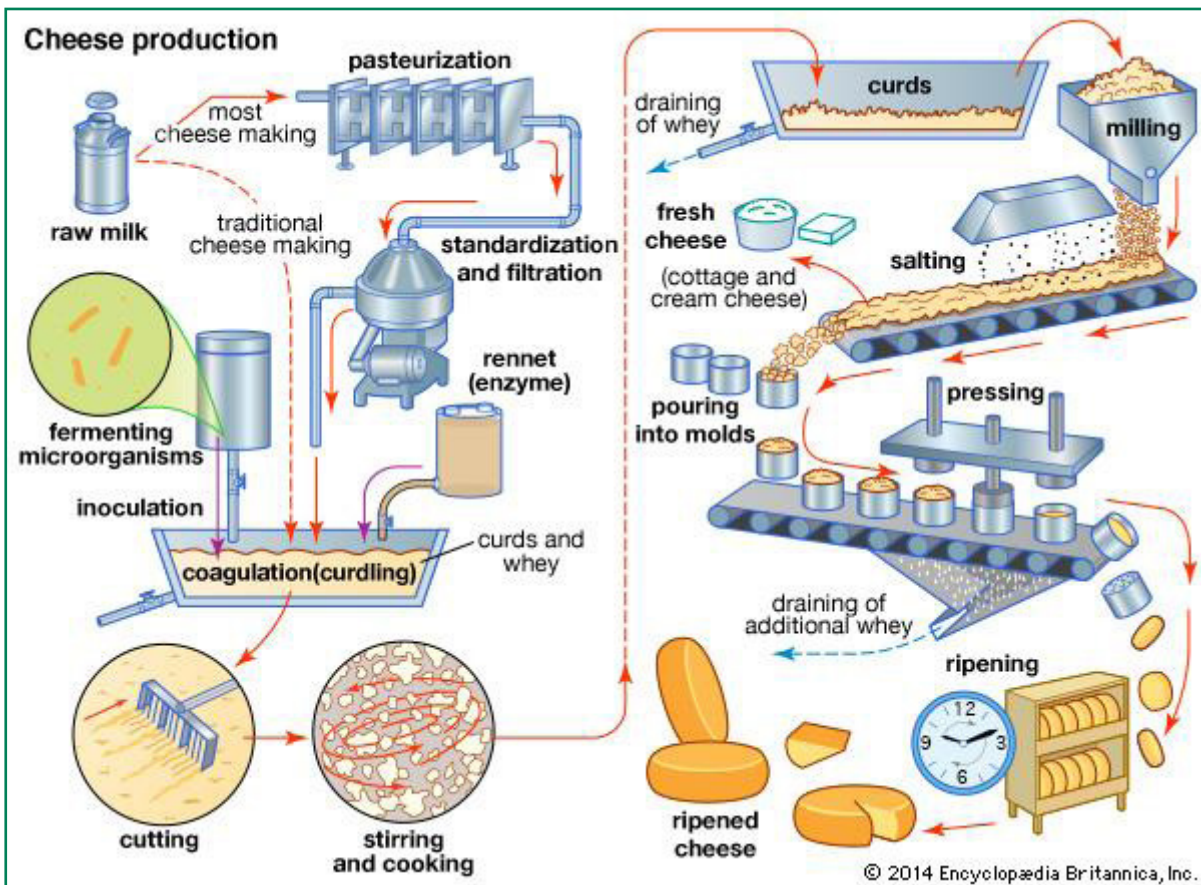
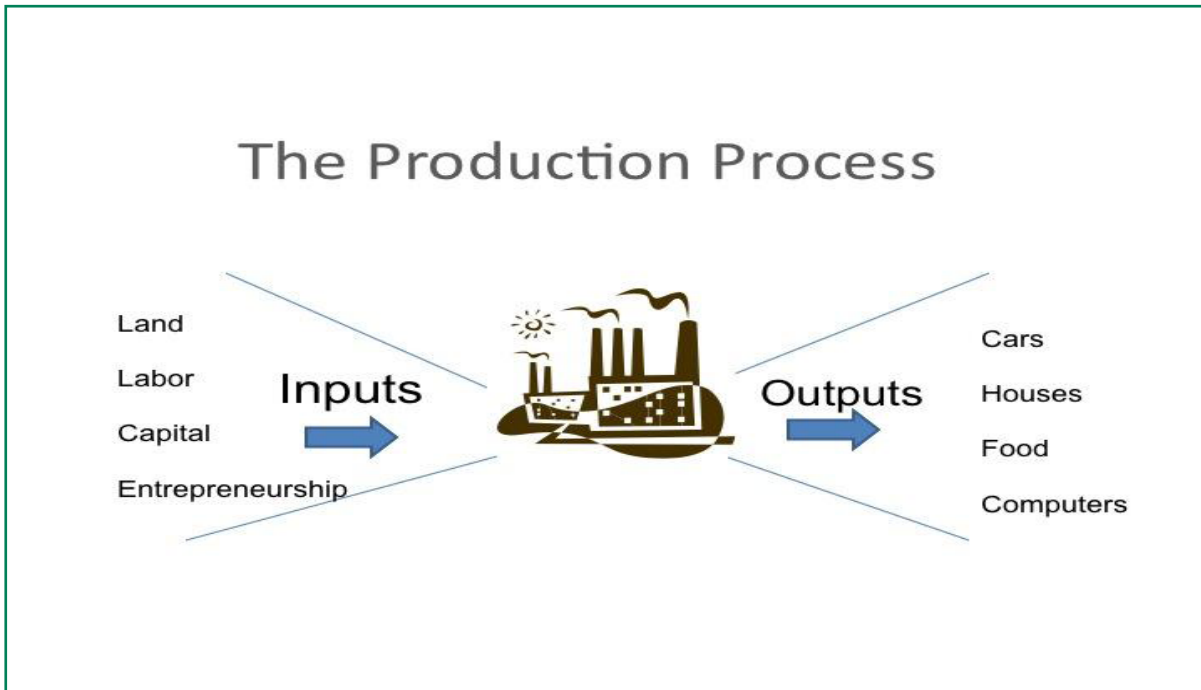
Milk Products infographic

<http://foddertech.com/blog/page/2/>



Appendix 3

Product process diagram examples



Source: <http://www.britannica.com/topic/cheese/images-videos/The-cheese-making-process/110232>

Appendix 4

Transcript of the reading (learning experience 3) adapted from Vernon Wood, Richard (2010) Birthplace of Australian Agriculture Belgenny Farm. Belgenny Farm Trust.

Belgenny Farm

A wonderful convergence of good soil, plentiful fauna, a freshwater river, ponds, forest and natural beauty made Belgenny a desirable place to live, work and to exploit during three distinct eras of occupation.

Over thousands of years the Dharawal shaped the landscape from the coast inland to near Camden. Their presence is recorded in rock engravings, cave paintings, and in stories about the land and its people. The name Belgenny is a variation of 'benkennie' or 'binhinny', a word used by the Dharawal traditional owners. It means 'the dry land'. The Dharawal influence was eventually overwhelmed by the British who came here in 1795 in search of a herd of cattle that had strayed from Sydney in 1788.

To British eyes, the landscape of forested hills and fenceless pasture, teeming with wildlife and dotted with Cabbage Gums that had been tended by Dharawal, Gundungarra and Dharuk people, appeared utopian and untouched. They named it 'the Cowpastures', and the area became a popular destination for dignitaries and officers from Sydney keen to see the escaped cattle herd, which by 1801 numbered more than 500 head. They studied the landscape and no doubt admired the scenery. It also became the haunt of escaped convicts who had 'gone bush'.

In 1805, John Macarthur was granted just over 2000 hectares of land specifically for the development of a wool industry. He chose a section of the Cowpastures, the best land available in the Colony of New South Wales, and named it Camden after Lord Camden in England who had recommended the grant. The property later became known as Camden Park.

The Macarthur family became preeminent in the development of Australia's colonial agriculture. At Belgenny Farm they pioneered fine wool sheep breeding, wool processing for export, grape growing, and wine making, silk production, fruit growing and horticulture, grain growing and refrigerated and mechanised dairying. The family's intensive and experimental farming over 168 years transformed the landscape and included the construction of many 'state of the art' agricultural buildings that remain intact today.

Most of Camden Park, the section we now call Belgenny Farm was sold in 1973. But, recognising its significance to history, architecture and agriculture, the NSW government bought back 1583 hectares in 1984 and built the Elizabeth Macarthur Agricultural Institute in 1990. This third era of occupation saw the reintroduction of the name Belgenny and the re-establishment of the farm as a place of agricultural innovation. It also ensured the preservation of its buildings and of a site significant to the Dharawal traditional owners and the Macarthur family.