Phase 1- Greenhouse | Stage 3 | Science and Technology K-6

Summary

In this unit, students explore sustainability with a specific focus on food. Students design and construct a mini greenhouse from recycled materials to grow and germinate seeds or seedlings. They plant the same seedlings in a vegetable patch. Both the mini greenhouse and the vegetable patch are monitored, observed and the results recorded daily. Students investigate the concepts of sustainable design, what plants need to grow, photosynthesis and how the analogy of the microclimate within a greenhouse relates to the global greenhouse effect. They research a vegetable and the planting specifications.

Duration

Sample term

7 weeks

Detail: Mid stage 3

Teacher Background Information

Students have the opportunity to investigate and design a sustainable mini greenhouse and compare the growth results with that of a regular vegetable garden. The outcome of this unit is for students to develop their understanding about the importance of sustainability, particularly in food, and how the process of their design can impact this.

NOTE: This unit includes working with soil. Follow the safety precautions for gardening with soil: http://www.eastfremantle.wa.gov.au/uploaded/pdf/potting.pdf

1. *Always wear gloves.*
2. *Keep the mix damp while in use.*
3. *Avoid inhaling the mix.*
4. *Wash your hands thoroughly after use.*

Key inquiry questions

- What would happen to plants if sunlight and water were restricted?
- What climate in Australia is best for a fast growing plant and why?
- How can we use a greenhouse to support plant growth?
- What is a microclimate and what are some examples?
- How is the microclimate within a greenhouse like the global greenhouse effect?
- Why is it important that we are aware of the greenhouse effect?
- What human activities release more greenhouse gases into the atmosphere?

Vocabulary

sustainability, physical conditions, impacts, survival, living things, conditions, light, water, growth, photosynthesis, plants, oxygen, carbon dioxide, vegetables, fruits, herbs, energy, sunlight, restricted, diagram, greenhouse, climate, characteristics, seeds, seedlings, germinate, season, environmental conditions, commercial, scale, depth, height, hydroponic, microclimate, greenhouse effect, inhale, safety, observation, length, width, perimeter, regular shape, irregular shape, dimensions, area, inconsistencies, planting specifications, processed, consequence

Outcomes

Science K-10 (inc. Science and Technology K-6)

- ST3-4WS investigates by posing questions, including testable questions, making predictions and gathering data to draw evidence-based conclusions and develop explanations
- ST3-5WT plans and implements a design process, selecting a range of tools, equipment, materials and techniques to produce solutions that address the design criteria and identified constraints
- ST3-11LW describes some physical conditions of the environment and how these affect the growth and survival of living things
- ST3-14BE describes systems in built environments and how social and environmental factors influence their design

Mathematics K-10

- MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations
- MA3-3WM gives a valid reason for supporting one possible solution over another
- MA3-5NA selects and applies appropriate strategies for addition and subtraction with counting numbers of any size
- MA3-7NA compares, orders and calculates with fractions, decimals and percentages
- MA3-9MG selects and uses the appropriate unit and device to measure lengths and distances, calculates perimeters, and converts between units of length
- MA3-10MG selects and uses the appropriate unit to calculate areas, including areas of squares, rectangles and triangles
- MA3-18SP uses appropriate methods to collect data and constructs, interprets and evaluates data displays, including dot plots, line graphs and two-way tables

Content

Stage 3 - Living World

Living things have structural features and adaptations that help them to survive in their environment. (ACSSU043)

- research the conditions needed for a particular plant to grow and survive in its environment, eg an indoor plant, plants in deserts, drought-resistant wheat or salt-tolerant plants

The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094)

Students:

- make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould

Stage 3 - Working Scientifically

Students plan investigations by:

- with guidance, planning appropriate investigation methods to test predictions, answer questions or solve problems including surveys, fieldwork, research and fair tests (ACSIS086, ACSIS103, ACSHE081, ACSHE098)
- deciding which variable should be changed and measured in fair tests while keeping everything else the same (ACSIS087, ACSIS104)

Teaching, learning and assessment

Week 1: Lessons 1 and 2 - Sustainability and essential scientific concepts for the design project

Whole-class activity

Sustainability

- Students brainstorm the meaning of sustainability.
- View the YouTube clip, 'Sustainability easily explained' (Duration 4:01min.)
- Discuss and identify the key points of sustainability as defined in the clip.
- Brainstorm why sustainability is important.
- Produce a poster with a definition of sustainability to display in the classroom.

Whole-class activity

Photosynthesis

- Students brainstorm the meaning of photosynthesis.
- Complete a mind map of student responses.
- View the YouTube clip, *'Photosynthesis - Biology basics for children'* (Duration 4:52min.
- Discuss and identify the key points of photosynthesis and the importance of plants for human life, eg oxygen production and carbon dioxide removal.
- Brainstorm photosynthesis and what life forms use this process. Ensure students understand that this occurs with all vegetables, fruits and herbs.
- Model a basic diagram of photosynthesis ensuring the following are included:
- energy from sunlight
- carbon dioxide and water from air

Student diversity

Optional

- Students create a leaf model demonstrating photosynthesis http://www.keslerscience.com/wp-content/uploads/2013/12/Leaf-Model1.pdf

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▪ collaboratively and individually selecting suitable methods for gathering data and information first-hand and from reliable secondary sources	▪ plants release oxygen into the air ▪ plants make foods from water and sunlight (this can be displayed in the room for future reference). **Small-group activity** Driving questions: What happens when wet soil is left in the sun uncovered for the day? What happens when wet soil is let covered in the sun all day? Activity: ▪ Cut 2 clear bottles in half to create 2 cup like containers. ▪ Fill both containers with wet soil. ▪ In one of the containers place cotton wool or any absorbent materials on the top and place the top half of the bottle back on top to seal the bottle. ▪ Weigh both of the bottles and note down the weights. Place both bottles outside in direct sunlight for the day. In the afternoon students are to revisit the bottles in their STEM groups and note the changes. What has happened to the cotton wool in the sealed bottle? Discuss with the class: ▪ Why there is condensation inside the sealed bottle? ▪ The changes occurred to the unsealed bottle? ▪ Do the bottle weigh the same now as they did in the morning? Explain the changes that have just occurred and how students have mimicked a green house. **Whole-class evaluation** Students are to write a hypothesis about the implications they think this would have on plants and their ability to grow. Revisit this hypothesis at the end of the unit. **Visible thinking activity** Present students with a variety of images of greenhouses. Students to do a 'See, Think, Wonder' activity using the images as stimulus: ▪ See: What features do they observe in the image? ▪ Think: Why do they think the greenhouse has these features? ▪ Wonder: Are there any questions they would like to answer through investigations or research? Go through student responses and give students the opportunity to express their prior knowledge of greenhouses. *This will determine exactly how detailed and what information to give to the students.* Introduce the basic concept of greenhouses and what they do.	
Stage 3 - Living World Living things have structural features and adaptations that help them to survive in their environment. (ACSSU043) Students:	**Week 1: Lessons 3 and 4 - Researching vegetables** **Teacher background information** *Students select a vegetable to be the focus of their design project.*	**Optional extension activity** ▪ Students look at different types of graphs that would best present the facts, modelling

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▪ research the conditions needed for a particular plant to grow and survive in its environment, eg an indoor plant, plants in deserts, drought-resistant wheat or salt-tolerant plants The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) Stage 3 - Working Scientifically Students question and predict by: ▪ with guidance, posing questions to clarify practical problems or inform a scientific investigation (ACSIS231, ACSIS232) Students plan investigations by: ▪ with guidance, planning appropriate investigation methods to test predictions, answer questions or solve problems including surveys, fieldwork, research and fair tests (ACSIS086, ACSIS103, ACSHE081, ACSHE098) Stage 3 - Data 1 Students: Pose questions and collect categorical or numerical data by observation or survey (ACMSP118) ▪ collect categorical and numerical data through observation or by conducting surveys, eg observe the number of a particular type of insect in one square metre of the playground over time Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies (ACMSP119) ▸ name and label the horizontal and vertical axes when constructing graphs (Communicating) ▸ choose an appropriate title to describe the data represented in a data display (Communicating) ▸ determine an appropriate scale of many-to-one correspondence to represent the data in a data display (Reasoning) Describe and interpret different data sets in context (ACMSP120) ▪ describe and interpret data presented in tables, dot plots, column graphs and line graphs, eg 'The graph shows that the heights of all children in the class are between 125 cm and 154 cm' ▸ identify and describe relationships that can be observed in data displays, eg 'There are four times as many children in Year 5 whose favourite food is noodles compared to children whose favourite food is chicken' (Communicating, Reasoning) ▸ use information presented in data displays to aid decision	**Small-group activity** Pose the questions: ▪ What climate in Australia is best for a fast growing plant? ▪ What are the climatic qualities that support plant growth? ▪ Students identify the information they need to research the question, including: ▪ vegetable type and characteristics ▪ cost of seeds/seedlings ▪ recommended climate ▪ recommended planting season ▪ why the vegetable will or won't work in our experiment and design project. Research using appropriate resources, including ICT resources. *Possible examples of vegetables includesnap beans, beets, broccoli, cucumber, green onion, kale, bok choy, lettuce, peas, radish and spinach.* **Whole-class discussion** ▪ Students present their findings to the class. ▪ They present their research to the class about why they chose this vegetable for the project. **Individual / group / paired activity** Students research how the fast-growing vegetable of their choice (see examples in resources of lettuce and spinach) are grown in a backyard and on a commercial scale. Ensure the dimensions are recorded and included for: ▪ distance of planting ▪ depth to plant both seeds and seedlings ▪ height that the plants will grow. **Whole-class discussion** Students pair, square and share. They discuss: ▪ their research ▪ how they think this will work in their school ▪ the environmental factors, ie hot or cold weather, storms, floods etc may influence the project Students graph the information in a column/bar graph to help persuade the class using the facts presented. ▪ name and label the horizontal and vertical axes ▪ choose an appropriate title ▪ determine an appropriate scale ▪ interpret the graph to identify and describe relationships in the display	explicitly on Excel or Google sheets. **Optional ICT extension activity** Students engage with the interactive, 'Fair test: growing lettuce'. They: ▪ run experiments in a plant research laboratory ▪ investigate the effects of different variables on the growth of lettuces ▪ research the answers to questions about how to achieve optimum hydroponic growth conditions ▪ examine the effect of key variables on growth: nitrogen, temperature, light intensity and light duration.

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making, eg decide how many of each soft drink to buy for a school fundraising activity by collecting and graphing data about favourite soft drinks for the year group or school (Reasoning) ▪ analyse the data to guide decision making about the vegetable choice.		
Stage 3 - Living World Living things have structural features and adaptations that help them to survive in their environment. (ACSSU043) ▪ research the conditions needed for a particular plant to grow and survive in its environment, eg an indoor plant, plants in deserts, drought-resistant wheat or salt-tolerant plants The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) Stage 3 - Working Technologically Students explore and define a task by: ▪ developing a design brief individually and in collaboration with others ▪ developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations Students generate and develop ideas by: ▪ selecting and using techniques for documenting and communicating design ideas to others, eg drawings, plans, flow charts, storyboarding, modelling and presentations, using digital technologies Students produce solutions by: ▪ using their plans and production sequence Students evaluate by: ▪ self or peer assessing the final product by using the established design criteria Stage 3 - Area 1 Calculate the areas of rectangles using familiar metric units (ACMMG109) ▪ establish the relationship between the lengths, widths and areas of rectangles (including squares) Stage 3 - Length 1 Choose appropriate units of measurement for length (ACMMG108) ▶ describe how a length or distance was estimated and measured (Communicating, Problem Solving)	**Week 2: Lessons 1 and 2 - Design brief and design** **Teacher background information** Outline to students that they are to design and build their own miniature greenhouses and germinate the selected vegetable from seed to seedling. **Whole-class discussion** ▪ where the seedlings/seeds will be planted ▪ location - is there an existing vegetable garden or is a new one required ▪ what needs to be determined before planting (*prompt determining perimeter and area*) Pose the following questions: ▪ Is it possible to grow a vegetable in a greenhouse-like environment? ▪ Can we determine if there is a difference in how the vegetable grows outside in the vegetable patch to in the greenhouse? How? Review and brainstorm the: ▪ definition of a greenhouse ▪ functions of a greenhouse ▪ vital design elements required when designing a greenhouse Students describe how this is modelled on the process of photosynthesis and make direct comparisons between the two. **Design brief** A mini greenhouse needs to be constructed at school. It needs to: ▪ be made of recycled materials ▪ contain all the vital elements of a greenhouse ▪ be aesthetically and environmentally appropriate ▪ Be large enough to house the plants when grown Using the key points from the brainstorm, students develop a design brief for the mini greenhouse. *Remind students that seeds will be germinated into seedlings within the mini greenhouses.* **Small-group activity** ▪ Divide students into groups. Specific roles may be given within the group to encourage cooperative learning. ▪ Referring to the design brief, students research an appropriate and workable design for their mini greenhouse. They: ▪ determine which recycled materials are needed to make the greenhouses	**Optional** ▪ To review student understanding of greenhouses, watch the '*Growing plants indoors*' ABC clip Duration 5:17min. Questions for discussion may include: ▪ What do you need to consider if you are growing plants indoors? ▪ How are conditions indoors different from conditions outdoors? ▪ What care is required to create the best conditions for plant growth? ▪ Nick calls the space under the glass dome a 'microclimate'. Can you explain why this word is used? **Support** ▪ Show students the *Mini Greenhouse'* clip Duration 2:55min, *Milk carton greenhouse' Duration 3:56min or* appropriate online resources.

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	▪ determine how their greenhouse will work ▪ include a labelled diagram of their greenhouse ▪ determine how to create the right conditions for the types of plants chosen ▪ allocate the resources to be brought in by each student ▪ identify what teacher/school assistance will be needed. **Whole-class evaluation** Groups ensure all the requirements specified on the design brief are met. Designs are presented to the teacher and signed off for construction.	
Stage 3 - Working Technologically Students explore and define a task by: ▪ developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations Students generate and develop ideas by: ▪ selecting and using techniques for documenting and communicating design ideas to others, eg drawings, plans, flow charts, storyboarding, modelling and presentations, using digital technologies Students produce solutions by: ▪ using their plans and production sequence Students evaluate by: ▪ self or peer assessing the final product by using the established design criteria Stage 3 - Working Scientifically Students conduct investigations by: ▪ using equipment and materials safely, identifying potential risks (ACSIS088, ACSIS105) ▪ accurately observing, measuring and recording data, using digital technologies as appropriate (ACSIS087, ACSIS104)	**Week 2: Lesson 3 - Construction of greenhouse** **Whole-class discussion** ▪ Review design brief and design plans from previous lesson. ▪ Students to bring in the recycled materials they require for their greenhouse, ensuring they have all things necessary to commence construction. (*Note teacher/school may assist in recycled materials if students are unable to provide.*) **Small-group activity** ▪ Referring to the design plan students construct their greenhouses. ▪ Once the greenhouse is built, students select the right amount of soil for their greenhouse. ▪ Students water the soil and plant the seeds *(ensuring they are adhering to the planting recommendations researched in previous lessons*). *Note: It is advisable to complete this step of the lesson either outside or in a wet area of the classroom/school.* **Whole-class evaluation** ▪ Take photos or videos of the steps in the design process and to make notes of students' ability to work effectively in groups. Students may wish to record the design process using appropriate digital resources. ▪ Review the established design criteria. Students reflect on how they worked as a group on the project, what went well, what could have been improved. ▪ Students may also complete a questionnaire / reflection on how they worked as a group. **Safety** Review the safety guidelines for working with soil: Tips for safe gardening: ▪ Always wear gloves. ▪ Keep the mix damp while in use. ▪ Avoid inhaling the mix. ▪ Wash your hands thoroughly after use.	
Stage 3 - Length 1 Choose appropriate units of measurement for length (ACMMG108)	**Week 3: Lessons 1 and 2 - Measuring and calculating perimeter and area of vegetable patch**	**Support** ▪ Students work with the teacher

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▶ describe how a length or distance was estimated and measured (Communicating, Problem Solving) ▶ question and explain why two students may obtain different measures for the same length, distance or perimeter (Communicating, Reasoning) ▪ record lengths and distances using combinations of millimetres, centimetres, metres and kilometres, eg 1 km 200 m ▪ use the term 'dimensions' to describe the 'lengths' and 'widths' of rectangles Stage 3 - Area 1 ▪ establish the relationship between the lengths, widths and areas of rectangles (including squares) ▶ explain that the area of a rectangle can be found by multiplying the length by the width (Communicating, Reasoning) ▪ record calculations used to find the areas of rectangles (including squares) ▪ apply measurement skills to solve problems involving the areas of rectangles (including squares) in everyday situations, eg determine the area of a basketball court Stage 3 - Fractions and Decimals 2 Add and subtract decimals, with and without the use of digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128) ▪ add and subtract decimals with a different number of decimal places, with and without the use of digital technologies Multiply decimals by whole numbers and perform divisions by non-zero whole numbers where the results are terminating decimals, with and without the use of digital technologies (ACMNA129) multiply decimals of up to three decimal places by whole numbers of up to two digits, with and without the use of digital technologies, eg 'I measured three desks. Each desk was 1.25 m in length, so the total length is 3 × 1.25 = 3.75 m'	**Small-group activity** Students observe their greenhouse and: ▪ make sure it is getting enough sunlight ▪ check the soil's dampness record the time of day that they are doing the observation ▪ take a photo of their greenhouse ▪ record their results. **Small-group investigation** ▪ Divide students into small groups (approximately 3 per group) and assign roles (recorder, measuring leader, measuring assistant). ▪ Move outside to the vegetable garden or proposed vegetable garden. In groups, students: ▪ measure the allocated vegetable garden, ensuring that the measurement is correct to two decimal places ▪ draw a labelled diagram of the garden ▪ calculate the perimeter and area of the vegetable garden showing their working out ▪ calculate how many seedlings can be planted in the vegetable patch (provide students with the statistics found in previous lesson on planting dimensions of the chosen vegetable **Whole-class discussion** ▪ Students share their group calculations with the class. ▪ Discuss why there may be inconsistencies between what groups have in measurements and answers. ▪ Determine correct answer for the number of seedlings which can be planted in the vegetable patch. ▪ Explicitly model how to divide the vegetable patch into even sections for each of the STEM greenhouse groups. ▪ Ensure students understand how to divide and how they can use the reverse operation to check their answer. **Whole-class evaluation** Students reflect on what worked well in their group and what they could improve on.	in small groups.
Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) Students: ▪ identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water ▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living	**Week 3: Lesson 3 - Planting of seeds/seedlings** **Small-group activity** Students observe their greenhouse see Week 3 Lessons 1 and 2. **Whole-class discussion** Review the findings of previous lessons on perimeter and area of the vegetable garden. *Note: depending on time, students can mark out the even area for each group or alternatively the teacher can do this.*	

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things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things Stage 3 - Working Scientifically Students conduct investigations by: ▪ working individually and collaboratively in conducting a range of appropriate investigation methods, including fair tests, to answer questions or solve problems ▪ using equipment and materials safely, identifying potential risks (ACSIS088, ACSIS105)	**Small-group activity** Refer to note in teacher background information page 1 ▪ Students are given seeds / seedlings of their chosen vegetable. ▪ They refer to the planting specifications recorded in previous lessons to ensure planting is done correctly. ▪ Students use the specifications to measure out the recommended width and depth to plant the seeds/seedlings. They water the soil and plant their seeds/seedlings. ▪ Take digital photographs of the students carrying out the process.	
Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) Students: ▪ identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water ▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things Stage 3 - Working Scientifically Students conduct investigations by: ▪ working individually and collaboratively in conducting a range of appropriate investigation methods, including fair tests, to answer questions or solve problems Students process and analyse data and information by: ▪ comparing gathered data with predictions, and using as evidence in developing explanations of events and phenomena (ACSIS218, ACSIS221, ACSHE081, ACSHE098) Stage 3 - Working Technologically Students explore and define a task by: ▪ developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations	**Week 4: Lessons 1 and 2 - Monitoring and observing growth of seeds/ seedlings** **Small-group activity** This activity should be completed at the beginning of every lesson until the conclusion of the unit. Students observe their greenhouse and: ▪ make sure it is getting enough sunlight ▪ check the soil's dampness record the time of day that they are doing the observation ▪ take a photo of their greenhouse ▪ record their results. **Whole-class activity** ▪ Create a mind map of the criteria that should be observed and measured in the vegetable garden experiment. Ensure students are referring back to initial concepts taught such as sustainability, photosynthesis etc. ▪ Discuss what would be the best measuring tool to use to measure the growth in height and width of the seedling. **Individual / group / paired activity** Students: ▪ measure a selection of objects similar in size to a seedling, eg pencil, pen, rubber etc ▪ record the measurement to the nearest whole number ▪ discuss the role of the zero when measuring, eg 0.170 has the same value as 0.17. **Whole-class activity** Students: ▪ share their results	**Support** ▪ Students work in a small group with the teacher.

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Stage 3 - Length 1 Choose appropriate units of measurement for length (ACMMG108) ▪ select and use the appropriate unit and measuring device to measure lengths and distances ► describe how a length or distance was estimated and measured (Communicating, Problem Solving) ► question and explain why two students may obtain different measures for the same length, distance or perimeter (Communicating, Reasoning) ▪ record lengths and distances using combinations of millimetres, centimetres, metres and kilometres, eg 1 km 200 m ▪ use the term 'dimensions' to describe the 'lengths' and 'widths' of rectangles Stage 3 - Length 2 Connect decimal representations to the metric system (ACMMG135) ▪ recognise the equivalence of whole-number and decimal representations of measurements of length, eg 165 cm is the same as 1.65 m ▪ interpret decimal notation for lengths and distances, eg 13.5 cm is 13 centimetres and 5 millimetres Stage 3 - Fractions and Decimals 1 Students: Compare, order and represent decimals (ACMNA105) ▪ interpret zero digit(s) at the end of a decimal, eg 0.170 has the same value as 0.17 Stage 3 - Fractions and Decimals 2 Add and subtract decimals, with and without the use of digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128) ▪ round a number of up to three decimal places to the nearest whole number ► describe situations where the estimation of calculations with decimals may be useful, eg to check the total cost of multiple items when shopping (Communicating, Problem Solving)	▪ discuss the accuracy of measuring to the whole number Pose the questions: ▪ Is this an efficient way to measure and record information? ▪ What problems could occur if we only measured to the whole number? ▪ What real world examples support this idea? (For example, builders, architects, engineers etc). ▪ Model how to measure an object to two decimal places using a ruler/tape measure, including using ICT tools to assist. ▪ Ensure students understand how to use the third decimal place to round the number up. Discuss how this is important and why it would affect accuracy, refer back to experiment and measuring seedlings. **Individual / group / paired activity** In grouped pairs students: ▪ re-measure the objects previously measured using a ruler and tape measure ▪ record to two decimal places ▪ use the ruler and tape measure for each object and compare measurements. **Whole-class discussion** Students: ▪ discuss the findings ▪ compare measurements to the whole number with those to the decimal place ▪ describe situations where estimation of calculations might be useful ▪ discuss effectiveness of ruler and tape measure in accuracy of measurements. Optional: Support student understanding of seeds and vegetable gardens by exploring the ABC Splash clips: ▪ '*How seeds become plants'* Duration 5.19 ▪ *'Vegetable gardens'* Duration 5.18 **Small-group activity** Students: ▪ measure their seedlings ▪ record their measurement to two decimal places ▪ observe their section of the vegetable patch ▪ record the important observations as identified in part 1 of this lesson.	
Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) Students: ▪ identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water	**Week 4: Lesson 3 - *Where food comes from. Is it sustainable? Part 1*** **Small-group activity** Students observe their greenhouse and make notes same as Week 4, Lessons 1 and 2. **Whole-class activity**	

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▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things Stage 3 - Working Scientifically Students conduct investigations by: ▪ working individually and collaboratively in conducting a range of appropriate investigation methods, including fair tests, to answer questions or solve problems Students process and analyse data and information by: ▪ comparing gathered data with predictions, and using as evidence in developing explanations of events and phenomena (ACSIS218, ACSIS221, ACSHE081, ACSHE098) Stage 3 - Working Technologically Students explore and define a task by: ▪ developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations Students generate and develop ideas by: ▪ selecting and using techniques for documenting and communicating design ideas to others, eg drawings, plans, flow charts, storyboarding, modelling and presentations, using digital technologies Stage 3 - Length 1 Students: ▪ select and use the appropriate unit and measuring device to measure lengths and distances ► describe how a length or distance was estimated and measured (Communicating, Problem Solving) ► question and explain why two students may obtain different measures for the same length, distance or perimeter (Communicating, Reasoning) ▪ record lengths and distances using combinations of millimetres, centimetres, metres and kilometres, eg 1 km 200 m Stage 3 - Length 2 Students: Connect decimal representations to the metric system (ACMMG135)	▪ Organise a collection of different foods such as tomato, flavoured milk, herbs, bread, muesli bar, ham, cereal, jar sauce. ▪ Students identify where the food comes from and its raw form, eg bread=wheat. ▪ Brainstorm and record in a mind map where food comes from, incorporating knowledge gained in previous activity. ▪ Ensure students understand the entire process from paddock to supermarket/plate. See video resources to use after establishing students prior knowledge. ▪ Discuss how changing the physical conditions of the environment might change the growth and survival of living things. **Whole-class evaluation** Students create a flow chart explaining their understanding of where a particular food originates. They should be encouraged to identify: 1. some physical conditions of the environment of the particular food 2. how changing the physical conditions of the environment impacts the growth and survival of living things. ICT resources to support learning include: ▪ Draw io ▪ Gliffy iPad Apps ▪ Lucidchart - Diagram & Flowchart By Lucid Software https.//itunes.apple.com/au/app/lucidchart-diagram-flowchart/id611543423?mt=8 ▪ Ideament by Nosleep Software. https://itunes.apple.com/au/app//ideament-formerly-idea-sketch/id367246522?mt=8 ▪ Pure Flow by Aleksandr Kozlov https://itunes.apple.com/us/app/pureflow/id600955222?mt=8	

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▪ recognise the equivalence of whole-number and decimal representations of measurements of length, eg 165 cm is the same as 1.65 m ▪ interpret decimal notation for lengths and distances, eg 13.5 cm is 13 centimetres and 5 millimetres Stage 3 - Fractions and Decimals 1 Compare, order and represent decimals (ACMNA105) ▪ interpret zero digit(s) at the end of a decimal, eg 0.170 has the same value as 0.17 Stage 3 - Fractions and Decimals 2 Add and subtract decimals, with and without the use of digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128) ▪ round a number of up to three decimal places to the nearest whole number ► describe situations where the estimation of calculations with decimals may be useful, eg to check the total cost of multiple items when shopping (Communicating, Problem Solving)		
Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) Students: ▪ identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water ▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things Stage 3 - Data 1 Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies (ACMSP119) ▪ tabulate collected data, including numerical data, with and without the use of digital technologies such as spreadsheets ▪ construct column and line graphs of numerical data using a scale of many-to-one correspondence, with and without the use of digital technologies	**Week 5: Lessons 1 and 2 - *Where food comes from. Is it sustainable? Part 2*** **Small-group activity** Students observe their greenhouse and make notes same as Week 4, lesson 1 & 2 **Whole-class activity** ▪ Revise key understandings about food from previous lesson. ▪ Identify what foods students typically eat for breakfast, lunch, snacks and dinner. ▪ Construct a table and collect data. Discuss and decide: ▪ which foods are from plants or animals ▪ which foods are processed from plants and animals. Discuss and clarify: ▪ which foods are processed from a plant, eg cereal ▪ which are processed from an animal, eg hamburger, sausages. Display information in a column graph: ▪ Excel ▪ Google sheets ▪ NCES Create a Graph **Individual / group / paired activity**	**Optional** ▪ Students note down the categories of minimally processed, moderately processed and highly processed. They record how many minimally processed foods are in the classes' lunch boxes and repeat the exercise for moderately processed and highly processed. **Extension:** ▪ View the BBC Bitesize Systems and Practices. Students compare today's processes and technologies with those used in 1994. ▪ *The resource uses animation to look at systems input, processing and output, as well as specialist equipment, computer technology, and quality control.*

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► name and label the horizontal and vertical axes when constructing graphs (Communicating) ► choose an appropriate title to describe the data represented in a data display (Communicating) ► determine an appropriate scale of many-to-one correspondence to represent the data in a data display (Reasoning) ► mark equal spaces on the axes when constructing graphs, and use the scale to label the markers (Communicating) ▪ consider the data type to determine and draw the most appropriate display(s), such as column graphs, dot plots and line graphs ► discuss and justify the choice of data display used (Communicating, Reasoning)	Students complete the above process ensuring information is presented in a column graph. They should include: ▪ appropriate title ▪ labelled vertical and horizontal axes ▪ appropriate scale (many-to-one correspondence). Provide each student with three cups (yellow, green and red). If students are struggling with the concept they have the red cup on top, yellow if they are going okay and green if they feel confident with the content and concept. **Whole-class evalution** Think, pair, square, share to discuss what students have learnt	
Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) ▪ identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water ▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things Stage 3 - Working Technologically Students explore and define a task by: ▪ developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations Stage 3 - Length 1 Students: Choose appropriate units of measurement for length (ACMMG108) ▪ select and use the appropriate unit and measuring device to measure lengths and distances ► describe how a length or distance was estimated and measured (Communicating, Problem Solving) ► question and explain why two students may obtain different measures for the same length, distance or perimeter	**Week 5: Lesson 3 - Greenhouse effect Part 1** **Small-group activity** Students observe their greenhouse and make notes same as Week 4, Lessons 1 and 2. **Whole-class activity** Greenhouse Effect Analogy View the YouTube clip 'What is the greenhouse effect' by Global Ideas (Duration 2:03mins). *This shows the link between the microclimate of a greenhouse and the global greenhouse effect.* Students discuss: ▪ Why the greenhouse effect was given its name? (*It mimics what happens in a greenhouse.)* ▪ The way the greenhouse is mimicking what occurs in the natural environment but it can be controlled and isn't exposed to weather conditions etc. Why is this useful? **Whole-class activity** Students complete a KWL chart (What I know, what I want to know and what I learned) to show what they know and remember from Week 1 Lesson 1, what they would like to know and later on record what they learned. Based on student responses show appropriate resources, such as: 1. BOM definition http://www.bom.gov.au/climate/glossary/greenhouse.shtml 2. ABC BtN Greenhouse gases http://www.abc.net.au/btn/story/s4122664.htm 3. NASA climate kids http://climatekids.nasa.gov/greenhouse-effect/ 4. Essential energy http://www.essentialenergy.com.au/content/education-the-greenhouse-effect 5. Global climate change: Think like a scientist http://www3.epa.gov/climatechange/kids/scientists/index.html 6. Classroom Antarctica: Greenhouse and Greenhouse effect http://classroom.antartica.gov.au/climate/greenhouse-effect-and-climate-change	**Optional extension activity** ▪ Understanding Climate Change. This unit introduces students to the key issues involved with global change and how they relate to our changing climate. Students explore different sources of greenhouse gas emissions and seek information detailing the potential impact they have on global climate. http://www.csiro.au/Portals/Education/Teachers/Classroomactivities/CarbonKids/CarbonKids-Understanding-Climate-Change.aspx

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(Communicating, Reasoning) ▪ record lengths and distances using combinations of millimetres, centimetres, metres and kilometres, eg 1 km 200 m ▪ use the term 'dimensions' to describe the 'lengths' and 'widths' of rectangles Stage 3 - Length 2 Students: Connect decimal representations to the metric system (ACMMG135) ▪ recognise the equivalence of whole-number and decimal representations of measurements of length, eg 165 cm is the same as 1.65 m ▪ interpret decimal notation for lengths and distances, eg 13.5 cm is 13 centimetres and 5 millimetres Stage 3 - Fractions and Decimals 1 Compare, order and represent decimals (ACMNA105) ▪ interpret zero digit(s) at the end of a decimal, eg 0.170 has the same value as 0.17 Stage 3 - Fractions and Decimals 2 Students: Add and subtract decimals, with and without the use of digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128) ▪ round a number of up to three decimal places to the nearest whole number Stage 3 - Working Scientifically Students conduct investigations by: ▪ working individually and collaboratively in conducting a range of appropriate investigation methods, including fair tests, to answer questions or solve problems Students process and analyse data and information by: ▪ drawing conclusions and providing explanations based on data and information gathered first-hand or from secondary sources ▪ comparing gathered data with predictions, and using as evidence in developing explanations of events and phenomena (ACSIS218, ACSIS221, ACSHE081, ACSHE098)	Students should consider a range of consequences for not reducing greenhouse gas emissions. Rate the consequences on a scale of 1 to 10, where 1 is a low impact and 10 is severe impact. Students give their opinion on the likelihood of each consequence. Suggested consequences include: 1. rising temperatures 2. ice will melt 3. sea levels will rise 4. plants and animals at risk 5. ecosystems will be affected (eg the Great Barrier Reef ecosystem) 6. health will be affected 7. extreme weather (heat waves, flooding, bushfires, drought). **Individual / group / paired activity** Students research the greenhouse effect finding 10 key facts and answering questions with evidence. Questions may include: 1. Why is it important that we aware of the greenhouse effect? 2. The greenhouse effect acts like a blanket keeping the earth warm. Explain this concept. 3. If the greenhouse effect did not exist, would the earth be cooler or warmer? Explain. 4. What human activities are releasing more gases to the overall amount of gas in the atmosphere? 5. Some human activities raise gas emissions and therefore enhance the greenhouse effect. As a result the Earth's temperature rises. True or false? Explain why. **Whole-class evaluation** Students add to their KWL chart recording what they have learnt after the lesson.	
Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) ▪ identify some physical conditions of a local environment, eg	**Week 6: Lessons 1 and 2 - Greenhouse effect part 2** **Small-group activity** Students observe their greenhouse and make notes same as Week 4, Lessons 1 and 2.	

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temperature, slope, wind speed, amount of light and water ▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things Stage 3 - Working Scientifically Students conduct investigations by: ▪ working individually and collaboratively in conducting a range of appropriate investigation methods, including fair tests, to answer questions or solve problems Students process and analyse data and information by: ▪ comparing gathered data with predictions, and using as evidence in developing explanations of events and phenomena (ACSIS218, ACSIS221, ACSHE081, ACSHE098) Stage 3 - Working Technologically Students explore and define a task by: ▪ developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations Stage 3 - Fractions and Decimals 1 Compare, order and represent decimals (ACMNA105) ▪ interpret zero digit(s) at the end of a decimal, eg 0.170 has the same value as 0.17 Stage 3 - Fractions and Decimals 2 Add and subtract decimals, with and without the use of digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128) ▪ round a number of up to three decimal places to the nearest whole number ► describe situations where the estimation of calculations with decimals may be useful, eg to check the total cost of multiple items when shopping (Communicating, Problem Solving) Stage 3 - Length 1 Students: Choose appropriate units of measurement for length (ACMMG108) ▪ select and use the appropriate unit and measuring device to measure lengths and distances	**Whole-class activity** ▪ View and discuss the student created animated film. '*Is it just me or is it getting hotter in here?'* By Christian Louis Deppeler (Duration 4:12min). ▪ Discuss the simple diagrammatic animation and the effectiveness of this in explaining the causes of the greenhouse effect. **Individual / group / paired activity** ▪ Students finalise their research. ▪ Students use this information to make a persuasive and creative presentation to the class. Suggestions include speech, song, rap, interview, animation. ▪ Students may use multimedia to assist their presentation. ▪ Jointly create the criteria for assessing learning. ▪ Remind students the presentation is to be persuasive, entertaining and informative *(the effect of changing the physical conditions of the environment and the effect on the growth and survival of living things).* **Whole-class presentations and evaluation** ▪ Students present their persuasive and creative presentations to the class. ▪ They provide peer feedback based on the jointly created criteria for assessing learning.	

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▸ describe how a length or distance was estimated and measured (Communicating, Problem Solving) ▸ question and explain why two students may obtain different measures for the same length, distance or perimeter (Communicating, Reasoning) ▪ record lengths and distances using combinations of millimetres, centimetres, metres and kilometres, eg 1 km 200 m ▪ use the term 'dimensions' to describe the 'lengths' and 'widths' of rectangles Stage 3 - Length 2 Students: Connect decimal representations to the metric system (ACMMG135) ▪ recognise the equivalence of whole-number and decimal representations of measurements of length, eg 165 cm is the same as 1.65 m ▪ interpret decimal notation for lengths and distances, eg 13.5 cm is 13 centimetres and 5 millimetres Stage 3 - Information Students: ▪ communicate with others in different social and/or cultural contexts when designing an information solution, eg being a member of a collaborative online learning community		
Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) ▪ identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water ▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things Stage 3 - Working Scientifically Students conduct investigations by: ▪ working individually and collaboratively in conducting a range of appropriate investigation methods, including fair tests, to answer questions or solve problems Students process and analyse data and information by:	**Week 6: Lesson 3 - Evaluation of mini greenhouse is it sustainable? Could it be used in a real world setting?** **Small-group activity** Students observe their greenhouse and make notes same as Week 4, Lessons 1 and 2. **Small-group activity and evaluation** Students discuss how effective their greenhouse has been (depending on the control given to each group, results will vary). Encourage the focus to be on: ▪ the greenhouse as a design structure ▪ is it structurally sound ▪ is it providing enough water ▪ did the seed germinate ▪ did the seedling grow etc Students are also to look at how sustainable their design is and if it could be used to encourage people as to how to live more sustainably. They record their ideas. *(Depending on learning needs of individual students and students ability to work in a group, the teacher may assist with the questions, ensuring that a higher*	**Extension** ▪ Students can research and make a design plan of how to make their greenhouse on a larger scale, and to make it available to the average household.

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▪ comparing gathered data with predictions, and using as evidence in developing explanations of events and phenomena (ACSIS218, ACSIS221, ACSHE081, ACSHE098) Stage 3 - Working Technologically Students explore and define a task by: ▪ developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations Stage 3 - Working Scientifically ▪ drawing conclusions and providing explanations based on data and information gathered first-hand or from secondary sources Stage 3 - Length 1 Students: Choose appropriate units of measurement for length (ACMMG108) ▪ select and use the appropriate unit and measuring device to measure lengths and distances ► describe how a length or distance was estimated and measured (Communicating, Problem Solving) ► question and explain why two students may obtain different measures for the same length, distance or perimeter (Communicating, Reasoning) Stage 3 - Length 2 Students: Connect decimal representations to the metric system (ACMMG135) ▪ recognise the equivalence of whole-number and decimal representations of measurements of length, eg 165 cm is the same as 1.65 m ▪ interpret decimal notation for lengths and distances, eg 13.5 cm is 13 centimetres and 5 millimetres Stage 3 - Fractions and Decimals 1 Compare, order and represent decimals (ACMNA105) ▪ interpret zero digit(s) at the end of a decimal, eg 0.170 has the same value as 0.17 Stage 3 - Fractions and Decimals 2 Add and subtract decimals, with and without the use of digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128) ▪ round a number of up to three decimal places to the nearest whole number ► describe situations where the estimation of calculations with	*level of questioning is being considered in the evaluation.)* **Whole-class activity and evaluation** STEM groups present their evaluations to the class. They provide peer feedback based on the criteria for assessing learning.	

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decimals may be useful, eg to check the total cost of multiple items when shopping (Communicating, Problem Solving)		
Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) ▪ identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water ▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things	**Week 6: Lesson 4 - Sustainability of vegetable and recipes that could be used with vegetable.** **Small-group activity** Students observe their greenhouse and make notes same as Week 4, Lessons 1 and 2. **Research activity** Students research recipes that could be made with the vegetable that they are growing as the main ingredient. They: ▪ look at nutritional value ▪ discuss and design a way that a recipe could be presented or made available to the public when purchasing the fully grown vegetable or seeds/seedlings. *(For example, recipe cards, links on website etc)* ▪ Students present their recipe and design to the class. The class votes on a winning design and recipe.	
See Week 4, Lessons 1 and 2 Stage 3 - Living World The growth and survival of living things are affected by the physical conditions of their environment. (ACSSU094) ▪ identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water ▪ make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould ▪ use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things	**Week 7: Lesson 1 - Observing and recording** **Small-group activity** Students observe their greenhouse and make notes same as Week 4, Lessons 1 and 2. **Whole-class activity** From the winning recipe design, the whole class makes the recipe.	
See Week 4, Lessons 1 and 2. Stage 3 - Working Scientifically Students communicate by: ▪ constructing and using a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data including using digital technologies as appropriate (ACSIS090, ACSIS107)	**Week 7: Lessons 2 and 3 - Observing and evaluating** **Small-group activity** Students observe their greenhouse and make notes same as Week 4, Lessons 1 and 2. **Whole-class activity** ▪ Discuss how scientists might report back about information from their research. ▪ Look at the features of pie graphs, line graphs, dot plots and column graphs and discuss their purposes.	

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	Individual or pair activity and evaluation ▪ Students consider their data type and determine the most effective graph to use to present their data. They use their table to draw or create in Excel or Google sheets or NCES Create a Graph. ▪ They include all key features including: title, labelled vertical and horizontal axes, and scale. ▪ Students evaluate the success of their design and experiment and its relationship to the scientific concepts taught.	

Assessment overview

- Students produce a variety of work samples, including designated assessment activities. These should be evaluated to determine students' level of achievement and understanding.
- Students engage in peer assessment, based on jointly derived assessment criteria.
- Additionally, student understanding may be assessed through the use of observational checklists, anecdotal records and analysis of contributions to class discussions.

Evaluation

Questions to guide reflection:

- To what level did students achieve the learning outcomes?
- How could the unit be improved to enhance student engagement and learning?