

Lesson Overview

This unit is a project based student-led, inquiry learning experience for students in Year 9 and 10. It is designed to be delivered over a period of 7-8 weeks in which students will be presented with opportunities to identify a real-world problem and work towards identifying a solution to the issue that produces a tangible product or strategy. They must incorporate the information and skills learnt during the unit.

The pedagogical framework for this unit is based on the 5Es learning model, commonly used in Australian classrooms and identifiable by both teachers and students. The process follows a student-centred (constructivist approach) and is represented by easily definable stages which can be explored as a single session or extended across several sessions according to the needs of the students.

Lesson Intentions

Students will understand:

- The need for sustainability in the Australian farming industry
- The definition of sustainability
- The importance of conducting research to understand the needs of a group
- How to work collaboratively to solve real-world problems
- The importance and range of alternative energy sources
- The importance and range of alternative farming techniques

Teachers Notes

Resources and Materials

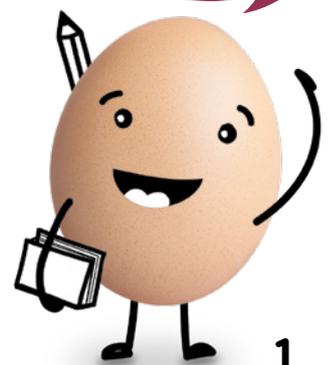
- Large paper (A2) for planning
- Felt tip pens, sticky notes, rulers, etc
- Interactive whiteboard resources
- Activity Sheets:
<https://www.australianeggs.org.au/education/secondary/sustainable-farm-design/>
- Australian Eggs website:
<https://www.australianeggs.org.au/>
- CSIRO website:
<https://www.csiro.au/en/Research/AF/Areas/Sustainable-farming>
- YouTube, TeacherTube or other trusted video sharing sites
- Egg Farmers of Australia website:
<http://eggfarmersaustralia.org/>
- UN Sustainability Goals:
<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>
- 3 types of egg cartons (cage, barn-laid and free range)

This unit is supported by interactive whiteboard resources available at:

<https://www.australianeggs.org.au/education/secondary/sustainable-farm-design/>.

For schools who do not have an interactive whiteboard or have limited access to an interactive whiteboard; please note that the resources can be downloaded as a pdf document, printed or accessed with shared or student-owned electronic devices. They can also be used simply as teacher inspiration if you wish to create your own resources to support this unit of work.

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let me
Eggplain!



Teachers Notes

Differentiation

As with all of the units of work by Australian Eggs, we encourage you to differentiate the following activities by making any necessary modifications in order to cater for diverse student learning needs. This unit is intended for Stage 5 students (Year 9 and 10).

Assessments

There will be a summative assessment task at the end of this unit but there are also a number of informal assessment opportunities throughout this lesson including:

- Class discussion
- Student questioning
- Student workbooks
- Observation
- A summative assessment of the finished digital resource

Stage 5 Curriculum links

Science

ACSHE158 Advances in scientific understanding often rely on developments in technology and technological advances are often linked to scientific discoveries

ACSHE228 / ACSHE230 Values and needs of contemporary society can influence the focus of scientific research

ACSSU189 Global systems, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere

Geography

ACHGK061 Human alteration of biomes to produce food, industrial materials and fibres, and the use of systems thinking to analyse the environmental effects of these alterations

ACHGK062 Environmental, economic and technological factors that influence crop yields in Australia and across the world

ACHGK070 Human-induced environmental changes that challenge sustainability

Digital Technologies

ACTDIP038 Define and decompose real-world problems precisely, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs

ACTDIP042 Evaluate critically how student solutions and existing information systems and policies, take account of future risks and sustainability and provide opportunities for innovation and enterprise

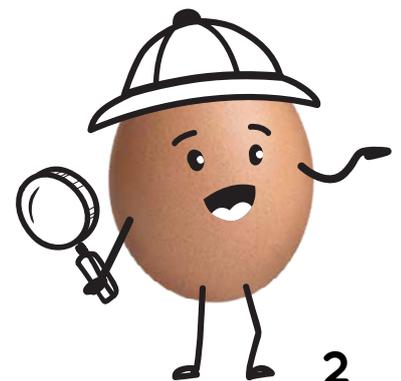
ACTDIP044 Plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability

Cross curriculum priorities

- Sustainability
- Asia and Australia's engagement with Asia

General capabilities

- Literacy
- Numeracy
- Information and Communication Technology (ICT) Capability
- Critical and Creative Thinking
- Personal and Social Capability
- Ethical Understanding



Stage 1: ENGAGE

Activity 1

1. Explain to the students that they will be solving a real life problem using an inquiry-based approach and the 5Es learning model. Display the 5Es learning model graphic on the interactive whiteboard (IWB) and talk through each stage to ensure students understand the process.
2. Display the main task on the interactive whiteboard:

'How can Australian Egg farmers use sustainable thinking and technology to ensure the best quality eggs are produced, while minimising the impact on the environment and meeting community expectations?'

3. Invite a discussion about the topic and gather the students' previous knowledge around sustainability, farming and the egg industry.
4. Brainstorm some ideas about the skills the students will need to employ during this project, focussing on collaborative and problem solving competencies, and encourage students to give examples of how they have used these skills in previous situations.
5. Split the class into groups of four. These will be their work groups for the entirety of this project.

Stage 2: EXPLORE

Teacher tip:

During this stage of the unit, it is a good idea for groups to start a 'diary of discovery' or 'learning journal' for students to document their learning and understanding. This can be done in their workbooks or digitally and can be used as a means of assessment throughout and at the end of the unit.

You may wish to split the class into three groups and have them 'play the expert' on one type of sustainability, before sharing their knowledge with the rest of the class.

Activity 1

1. Open a discussion about sustainability and collect students' thoughts on the meaning of sustainability.
2. Explain that there are three key types of sustainability: social, environmental and economic. Display the graphic for the three types of sustainability on the board as provocation for research. Encourage groups to use appropriate devices to research online each of the three types of sustainability and record the new information in their learning journals.
3. Plenary. Bring the class back together to share their research about the three types of sustainability.

Teacher tip:

You may wish to split the class into three groups and have them 'play the expert' on one type of sustainability, before sharing their knowledge with the rest of the class.



Stage 2: EXPLORE

Activity 2

1. Ask the class: what does sustainability look like in agriculture? Gather students' ideas on this in a brainstorm before showing them a short video on Sustainability in the Egg Industry on the Australian Egg website, found at the following link, or on the accompanying interactive whiteboard resource: <https://www.australianeggs.org.au/what-we-do/sustainable-production/sustainability-report/environmental-impact/>.
2. Encourage groups to do their own research on sustainability in the egg industry in Australia using appropriate devices. They may use videos or websites that specialise in agricultural sustainability, such as the CSIRO website (<https://www.csiro.au/en/Research/AF/Areas/Sustainable-farming/>), the Sustainable Farming website (<https://sustainablefarming.com.au/>) or the UN Sustainability Goals (<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>).
3. Plenary. Bring the class back together and open a discussion about what practices could help support sustainability in the egg industry. Record the students' ideas and discuss the merits of each. Keep this class list for reference later on in the project.

Teacher tip:
Download the Sustainability Framework pdf from the Australian Eggs website for students to absorb, specifically the Key Areas page which outlines plans for each area of sustainability.

Activity 3

1. Brainstorm with students the main inputs into a farm. What does a farm need to be able to run (for example, water, people, energy, feed, land, etc)? Think about all the resources needed and note down key phrases and words.
2. Direct students to think about electricity and energy on a farm and start a discussion about renewable or clean energy sources. What do students already know about it? Record their ideas and key words on the **Renewable (Clean) Energy slide**.
3. Talk about why it is important for us to use renewable energy sources and clean energy. Gather students' ideas for how renewable energy sources could be used on a farm.
4. Challenge students to work in their groups to create (or plan) a model which uses clean energy to either lift a load from floor to table or move a load from A to B. Models should be simple and able to be created with common materials such as cardboard, dowling rods, and sticky tape.

Teacher tip:
The activity in point 4 is not essential to the outcomes of this unit and so can be presented as a planning challenge, rather than a creation challenge according to the amount of time available.

Activity 4

1. Display the **Animal Welfare in the Egg Industry** slide and discuss students' ideas and thoughts on this topic.
2. Display the next slide, showing the relevant authorities in Australia for regulations on animal welfare and legislation relevant to the egg industry. Split the class into eight groups to play the expert on one of these authorities.
3. Groups are to find relevant information through research of their authority or legislation and take notes of their material in their learning journals.
4. Plenary. Bring the class back together and give each group the opportunity to present interesting information they discovered in their research session.
5. Challenge students to think about how sustainable practices can be used to support animal welfare and abide by national legislation, recording their ideas on the **Sustainable Practices in the Egg Industry Activity Sheet**.

Teacher tip:
This could be an emotional topic for some students and should be discussed with sensitivity.

Teacher tip:
This activity could be completed as a homework task. An activity sheet has been provided for this purpose



Stage 2: EXPLORE

Activity 5

1. Display before the class three cartons of eggs, one from each of the main egg production systems: cage, barn-laid and free range.
2. Collect students' ideas and thoughts about the three production systems and record key words on the IWB.
3. Encourage groups to discover more about each of the three production systems and analyse each of them on the **SWOT Analysis Activity Sheet** (each group will need three copies of this resource).
4. Plenary. Choose one group to explain each of the three production systems to the class. Encourage groups to add extra information they have found out through their own research.

Activity 6

1. Encourage the groups to review the information they have collected so far and compose some questions for finding further information relevant to the main task.
2. Provide adequate time for groups to answer these questions with further research and encourage them to record new information in their learning journals.
3. Plenary. Bring the class back together and encourage each group to share a piece of new information learnt about the egg industry.

Stage 3: EXPLAIN

Activity 1

1. Explain the task to the class:

Work in groups to develop a plan for a sustainable egg farm. The farm should: utilise a range of technology; include ideas for renewable energy sources; demonstrate a clear understanding of hen health; and present a plan of how to use sustainability techniques on the egg farm to decrease expenditure and increase profit, and to support and contribute to the local community and environment.

2. Ask groups to record any questions they have about the task or the required information in their learning journals, to investigate further during this stage of the unit.
3. Give groups adequate time to develop an initial plan for their sustainable egg farm. Allow them scope to ideate according to their preferred learning style. For example, they may wish to record ideas in their learning journals via a list or sketch a rough layout. Provide large paper and drawing materials for students to use if they wish.
4. Explain to the groups that they must write a paragraph justifying the choices they made in their initial plans, based on their own values and beliefs and their knowledge and understanding of the Australian egg industry.
5. Plenary. Bring the class back together and encourage each group to present their initial plan and collect feedback from their peers. Groups will use this feedback in the next stage to refine their plan and inform their next steps in research.

Teacher tip:
During the feedback process, ensure the language is kept positive and objective. Positivity encourages creativity, confidence and collaboration; three key skills when conducting this type of design project.

Activity 2

1. As a class, look at each group's plan and decide on the most important aspects. For example, how does their plan: support hen health, feature renewable energy sources, etc. From this, create a class criterion for success to assess against at the end of the project. These criteria should be continually displayed throughout the topic for groups to refer to and track their learning. This is a great opportunity for student self-assessment as well as formative assessment throughout the remainder of the unit. You may wish to advise the class on the content of the criteria and guide them in wording it so it is helpful and informative.

Stage 4: ELABORATE

Activity 1

1. This is a great time in the program for students to interview a real Australian egg farmer to learn from a primary information source about current sustainable practices, thoughts on future sustainable techniques, and practical uses of renewable energy sources. This could be conducted via a face-to-face method (Skype or Zoom meeting, class excursion to an egg farm) or by email. It is incredibly valuable for students to gain firsthand experience to support their knowledge and understanding of sustainable practices in the egg industry. However, if this is not possible, students could research the practices of different egg farmers on the Australian Eggs website at the following link: <https://www.australianeggs.org.au/learn-about-egg-farming/meet-australian-egg-farmers/>.
2. Groups should design a survey or a list of interview questions for the farmer that will give them relevant information to their own study and project. They should ask questions that aim to fill their knowledge gaps or clarify understanding on the topics they are researching.
3. Groups are to talk to an Australian egg farmer or research more about working egg farmers using the above website.
4. Plenary. Groups are to review their plan for the sustainable farm and make any necessary changes based on the new insights gleaned from the farmer(s) and from the feedback session in Activity 1 of the Explain stage.
5. Groups should add to their learning journals with a paragraph of what changes were made and why, ensuring they can justify their choices.

Activity 2

1. Groups are to add notes to their plans to detail how each sustainable technique and technology works and how they will support the farmer, the animals and increase profits and how they will support and contribute to the local community and environment.
2. Groups are to research how much each sustainable technique or technology will approximately cost. Add these details to their plan.
3. Groups are to present three of their sustainable techniques or technologies to the class in detail. The rest of the class should aim to analyse the effectiveness of each of these in terms of practicality and cost. For example, will the set up of these methods cost more than the energy saved? How much will the materials and equipment cost? Can it be set up using natural resources? How long will it take to make back the initial investment in the project?
4. Groups are to make any changes to their plan and notes based on the feedback they receive, applying this practical thinking to the rest of their features. Groups should record the changes and any updated understanding or knowledge in their learning journals.
5. Each group member should use their plan to write a full explanation of the design choices, each feature described and its function within the farm plan. Students should demonstrate how their knowledge has changed throughout the project and which areas of research helped them to plan each feature.

Teacher tip:
As an extension task, groups could put together a quote for a high cost option for the sustainable egg farm plan and a low cost option, both of which should involve several sustainable techniques and technologies. This will demonstrate a deep understanding of hen health needs and upholding the national regulations explored previously.

Stage 5: EVALUATE

Activity 1

1. Each group should have the opportunity to present their plan and learning journal to a visiting farmer or the school's leadership team, explaining their journey of discovery and how this informed their design choices throughout the project.
2. Present to a visiting farmer (if possible) or school leadership team and collect feedback.
3. Using the class assessment criteria, groups are to evaluate how well their plan met the brief and how well it solved the problem. Each group member is to write a paragraph showing how their knowledge and understanding changed over the period of the unit and how their project evolved. They should critique their use of sustainable techniques and range of technology, as well as how each of these supported animal welfare and upheld the national legislation of the egg industry in Australia.

Teacher tip:
Each group's plan must be approved by a teacher before being presented.

Further Reading and References

- Aalborg CSP. (2019). Growing food in the Australian desert with sunlight and seawater - the Sundrop Farms project. [image] Available at: <https://www.youtube.com/watch?v=jUWdtwYh96c> [Accessed 14 Jan. 2019].
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