Including cattle in your curriculum

LEAD AG TEACHER | SOUTH AUSTRALIA

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The Australian beef cattle industry is worth over $23 billion to Australia's economy, employing 192,000 people. Exports are valued at over $10 billion, contributing to trade relationships with over 50 countries (mla_beef-fast-facts-2023_300523.pdf).

SPECIFIC LEARNING INTENTIONS

- Cattle are farmed for meat and milk
- Cattle are an important industry in SA
- Different cattle breeds serve different purposes
- Cattle have been selectively bred over many generations to meet market expectations and increase productivity
- Cattle are ruminant animals
- Genetics determines the characteristics of breeds, individual animals and products
- Technology can contribute to gains in productivity, welfare and biosecurity
- Cattle require specific management strategies to maintain welfare and productivity
- Intensive housing in feedlots requires careful management and special feed rations
- Live Export of cattle is a complex and controversial industry with benefits and challenges
- Markets and consumers can have a powerful influence on farming systems
- Selecting and preparing cattle for showing requires understanding of the judging criteria
- Practical activities with cattle require the completion of a risk assessment, induction process and supervision

AUSTRALIAN CURRICULUM VERSION 9 ACHIEVEMENT STANDARDS

Technologies Year 9-10

By the end of Year 10 students explain how people consider factors that impact on design decisions and the technologies used to design and produce products, services and environments for sustainable living. They explain the contribution of innovation, enterprise skills and emerging technologies to global preferred futures. For the food and fibre production context, students explain the features of technologies and their appropriateness for purpose, and create designed solutions based on an analysis of needs or opportunities. Students create, adapt and refine design ideas, processes and solutions and justify their decisions against developed design criteria that include sustainability. They communicate design ideas, processes and solutions to a range of audiences, including using digital tools. Students independently and collaboratively develop and apply production and project management plans, adjusting processes when necessary. They select and use technologies skilfully and safely to produce designed solutions.

Science Year 10

By the end of Year 10 students explain the processes that underpin heredity and genetic diversity and describe the evidence supporting the theory of evolution by natural selection. Students analyse the relationship between science, technologies and engineering. They analyse the key factors that influence interactions between science and society.

Students plan and conduct safe, valid and reproducible investigations to test relationships or develop explanatory

models. They explain how they have addressed any ethical and intercultural considerations when generating or using primary and secondary data. They select equipment and use it efficiently to generate and record appropriate sample sizes and replicable data with precision. They select and construct effective representations to organise, process and summarise data and information. They analyse and connect a variety of data and information to identify and explain patterns, trends, relationships and anomalies. They evaluate the validity and reproducibility of methods, and the validity of conclusions and claims. They construct logical arguments based on analysis of a variety of evidence to support conclusions and evaluate claims. They select and use content, language and text features effectively to achieve their purpose when communicating their ideas, findings and arguments to diverse audiences.

AUSTRALIAN CURRICULUM VERSION 9 CONTENT DESCRIPTORS

Strand: Technologies knowledge and understanding

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

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

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

Strand: Technologies processes and production skills

4. Select, justify, test and use suitable technologies, skills and processes, and apply safety procedures to safely make designed solutions (AC9TDE10P03)

Strand: Science understanding

5. Explain the role of meiosis and mitosis and the function of chromosomes, DNA and genes in heredity and predict patterns of Mendelian inheritance (AC9S10U01)

    Use the theory of evolution by natural selection to explain past and present diversity and analyse the scientific evidence supporting the theory (AC9S10U02)

Strand: Science as a human endeavour

6. Analyse the key factors that contribute to science knowledge and practices being adopted more broadly by society (AC9S10H03)

    Investigate how advances in technologies enable advances in science, and how science has contributed to developments in technologies and engineering (AC9S10H02)

    Examine how the values and needs of society influence the focus of scientific research (AC9S10H04)

Strand: Science Inquiry

7. Develop investigable questions, reasoned predictions and hypotheses to test relationships and develop explanatory models (AC9S10I01)

    Plan and conduct valid, reproducible investigations to answer questions and test hypotheses, including identifying and controlling for possible sources of error and, as appropriate, developing and following risk assessments, considering ethical issues, and addressing key considerations regarding heritage sites and artefacts on Country/Place (AC9S10I02)

    Select and use equipment to generate and record data with precision to obtain useful sample sizes and replicable data, using digital tools as appropriate (AC9S10I03)

    Select and construct appropriate representations, including tables, graphs, descriptive statistics, models and mathematical relationships, to organise and process data and information (AC9S10I04)

    Analyse and connect a variety of data and information to identify and explain patterns, trends, relationships and anomalies (AC9S10I05)

    Assess the validity and reproducibility of methods and evaluate the validity of conclusions and claims, including by identifying assumptions, conflicting evidence and areas of uncertainty (AC9S10I06)

    Write and create texts to communicate ideas, findings and arguments effectively for identified purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate (AC9S10I08)

numbering system used above identifies content descriptors delivered within cattle topics in the curriculum table following.

Cattle industry topics	Resources	ACARA V9 content descriptors	Capabilities and Cross Curriculum priorities
Cattle terminology • bull • cow • steer • calf • heifer • weaner • yearling • Bos indicus • Bos taurus	Glossary | Meat & Livestock Australia (mla.com.au)	Foundation concepts required to support thorough understanding of ACARA Technologies and Science content descriptors identified below.	Literacy Numeracy Personal and social *Sustainability*
Cattle breeds • Breed groups (eg British], European, Bos indicus • Australian favourites • purposes & characteristics – matching to end use, climate and topography	Primefact 623 (nsw.gov.au) Cattle breed types Australian beef cattle breeds | PPT (slideshare.net)		
Anatomy & physiology • parts of a cow/bull • major systems • function of key organs	https://static.producer.com/wp-content/uploads/2017/11/30144131/58-bull-anatomy.jpg		
Ruminant nutrition • key organs – structure and function • comparison with monogastric system • implications for feeding • acidosis • bloat • feed rations	Good Meat | Resources – ruminant digestive system graphic https://www.agric.wa.gov.au/feeding-nutrition/grain-overload-acidosis-or-grain-poisoning-stock Feed cost calculator (nsw.gov.au) Beef Tools & Calculators | Feeding Livestock | Agriculture Victoria		
Reproduction • gestation period • oestrus • calving • reproductive system • cross breeding • pure breeding	https://futurebeef.com.au/resources/managing-cow-reproduction-an-overview/		
Genetics • inheritable characteristics • genes & DNA • artificial insemination • embryo transfer • sex selection • Estimated breeding values EBVs	Bull selection app "Good Bulls" Bull selection | Dairy Australia Estimated Breeding Values - FutureBeef What are Estimated Breeding Values? https://youtu.be/Yhsw3HJDtf4?si=89sK9Tpam3e4BtS8	1 2 3 5 6	Literacy Numeracy Personal and social *Sustainability*
Meat quality • prime cuts • cooking methods • consumer habits • MSA – Meat standards Australia • fat and muscle scoring	Assessment and advertising gme-teacher-9-10-lesson-4-v1.pdf (goodmeat.com.au) Red meat cuts and recipes (goodmeat.com.au) Grainfed vs. grassfed meat | Understand the Difference | AGM (goodmeat.com.au)	1 5	Literacy Numeracy Personal and social *Sustainability*

Cattle industry topics	Resources	ACARA V9 content descriptors	Capabilities and Cross Curriculum priorities
Biosecurity • National Livestock Identification Scheme (NLIS) & traceability • National vendor declarations (NVD) and animal health statements • foot and mouth disease • lumpy skin disease • quarantine	**NLIS | Australia's system for identification and traceability of livestock** **Farm biosecurity | Meat & Livestock Australia (mla.com.au)** **A practical approach to beef herd biosecurity | Biosecurity for beef cattle | Beef | Livestock and animals | Agriculture Victoria** **Foot-and-mouth disease - DAFF (agriculture.gov.au)** **Lumpy skin disease - DAFF (agriculture.gov.au)**	1 2 3 6	Ethical understanding Intercultural understanding Literacy Numeracy *Asia and Australia's Engagement with Asia* *Sustainability*
Health • pests • diseases including pestivirus and ovine brucellosis • nutritional issues • acidosis	**Cattle - PIRSA Cattle** Cattle diseases guide	3	Literacy Numeracy *Sustainability*
Welfare • pain relief • feedlots • meat processing • dehorning • nose rings	Animal welfare considerations **gme-teacher-9-10-lesson-2-v1.pdf (goodmeat.com.au)** **Red Meat and Animal Welfare | Animal Wellbeing | AGM (goodmeat.com.au)** **Cattle – RSPCA Knowledgebase**	1 2 3 6	Ethical understanding Intercultural understanding Literacy Numeracy *Sustainability*
Technology & innovation • climate change and methane reduction strategies including asparagopsis • telemetry • biometrics • intelligent eartags • virtual fencing	**Reducing the Environmental Impact of Meat | AGM (goodmeat.com.au)** **Telemetry - remote eyes on the ground | Meat & Livestock Australia (mla.com.au)** **Ceres Tag: smart ear tags for livestock - CSIRO** **Facial recognition comes for cattle - University of New England (UNE)**	1 2 3 6	Digital literacy Literacy Numeracy *Sustainability*
Economics & business • consumer influence • case study – indigenous cattle company • Stock Journal market reviews	The marketing and supply chain **gme-teacher-9-10-lesson-3-v1.pdf (goodmeat.com.au)** **Indigenous cattle company building billionaire-style cattle empire that puts people before profits - ABC News**	3 6	Critical and Creative thinking Digital literacy Literacy Numeracy Personal and social *Aboriginal and Torres Strait Islander Histories and Cultures* *Sustainability*
Global significance • consumption data • exports • trade relationships • tariffs	**mla_beef-fast-facts-2023_300523.pdf** **Snapshot of Australian Agriculture 2024 - DAFF**	3 6	Intercultural understanding Literacy Numeracy *Asia and Australia's Engagement with Asia* *Sustainability*

Cattle industry topics	Resources	ACARA V9 content descriptors	Capabilities and Cross Curriculum priorities
Live Export • purpose • countries involved • stakeholders • benefits • challenges • solutions • live export ban 2011 • live sheep export ban 2025	**Red Meat and Live Animal Exports | Meat Industry Facts | AGM (goodmeat.com.au)**	1 2 3 6	Critical and Creative thinking Ethical understanding Intercultural understanding Literacy Numeracy *Asia and Australia's Engagement with Asia* *Sustainability*
Feedlotting • purpose • Australian data • issues • Standards and guidelines • Beef specs calculator	**gme-teacher-9-10-lesson-1-v1.pdf (goodmeat.com.au)** Intensive and extensive production systems **Understand Red Meat and Feedlots | Feedlots Australia | AGM (goodmeat.com.au)** **Take a virtual feedlot tour (feedlots.com.au)** **BeefSpecs (nsw.gov.au)**	1 2 3 6	Ethical understanding Literacy Numeracy *Sustainability*
Science as a Human Endeavour (S.H.E.) Key topics: • sustainability • technology • welfare • R & D priorities	**Beef CRC projects - FutureBeef**	3 6	Critical and Creative thinking Ethical understanding Literacy Numeracy *Sustainability*
Science inquiry skills Using the scientific method to investigate: • feed types • breeds • gender • age • stocking density • housing systems	**Working scientifically (nsw.gov.au)** **Science skills rubric (nsw.gov.au)**	3 7	Critical and Creative thinking Ethical understanding Literacy Numeracy *Sustainability*
Practical skills • animal ethics approval • managing cattle • safe work practices • developing responsibility • feed systems • low stress livestock handling • safe operating procedures • risk assessments • Standards and Guidelines • recording and interpreting data • using yards and a cattle crush • NLIS system incl eartags • assessing cattle for health, productivity, market specifications • understanding flight zone • practical application of genetics, welfare, biosecurity, marketing, breeding, meat quality	**Livestock handling — cattle (nsw.gov.au)** **Cattle-Standards-and-Guidelines-Endorsed-Jan-2016-061017_.pdf (animalwelfarestandards.net.au)** **General Guide for Managing the Risks of Cattle Handling (safeworkaustralia.gov.au)** Both the SA Department for Education and Association of Independent Schools of SA require approval for schools to house cattle on site. Ensure approvals are in place and welfare requirements have been addressed before sourcing cattle. The DfE and AISSA both have standard operating procedures for cattle. FURTHER INFORMATION: **https://www.education.sa.gov.au/doc/standard-operating-procedures-use-animals-schools-preschools-and-childcare-centres** **https://www.ais.sa.edu.au/animal-ethics/**	3 4 7	Ethical understanding Literacy Numeracy Personal and social *Sustainability*

Cattle industry topics	Resources	ACARA V9 content descriptors	Capabilities and Cross Curriculum priorities
Preparation of cattle for showing • all the practical skills listed above • safe work practices in unfamiliar settings • team work • responsibility and leadership • public speaking • communication with stakeholders (eg breeders, judges) • cattle industry knowledge • meeting market specifications • Quality Assurance processes • required record keeping and documentation • assessing cattle • career exposure	Beef Cattle & Led Steer Competition | Royal Adelaide Show (theshow.com.au) Contact Competition Coordinator Name: Amanda Ford Email: aford@adelaideshowground.com.au Phone: 08 8210 5265 RA&HS Reception: 08 8210 5211 Beef Cattle Parading | ASA - Agricultural Shows Australia (agshowsaustralia.org.au) Beef Cattle Judging | ASA - Agricultural Shows Australia (agshowsaustralia.org.au) Dairy Cattle Parading | ASA - Agricultural Shows Australia (agshowsaustralia.org.au) Dairy Cattle Judging | ASA - Agricultural Shows Australia (agshowsaustralia.org.au)	3 4 7	Critical and Creative thinking Ethical understanding Literacy Numeracy Personal and social *Sustainability*
Careers Consider the range of skills students have – there will be a place for them all in the cattle sector: • practical "hands on" • enterprise skills • data management • IT system development • mechanical • technical • research/scientific • marketing • communication	Careers In Agriculture | Ag Careers | Australia - Career Harvest – search prompts: cattle • Cows • Animal science • welfare Good Meat | Resources careers in agriculture graphic	1 3	Digital literacy Literacy Numeracy Personal and social *Sustainability*

ASSESSMENT EXAMPLES USING THE ACARA ACHIEVEMENT STANDARDS

Technologies achievement standard	Example assessment activity	accomplished	competent	satisfactory	developing	limited
Explain how people consider factors that impact on design decisions and the technologies used to design and produce products, services and environments for sustainable living.	Investigate the features of a cattle crush or weighing system. Describe the factors that influenced the design of the equipment.					
Explain the contribution of innovation, enterprise skills and emerging technologies to global preferred futures.	Evaluate the benefits and limitations of the reproductive technologies of artificial insemination, sexed semen, embryo transfer and genomics.					
For the food and fibre production context, explain the features of technologies and their appropriateness for purpose	Complete an audit of a set of cattle yards, using criteria including worker safety, practicality, animal welfare, use of natural cattle behaviour, Cattle Guidelines and Standards.					
Create designed solutions based on an analysis of needs or opportunities.	Following an audit of cattle yards, suggest improvements to the design that would improve outcomes for animal welfare, worker safety and data collection.					
Create, adapt and refine design ideas, processes and solutions and justify their decisions against developed design criteria that include sustainability.	Imagine future trends in cattle equipment by creating, adapting or refining an existing example of equipment, to improve the triple bottom line of a cattle enterprise.					
Communicate design ideas, processes and solutions to a range of audiences, including using digital tools.	After creating, adapting or refining an innovative piece of cattle equipment. create a brochure, Facebook post or Stock Journal advertisement to promote it.					
Independently and collaboratively develop and apply production and project management plans, adjusting processes when necessary	Demonstrate practical skills while working with cattle, including: • safe work practices • cattle welfare • collaboration • independent work • setting up cattle scales • feeding routines • pen maintenance • data collection					
Select and use technologies skilfully and safely to produce designed solutions						

Science achievement standard	Example assessment activity	accomplished	competent	satisfactory	developing	limited
Explain the processes that underpin heredity and genetic diversity and describe the evidence supporting the theory of evolution by natural selection	In a supervised setting, answer short answer and extended response questions on key breeding, genetics and reproduction concepts.					
Analyse the relationship between science, technologies and engineering	Complete a case study of a biosecurity risk for cattle such as foot and mouth disease or lumpy skin disease. Compare and contrast the role of producers, general public, Government and industry bodies like Meat and Livestock Australia (MLA) in protecting the cattle industry. **OR** Reflect on the live export industry and the role technology could play in improving outcomes for producers, consumers and cattle.					
Analyse the key factors that influence interactions between science and society.						
Plan and conduct safe, valid and reproducible investigations to test relationships or develop explanatory models	Design a practical investigation into cattle growth rates. Suggested topics to explore: • breed • age • gender • stocking density • feeding regimes • feed types					
Explain how they have addressed any ethical and intercultural considerations when generating or using primary and secondary data	For the practical investigation, complete a risk assessment and outline a safety and welfare plan.					
Select equipment and use it efficiently to generate and record appropriate sample sizes and replicable data with precision	For the practical investigation, use equipment to collect quantitative data and record qualitative observations.					
Select and construct effective representations to organise, process and summarise data and information	For the practical investigation, present relevant summary data in tables and graphs.					
Analyse and connect a variety of data and information to identify and explain patterns, trends, relationships and anomalies	For the practical investigation, analyse and explain data from scientific and enterprise perspectives.					
Evaluate the validity and reproducibility of methods, and the validity of conclusions and claims	For the practical investigation, evaluate the trial design and suggest improvements.					
Construct logical arguments based on analysis of a variety of evidence to support conclusions and evaluate claims	For the practical investigation, make conclusions and justified recommendations for commercial producers after reviewing existing research and the investigation results.					
Select and use content, language and text features effectively to achieve their purpose when communicating their ideas, findings and arguments to diverse audiences	For the practical investigation, present a scientific report using standard structure, formal writing style, technical language, in text referencing and a correctly formatted bibliography.					