Unit plan

QCAA sample STEM unit

Unit title	Year level	Timing and duration of unit
Let it grow!	6	16 lessons

Identify curriculum

Unit overview

This unit supports the school's STEM education priority.
Students will conduct an inquiry into the need for fresh food throughout the school day to maintain physical and mental energy levels. They will investigate the optimal conditions for growing plants within the school grounds. This will inform the design of a sustainable garden space that can provide the school community with fresh, healthy snacks.
For this unit, the scientific investigations are an opportunity to develop Science inquiry skills that will be assessed in a future unit. As students design a solution to an identified problem they will enhance the processes and production skills associated with Design and Technologies.

Achievement standard

Science
By the end of Year 6, students compare and classify different types of observable changes to materials. They analyse requirements for the transfer of electricity and describe how energy can be transformed from one form to another when generating electricity. They explain how natural events cause rapid change to Earth's surface. They describe and predict the effect of environmental changes on individual living things. Students explain how scientific knowledge helps us to solve problems and inform decisions and identify historical and cultural contributions.
Students follow procedures to develop investigable questions and design investigations into simple cause-and-effect relationships. They identify variables to be changed and measured and describe potential safety risks when planning methods. They collect, organise and interpret their data, identifying where improvements to their methods or research could improve the data. They describe and analyse relationships in data using appropriate representations and construct multimodal texts to communicate ideas, methods and findings.

Design and Technologies
By the end of Year 6, students describe competing considerations in the design of products, services and environments, taking into account sustainability. They describe how design and technologies contribute to meeting present and future needs. Students explain how the features of technologies impact on designed solutions for each of the prescribed technologies contexts.
Students create designed solutions for each of the prescribed technologies contexts suitable for identified needs or opportunities. They suggest criteria for success,

Achievement standard

including sustainability considerations, and ==use== these to ==evaluate== their ideas and designed solutions. They ==combine== design ideas and ==communicate== these to audiences ==using== graphical representation techniques and technical terms. Students record project plans including production processes. They select and use appropriate technologies and techniques correctly and safely to produce designed solutions.

Content descriptions

Science understanding	Science inquiry skills
Biological sciences: The growth and survival of living things are affected by physical conditions of their environment (ACSSU094)	**Questioning and predicting:** With guidance, pose clarifying questions and make predictions about scientific investigations (ACSIS232) **Planning and conducting:** Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS103) Decide variables to be changed and measured in fair tests, and observe, measure and record data with accuracy using digital technologies as appropriate (ACSIS104) **Processing and analysing data and information:** Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS107) Compare data with predictions and use as evidence in developing explanations (ACSIS221) **Evaluating:** Reflect on and suggest improvements to scientific investigations (ACSIS108)
Design and Technologies knowledge and understanding	**Processes and production skills**
Food and fibre production / Food specialisation: Investigate how and why food and fibre are produced in managed environments and prepared to enable people to grow and be healthy (ACTDEK021)	**Investigating and defining:** Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions (ACTDEP024) **Generating and designing:** Generate, develop and communicate design ideas and processes for audiences using appropriate technical terms and graphical representation techniques (ACTDEP025) **Producing and implementing:** Select appropriate materials, components, tools, equipment and techniques and apply safe procedures to make designed solutions (ACTDEP026) **Evaluating:** Negotiate criteria for success that include sustainability to evaluate design ideas, processes and solutions (ACTDEP027) **Collaborating and managing:** Develop project plans that include consideration of resources when making designed solutions individually and collaboratively (ACTDEP028)

General capabilities	
Critical and creative thinking	Organise and process information — analyse, condense and combine relevant information from multiple sources Seek solutions and put ideas into action — assess and test options to identify the most effective solution to put ideas into action Reflect on processes — identify and justify the thinking behind choices they have made

Cross curriculum priorities	
Sustainability	Systems — All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival

Develop assessment

Unit assessment			
Title of assessment/s	**Technique/s**	**Conditions**	**Assessment dates**
Let it grow!	Design task supported by a learning journal	Open Reasonable adjustments: • assistive technology where necessary and/or appropriate • multiple means to create a graphical representation, e.g. Minecraft or collage • use checklists	
Description of assessment/s			**Assessment dates**
Design brief: Students need healthy food throughout the school day to maintain their energy levels and stay alert. They would benefit from fresh, healthy snacks available to eat during a school day. How might we design a garden space in our school environment so that students can grow nutritious food? **A supporting learning journal will provide opportunities for ongoing feedback during the design process that includes:** • investigation of the design brief needs and opportunities • negotiated criteria for success that include sustainability considerations • explanation of the techniques that will help the garden to grow and thrive • explanation of how the identified gardening techniques will inform the designed solution			

Unit assessment	
• graphical representations that combine selected design ideas • evaluation of the designed solution using the negotiated 'criteria for success' • suggested changes or additions that could improve the garden space. A Year 6 STEM sample assessment is available.	
Create the task-specific standards	
The task-specific standards (marking guide) can be found at the end of the sample assessment.	

Sequence teaching and learning

Learning intentions and success criteria	Key teaching and learning experiences, including opportunities for feedback	Adjustments	Resources
Note: Lessons 6–7 rely on the ongoing collection of data from a variety of scientific investigations. It is suggested that these investigations are set up early in the unit, so that data can be collected at regular intervals.			

Lessons 1–2
We are learning to explain how and why food is produced in managed environments and prepared to enable people to grow and be healthy. (ACTDEK021)
What I'm looking for is a flow chart of the sequence involved in converting 'on farm' food to the food we buy at the supermarket. I'm also looking for a comparison of this to the 'garden to plate' supply chain and a list of the benefits of having access to healthy fresh food.
This is because understanding the processes involved in food production will help us to design a space that fulfils the need for nutritious food.
	• Present the 'Design brief' to students.
	• Consider the problem the designed solution will address and explain that the designed garden spaces will be presented to a group for consideration and feedback. (This group could include the school principal, P&C representative, experts etc.)
	• Investigate the benefits of eating fruit and vegetables (see 'Australian guide to healthy eating' resource).
	• View a video that describes the 'paddock to plate' supply chain, such as '11 Lunchbox Legends' (see resources).
	• Diagrammatically represent a 'paddock to plate' supply chain (see 'Flow chart' resource).
	• Visit or research a local community garden, such as Jane Street in West End (see resource), then create an empathy map (see 'Placemat' resource) with the following in each section
	  – Draw the users of this garden in the centre square.
	  – In each of the squares around the picture of the user answer the following questions. When community members use the
		Ensure subtitles, audio description and/or AUSLAN sign is turned on for videos.
		
		Complete in pairs and/or groups.
		
		Provide photos and/or pictures.
			• *National Health and Medical Research Council*, 'Australian guide to healthy eating', www.eatforhealth.gov.au/sites/default/files/content/The%20Guidelines/n55i_australian_guide_to_healthy_eating.pdf
			• *11 Lunchbox Legends — the people behind your lunch* (4:40), www.youtube.com/watch?v=-GY1mHiRHmU
			• *Global Education*, 'Flow chart', www.globaleducation.edu.au/verve/_resources/flow_chart.pdf

Learning intentions and success criteria	Key teaching and learning experiences, including opportunities for feedback	Adjustments	Resources

	community garden
	  ▪ what do they see and hear?
	  ▪ what do they say and do?
	  ▪ what do they think and feel?
	  ▪ what do they want from the space?
	• Consider the parts of the 'garden to plate' supply chain within the 'paddock to plate' supply chain and discuss the benefits of having access to healthy fresh produce at school.
	• Gather evidence of prior knowledge of gardening and sustainable practices through discussion or online discussion board.
			• *Jane Street Community Garden*, (West End, Brisbane), www.janestgarden.org.au
			• *Global Education*, 'Placemat', www.globaleducation.edu.au/verve/_resources/placemat.pdf

Lessons 3–4 We are learning to communicate how the conditions of an environment impact the suitability of plant types. (ACSSU094) (ACTDEP025) What I'm looking for is an awareness of the types of plants you observe being grown in a local garden, the impact of the local environment and the methods being used to ensure that plants thrive. I'm also looking for explanations of garden features through annotated drawings that include an aerial and side view of a garden. This is because our design brief requires you to select fruit and vegetables that will successfully grow in your school environment. The skill of graphically representing ideas is an important communication technique as an annotated drawing can convey a lot of information in a clear, ordered way.	• List (as a class) what seeds and plants need to grow and thrive. • View the 'Tasty bush tucker' video (see resource) and consider the techniques Aboriginal and Torres Strait Islander people use to source food. • Research your local climate zone and record the environmental conditions. List some of the types of fruit and vegetables that the local conditions will support (see 'Vegie guide zones' resource). • Present an image of a thriving local vegetable garden. Model drawing an aerial and side view of the garden and label the features that help the plants to grow and thrive. • Practise drawing and labelling an aerial and side view of an area or feature in the school. • Learn about the growing conditions of fungi and, if there is time, conduct a scientific inquiry into how mushrooms grow in a dark, warm cupboard compared to the classroom environment. • Each student provides feedback to a peer on the graphical representation they have drawn.	Provide key points from the video and guide students to highlight important concepts as the movie progresses. Scaffold this research with a visual thinking tool such as a consequence chart. Use assistive technology where necessary and/or appropriate.	• *ABC Education*, 'Tasty bush tucker', (4:14), http://education.abc.net.au/home#!/media/30798/understanding-bush-foods • Gardening Australia, 'Vegie guide zones', www.abc.net.au/gardening/vegie-guide-zones/9796680 • *ABC Education*, The dark world of fungi', (5:20), http://education.abc.net.au/home#!/media/104122/fungi-how-they-grow • Global Education, 'Consequences chart', www.globaleducation.edu.au/verve/_resources/consequences_chart.pdf

Learning intentions and success criteria	Key teaching and learning experiences, including opportunities for feedback	Adjustments	Resources

Lessons 5–6
We are learning to investigate and evaluate sustainable techniques for improving soil. (ACTDEK021) (ACTDEP027)
What I'm looking for is an understanding of the benefits of sustainable fertilising techniques such as composting. I'm also looking for an understanding of the need for sustainable water usage and systems that can enable this to happen in the school environment.
This is because we need to be aware of our impact on the environment and include sustainable elements in our garden design.
	• View 'Introduction "Technology" in Agribusiness' (see resource).
	• View 'The life in dirt' video (see resource) to explore the benefits of nutrient-rich soil conditions on the growth of plants.
	• Research the types of items that can and can't be placed in a compost bin (see 'Guide to composting and worm farms' resource).
	• Develop (as a class) composting 'criteria for success' and evaluate the composting that occurs at the school against the 'criteria for success'.
	• Consider the importance of water in the growth and maintenance of a plant. Discuss the importance of water conservation and evaluate how water is used throughout the school. As a class, brainstorm ways that water could be conserved.
	• Exit ticket activity:
	  1. Describe two benefits of composting.
	  2. Describe a technique that could be used to save water at home or at school.
		Provide key points from the video and guide students to highlight important concepts as the movie progresses.
		
		Scaffold the 'criteria for success' with a visual thinking tool such as a web map (the evaluation can be located in the related circles).
			• Introduction 'Technology' in AgriBusiness (2:23), www.youtube.com/watch?v=kIMGdeEhlIQ
			• ABC Education, 'The life in dirt' (5:19), http://education.abc.net.au/home#!/media/104056/soil-healthy-dirt-makes-healthy-plants
			• *City of Ipswich*, 'Guide to composting and worm farms', www.ipswich.qld.gov.au/__data/assets/pdf_file/0006/98205/Worm-Farm-Guide.pdf
			• *Global Education*, 'Web map', www.globaleducation.edu.au/verve/_resources/webmap.pdf

Lessons 7–8
We are learning to inquire into the impact of different variables on the growth of plants. (ACSSU094) (ACSIS232) (ACSIS103) (ACSIS104) (ACSIS107) (ACSIS221) (ACSIS108)
What I'm looking for is a scientific inquiry where one variable is changed to measure the impact of that variable on the growth of a plant.
This is because it is important to collect scientific evidence to support the design choices we are making so we can optimise the growing conditions in our designed garden space.
	Note: It is suggested that these scientific investigations are started at the beginning of the unit.
	• Conduct a variety of scientific inquiries using seedlings. These will be monitored regularly over a two-week period and data will be collated and evaluated.
	  – Possible experiments include an inquiry into the same type of plant growing
	    ▪ in shade and in sunlight
	    ▪ in a variety of soil types
	    ▪ with a variety of watering conditions.
	• Write up an investigation as a science report.
	• Summarise the findings of the investigations in an infographic.
	• Opportunity to collect evidence of Science inquiry skills and provide feedback.
		Use assistive technology where necessary and/or appropriate.
		
		Complete in pairs and/or groups.
			• *ABC Education*, 'Plant lab', http://education.abc.net.au/home#!/media/1388685/plant-lab
			• *ABC Education*, 'Science experiment: Tasty sandwich sprouts', http://education.abc.net.au/newsandarticles/blog/-/b/2397251/science-experiment-tasty-sandwich-sprouts

Learning intentions and success criteria	Key teaching and learning experiences, including opportunities for feedback	Adjustments	Resources

Lessons 9–10
We are learning to reflect on the impact of physical conditions on plants and evaluate the best design elements to fulfil the design brief. (ACSSU094) (ACTDEP024) (ACTDEP027)
What I'm looking for is a negotiated 'criteria for success' for a garden design in our school environment that:
• supports optimal conditions for growing plants
• includes sustainable design ideas
• fulfils the needs of students.
This is because 'criteria for success' will help you evaluate design ideas and create something that fulfils the design brief to a high standard.
	• Review the sustainable gardening techniques and results of the scientific investigations.
	• Show photos of a variety of inspirational vegetable gardens, e.g. vertical gardens, glasshouse structures, hydroponic systems, repurposed garden beds such as an old bathtub. Identify some features of each garden and discuss how they meet user needs.
	• Watch 'Building a school garden' (see resource) and list the design elements that appeal to students.
	• Discuss and clarify understanding of the design brief.
	• Observe and survey students from a variety of year levels to find out what sort of design features they would like in a garden space.
	• In the 'Let it grow!' booklet complete:
	  – Section 1: Design brief needs and opportunities
	  – Section 4: Add jointly developed 'criteria for success' for the designed solution
	  – Section 2: Scientific knowledge.
	• Model (teacher talk-aloud) using the 'criteria for success' to evaluate an example vegetable garden.
	• Evaluate an example garden design using the negotiated 'criteria for success'.
		Use assistive technology where necessary and/or appropriate.
		
		Ensure subtitles, audio description and/or AUSLAN sign is turned on for video.
		
		Provide multiple opportunities for students to demonstrate what they know and can do.
			• *ABC Education*, 'Building a school garden' (5:07), http://education.abc.net.au/home#!/media/30753/the-patch-school-garden
			• 'Let it grow!' sample assessment

Lessons 11–12
We are learning to generate design ideas for a garden. These ideas will need to be evaluated. (ACTDEP025) (ACTDEP027)
What I'm looking for are many ideas about possible materials, vegie types, garden placement, structural shape, aesthetics and sustainability.
This is because it is important to evaluate design ideas and then improve the designed solution.
	• Brainstorm design ideas for a garden space under the headings
	  – fruit and vegetables
	  – techniques to help plants grow
	  – appearance/function
	  – materials
	  – sustainability.
	• Evaluate brainstormed ideas against the negotiated 'criteria for success' and select design ideas.
	• Draw a quick aerial representation of the garden that includes
		Use assistive technology where necessary and/or appropriate.
		
		Complete in pairs and/or groups.
		
		Create opportunities for student/teacher discussions.	

Learning intentions and success criteria	Key teaching and learning experiences, including opportunities for feedback	Adjustments	Resources
	the selected ideas.		
	• Guide the students to improve the design as they apply the SCAMPER tool through the following questions		
	– Substitute: What materials can you substitute to improve sustainability?		
	– Combine: What garden features could you combine to make something new? e.g. sculptures that collect water for the garden		
	– Adapt: What could you adapt to make it more assessable/appealing to younger students?		
	– Modify: What could you improve to increase the productivity of the garden?		
	– Put to another use: What design features could be put to another use? e.g. seating that includes storage		
	– Eliminate: What could you eliminate to improve the garden?		
	– Reverse: Are there garden features that need to be moved/swapped so when you experience the garden it makes sense?		
Lessons 13–14 We are learning to communicate design ideas and processes for audiences using appropriate technical terms and graphical representation techniques. (ACTDEP025) What I'm looking for is: • two graphical representations (front view and aerial view) of the designed solution • annotations that justify the inclusion of each design element • an evaluation of the designed solution against the 'criteria for success'	• Display and discuss an example (possibly from lesson 3) of a clearly labelled and annotated diagram with an aerial and side view of a designed solution. • In the 'Let it grow!' booklet complete: – Section 3: Graphical representation. • Students present the graphical representations to an audience for consideration and feedback (this group could include the school principal, P&C representative, experts etc.). • In the 'Let it grow!' booklet complete: – Section 4: Evaluating the designed solution.	Use assistive technology where necessary and/or appropriate.	'Let it grow!' sample assessment

Learning intentions and success criteria	Key teaching and learning experiences, including opportunities for feedback	Adjustments	Resources
• changes or additions that could improve the garden space. This is because communicating design ideas through annotated graphical representations can demonstrate how the garden space fulfils the design brief for an audience.			
Lessons 15–16 (optional) We are learning to collaboratively plan a designed solution, select appropriate materials, components, tools, equipment and techniques, and apply safe procedures to construct a prototype. (ACTDEP026) (ACTDEP028) What I'm looking for is a collaboratively considered, safe, well-constructed, 3D prototype of the designed solution made out of recycled materials. This is because prototyping a 3D model of the garden space will help us to better understand how students will interact with the space.	• With a partner, students combine the best of the design ideas, then plan and create a 3D model of a designed garden space that fulfils the design brief. • Demonstrate safe cutting and adhering procedures. • Collect evidence of the processes and production skills related to 'producing and implementing' for Design and Technologies.	Prompt students to use equipment properly. Use assistive technology where necessary and/or appropriate.	'Let it grow!' sample assessment

Evaluate and quality assure

Prior to implementation, quality assure the unit to ensure assessment is valid, accessible and reliable and that curriculum, teaching and learning is aligned with assessment.

Determine the processes for moderation of assessment.

During and at the end of the unit, reflect on the teaching, learning and assessment to make refinements for the future.

Evaluate how the teaching, learning and assessment provided opportunities to develop depth and breadth of student learning. Consider:

* Was the teaching, learning and assessment effective?
* Are there opportunities to improve the effectiveness of the teaching, learning and assessment? If so, where and how?
* Were there any common student misconceptions that need, or needed, to be clarified?
* How does student progress and achievement in this unit affect the planning of subsequent units within the year/band of years?