Royal Agricultural Society of NSW

Tomato Time

Teacher Resource

For Technology Mandatory Years 7–8 NSW Syllabus

Royal Agricultural Society of NSW Education

Sydney Showground
Sydney Olympic Park
www.rasnsw.com.au

Tomato Time Teacher Resource

Tomatoes are one of the most popular edible plants that consumers love to eat all over the world. They can be grown in pots, greenhouses, farms and even on a windowsill. In the market we now see over 3000 different varieties of tomatoes ranging from heritage varieties that have been around for generations to new breeds of hybrid tomatoes that are commonly grown commercially to withstand the effects of transport and refrigeration over flavour and taste. For the consumer, it can be daunting to know what to choose when selecting from the different varieties that are in the supermarket year round.

Traditionally food was grown outdoors and depending on your school environment you may choose your growing infrastructure, whether it be an agriculture plot outdoors or a raised garden bed to represent urban gardening, a hydroponic or vertical garden to demonstrate advancements in plant technology or growing in a pot with the increased need to recognize apartment dwelling.

This unit of work based on tomatoes aims for students to learn about the agriculture industry through hands on activities. Students are encouraged to research the range of varieties of tomatoes and the products that can be manufactured from them. Students develop knowledge and understanding of agriculture through soil investigations, growing tips, identifying growing problems, exploring supply chains, industrialisation of agriculture, processing and the importance of sustainability in our food supply.

Tomato Time supports the Technology Mandatory Stages 4-5 NSW Syllabus by listing its outcomes for each of the 16 lessons and includes links to Australian Curriculum.

Lesson Index:

Warm Up Activities

There's a lot to be said about tomatoes and a good old brainstorm can reveal many ideas and plant the seed during the following lessons. Some fun facts to add include;

- Related to eggplants, capsicums, chillies and potato
- Best and cheapest from July to December
- Originate from wild tomatoes grown in the lower Andes on the west coast of Peru
- Arrived in Europe in 16th Century
- No record of tomato seeds on First Fleet, however tomato plants were noticed in convict gardens in Parramatta in 1793
- Richest source of lycopene and a good source of Vitamin C along with vitamin E folate and dietary fibre
- Most flavoursome ripened at room temperature
- Tasmania is the only state or territory without a major tomato growing area

Challenge groups to come up with as many dishes that include tomato in two minutes and have a bunch of tomatoes for the winning group.

Scope and Sequence: Tomato Time

Page	Lesson	Description (Students Will….)	Outcomes
7	**The Earth's Surface as Seen Through an Apple** Teacher demonstration and group discussion	• think about the responsibility of the population to use the earth's resources wisely • consider how much of the earth's surface is suitable for food production for the world's population	**TE4-5AG** (ACTDEK029) Investigate the importance of food and fibre production **TE4-2DP** (ACTDIP025; ACTDIP026) Acquire and interpret data
11	**Tomato Seed Extraction** Students extract and ferment seeds from fruit	• To discover seed saving, gain an understanding of how to save seeds, and set up a tomato fermentation experiment.	**TE4-6FO** (ACTDEP039) Produce an implement an agricultural project and or produce nutritious food
13	**Soil Types: Mason Jar** Mason Jar testing soils to identify their soil type	• explore that what's in soil affects what you grow	**TE4-5AG** (ACTDEK032) Investigate ideal conditions for growth and development of an agricultural plant
15	**Soil Types: Feel Test** Students rely on touch and feel to guess the soil type	• Develop a basic understanding of soil composition. • Understand that soil is made up of minerals, water, air and organic matter. • Identify different types of soil by sight and feel. • Know characteristics of the different types of soil and which are best for cultivation of certain crops.	**TE4-AG5** (ACTDEK032) Investigate ideal conditions for growth and development of an agricultural plant or animal
17	**Soil Texture Triangle** Students test and observe soil mixed with water over 24 hours. Use observations to calculate percentages against Soil Texture Triangle	• Use mathematics and the soil texture triangle tool for more precise identification of soil content	**TE4-5AG** (ACTDEK029) Investigate the importance of food and fibre production **TE4-2DP** (ACTDIP025; ACTDIP026) Acquire and interpret data
19	**Soil Under Microscope** Microscopes used to investigate soil has minerals, water, air and organic matter and students record their observations	• Examine different types of soil through a microscope and determine which soil type will store the most water • Explain the difference between well sorted, medium sorted and poorly sorted grains. • Recording basic soil micro-morphological observations	**TE4-AG5** (ACTDEK032) Investigate ideal conditions for growth and development of an agricultural plant or animal

23	**pH Soil Testing** Students test soil using Soil pH Test Kit, research how to change the soil types and complete a Nutrient Investigation Activity	• Learn various techniques that are used to modify the quality of soil	**TE4-5AG** (ACTDEK032) Plant species grown in managed environments **TE4-2DP** (ACTDIP025; ACTDIP026) Acquire and interpret data
25	**Coding for Soil Moisture Testing** This is a separate unit of work using Arduino to create soil moisture testing	• Explain the basic control structures in coding and how they can be used to control program flow during execution. • Discuss some of the activities involved with coding, debugging and maintaining programs in coding.	**TE4-2DP; TE44DP; TE4-7DI** (ACTDIP025) collect and access data from a range of sources (ACTDIP030) implement a functioning user interface
26	**Tomato Production** Students research where tomatoes are grown and create infographics to record their findings	• Research tomato production in Australia to gather data as a stimulus to understand and create a digital map using abstractions to represent their data on growing conditions and the type of tomato produced in different locations	**TE4-2DP** (ACTDIK024) investigates how digital systems represent text, image and audio with whole numbers
27	**Research on Tomato Varieties and Growing Conditions** Students complete a table showing the nutritional value of each variety and how they are used	• Investigate a broad range of tomatoes to better understand how and why they are used	**TE4-6FO** (ACTDEK032) Investigate ideal conditions for growth and development of an agricultural plant
32	**Analyse Local and Imported Tomatoes** Dissect tomatoes to discover observable properties	• Analyse the differences between local and imported tomatoes in the supermarket.	**TE4-6FO** investigate the characteristics and properties of a variety of nutritious foods
34	**Exploring our Supply Chain** Discover where tomatoes are produced and how they are transported to markets	• Describe the interdependence of consumers and producers of food in the market • Explain the importance of short and long term planning to business success • Explain how food manufacturing has evolved over time and the effects on the economy and sustainability of resources and food supply	**TE4-1DP** (ACTDEP038, ACTDIP027, ACTDIP031) Develop criteria to evaluate processes and solutions, the functionality and a range of constraints eg accessibility, economic, resources, safety, social, sustainability, technical. (ACTDEK032) Investigate how food production is managed in environments as a system and how sustainability can be improved

36	**pH and Food Processing of Tomatoes** Litmus paper is used to discover pH levels best for the canning process	• Determine the pH of common food ingredients • Determine the ideal temperature for canning tomatoes.	**TE4-5AG**; **TE4-6FO** (ACTDEK033) identify a range of feed preparation techniques and analyse the impact on nutrient value (ACTDIP025; ACTDIP026) Acquire and interpret data
39	**Practical Applications Taste Testing Salsa Challenge**	• Determine the best ingredients to add to tomatoes to make a tomato salsa • Create a recipe for a tomato salsa.	**TE4-6FO** (ACTDEP039) Produce and implement an agricultural project and or produce nutritious food
42	**Preservation and Value Adding with Tomatoes;** • Vinegar Pickled Tomatoes Practical • Tomato Seed Crackers Practical • Tomato Passata Recipe	• Develop a deeper understanding about food selection and preparation • Select and use a range of tools safely in food preparation	**TE4-6FO**; (ACTDEP039) produce and implement an agricultural project and/or produce nutritious food **TE4-3DP** (ACTDEK037) Select, justify and use a range of appropriate tools and techniques in an agricultural project and/or food production.
45	**Practical Assessment: Technology and Recipe Development** Assessment	• Students will conduct research on one technological advance in food processing (eg: canning, freeze drying, dehydrating, drying (air or mechanical), vacuum packaging, pickling) • They will explore why the advancement was invented and what problem it addressed in food production. • Analyse the benefits and costs and discuss your opinion on whether it has led to a societal benefit.	**TE4-6FO; TE4-10TS** (ACTDEK033) Identify a range of food preparation techniques and analyse the impact on nutrient value (ACTDEP039) Investigate and communicate how a recipe can be improved to enhance nutritional value, and justify the recipe adjustment.
46	**Case Study Costa Tomatoes** Assessment	• Students research how Costa manage their facilities to ensure environmental sustainability. • Create an infographic to represent the main points gathered during research with reference to environmental sustainability. • Students present their infographics to the class and discuss findings.	**TE4-5AG** (ACTDEK032) Investigate how food production is managed in environments as a system and how sustainability can be improved.

The Earths Surface as Seen Through an Apple

One of the most important natural resources that covers much of the earth's land surface is soil. All living things depend on it as a source of food, either directly or indirectly. Our food producing land remains the same and yet the world population continues to grow. Consequently, each person's food portion becomes smaller and smaller. It is the responsibility of each generation to use the soil wisely to ensure the future. The following demonstration will show how little of the earth's surface is actually available for food production to meet the demands of the growing population.

Learning Objectives:

- Describe the responsibility of the population to use the earth's resources wisely.
- To consider how much of the earth's surface is suitable for food production for the world's population

Curriculum Links:
TE4-5AG (ACTDEK029) Investigate the importance of food and fibre production;
TE4-2DP (ACTDIP025; ACTDIP026) Acquire and interpret data

Activity:

This can be completed as a teacher demonstration or a student activity. Explain to the class that you are going to look at the earth's resources by using an apple to represent the total land surface.

Resources:
2 Apples
Knife
Chopping Board

Student Activity Procedure:

1. Give each student/group one apple, a knife and an activity sheet (below)
2. Ask students to guess which percentage of the apple should go in each box
3. Ask the students to cut the apple into those segments and place each segment into the box
4. Show students the correct answer sheet and discuss results as a class

Demonstration Procedure:

1. Show the apple to the class as whole representing the world as we know it.
   Question: What percentage of the apple do they think represents all the available land for growing food? Write this down and keep for later reference.

2. Commence by cutting the apple into four equal parts (4/4, 4 quarters). Three segments of the apple represent all of the bodies of water in the world, including rivers, lakes and oceans. The fourth quarter represents the total land area of the world. Label three sections with water to remind the class what these represent. Keep one quarter aside as representing land.

3. **Question**: Can we grow food on any land that exists? A: No a percentage of land is unsuitable for example, deserts, ice, Arctic, Antarctic, and mountain areas.

4. Take the land quarter and cut it in half lengthwise.
   Question: What fraction of the apple do you know have? A: Now you have two one-eighth pieces. One eighth represents the unsuitable land discussed where we cannot grow food. The remaining one eighth 1/8 represents other land but there is still a question mark over whether we can grow food on this entire area.

5. Slice the remaining one-eighth segment lengthwise into four equal parts. Now you have four thirty-second 4/32 pieces.
   Discuss: Is the land around you at school or at home suitable to grow any type of food?

   Put three of these 1/32, one thirty-second sections aside and explain that these represent the areas of the world which are too rocky, too wet, too hot, or where soils is unsuitable to grow food or areas like highways, roads, buildings and cities that have been built on land and already been developed by people. As the population grows, available land will continue to decrease and at this point in theory we only have approximately one thirty second section is suitable for production.

6. This leaves 1/32nd slice of apple which you will need to cut the flesh away from the peel and keep the peel intact. Explain that this strip represents the soil or land that remains on earth to produce the entire food production for the world.

   It is beneficial to place another whole apple next to the tiny strip so that students can see the small area of soil that is available and suitable for the worlds' food production.

   Discuss: Consider that implications as the world's population continues to grow.
   How do we ensure we take good care of the suitable land to ensure intergenerational equity?

The Earth's Surface as Seen through an Apple
Activity Sheet

Water	**Uninhabitable & Non-Arable Land**
Habitable but Non-Arable Land	**Arable Land**

The Earth's Surface as Seen through an Apple
Answer Sheet

Water  3/4	**Uninhabitable & Non-Arable Land**  1/8
Habitable but Non-Arable Land  3/32	**Arable Land**  1/32

Tomato Seed Extraction Practical

Fruits can serve different purposes – firstly, they provide the nutrients needed for seeds to develop and protection for the seeds to ripen. Some attract animals to eat them so the seeds will be dispersed wherever the animal brings them. Tomato seeds are a bit different: as the fruit rots, it ferments - as bacteria feed off of the fruit, they cause chemical changes to create new compounds - which breaks down the germination inhibitor that exists on the seeds, thus allowing the seed to sprout and grow into a new tomato plant.

Learning Objectives:

- To discover seed biology and gain an understanding of how to save seeds
- To set up a tomato fermentation experiment to extract tomato seeds

Curriculum Links:
TE4-6FO (ACTDEP039) Produce an implement an agricultural project and or produce nutritious food

Activity:
In this lesson, students will create that process of fermentation in order to save tomato seeds. It is important to note that this is unique to tomatoes (and cucumbers); not all seeds need fermenting. If mould appears, note that it is the same mould as what is seen in cheese making and it is not harmful.

Resources:

Two types of tomatoes
Cups
Markers
Water
Plastic knives
Cutting boards

Procedure:

1. Cut the tomatoes open
2. Place the juice and seeds in a cup
3. Make sure that there is enough juice in the cups to cover the seeds. If there isn't enough, add water.
4. Label the cup
5. Leave the cup to ferment for three days.
6. Stir as needed.
7. Make and record observations (temperature in each location, any changes in the mixture)

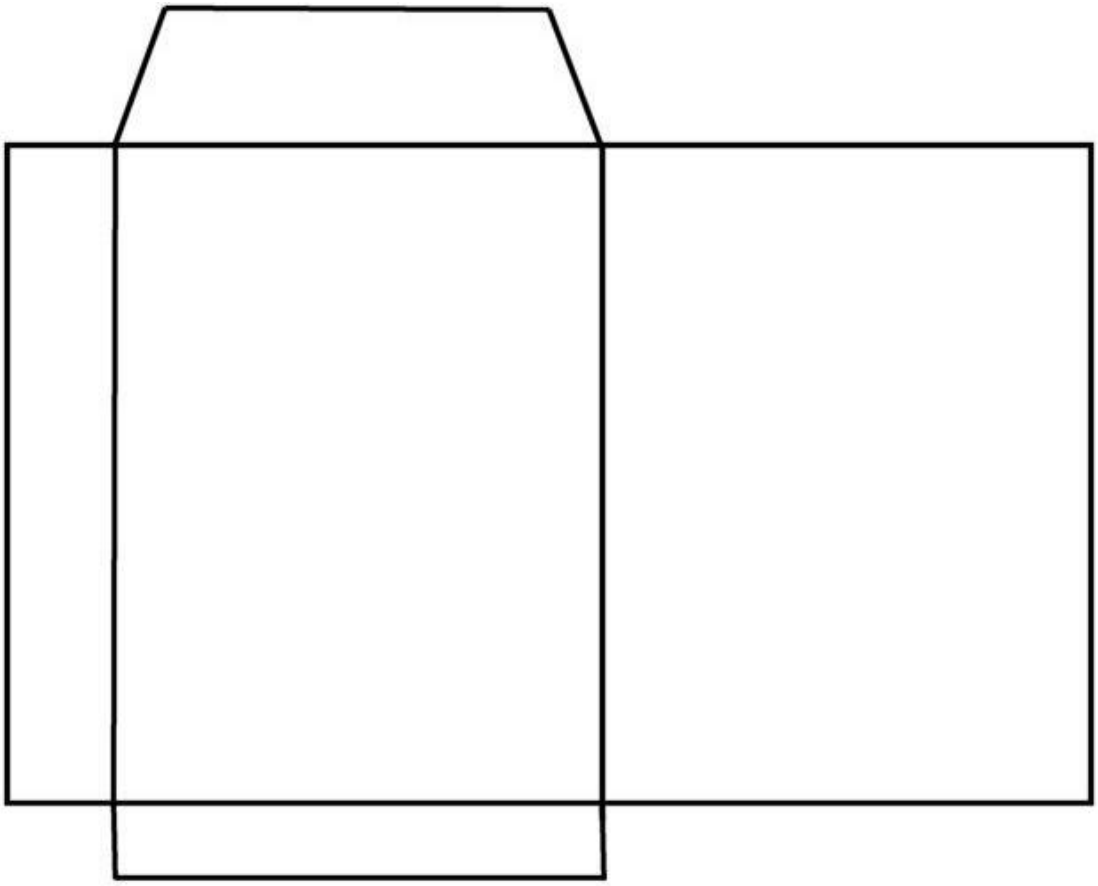
After three days the seeds will need to be rinsed and dried:

1. Add water to the mixture.
2. The good seeds should sink to the bottom and you can pour off the unwanted material at the top.
3. Do this repeatedly until the water runs clear.
4. You can use a strainer when it gets to the point where there is little juice/pulp in the mix.
5. Dry the seeds slowly in a warm place with airflow or a dehydrator set as low as possible

What Next?

1. Students could conduct a germination test to make sure seeds are viable. You can do this by placing 10 seeds between two moist paper towels and rolling them up with a rubber band, and counting how many sprouts emerge after one week.
2. Students could test the germination of the fermented seeds vs. seeds that have not been fermented (just extracted and dried)
3. Test some different variables and set up an experiment to see what will ferment the seeds best. Maybe try using different varieties of tomatoes, or different climate conditions – hot vs. cold, light vs. dark, etc. See what new observations can be made

Students can design their own seed packets:



Soil Types
Mason Jar Test

There are lots of ways to test soils but some of the easiest can be performed with very little effort nd the success of your crops will be dependent on what's in your soil web.

Learning Objective:

- To understand that what's in soil affects what you grow.

Curriculum Links: TE4-5AG (ACTDEK032) Investigate ideal conditions for growth and development of an agricultural plant

Activity: Mason Jar Tests

Soil Testing: The Mason jar soil test is a relatively simple and quick way to get a visual of the proportions of sand, silt and clay in your garden bed. Understanding your soil will allow you to choose the plants that will thrive in your conditions or make the adjustments to your soil to help improve it.

Resources:

Large glass jar with a lid
A variety of different soil samples (collected prior to lesson)
Ruler
Water
Laundry detergent (optional — to help with separation)
Wooden stirrer of long spoon
Ruler
Calculator

Activity:

1. Review with students the three main types of soil (sand, silt, clay)

2. Label each jar with where the soil sample has come from.

3. Ask students to hypothesize what percentages of sand, silt and clay they think will be in the samples they are testing.

4. Introduce the "Soil in a Jar" test and explain how it will separate out a soil sample into the three main types of soil. Demonstrate how to set up the experiment with a classroom example and that you will be working out percentages as well.

5. As a class, have students hypothesize out loud about the order of layers, from bottom to top. They should explain their reasoning. Do not reveal the correct answer, but rather let them discover answers themselves as they perform the experiment.

6. Then tell them that, based on the amount in each layer, they will be able to determine a more specific soil texture by using the Soil Triangle in another lesson.

7. Give each group a numbered soil sample and have them follow the instructions on the Soil in a Jar worksheet.

8. When the groups have completed the setup, they should hypothesize about the specific texture of soil they think their sample will be.

9. Leave the mixture to settle overnight.

Next lesson:

1. Have students examine their soil sample in the jar and reflect on their hypotheses, using the Soil in a Jar worksheet.

2. Using the example jar, show students how they can measure the different layers of soil and divide that by the overall measurement of all three layers to get percentages. Some students may need additional instruction and/or a calculator.

3. Compare and contrast the different soil types from the different locations. Bring the class together to discuss the results and discuss the best location for growing crops.

Soil Types
Feel Test

Soil goes by many names such as dirt, clay, silt, sand or even mud. Time to dig a little deeper and get dirty hands to observe the differences to understand that what's in soil affects what you grow.

Learning Objectives:

- Develop a basic understanding of soil composition.
- Understand that soil is made up of minerals, water, air and organic matter.
- Identify different types of soil by sight and feel.
- Know characteristics of different types of soil and which are best for cultivation of certain crops.

Curriculum Links: TE4-AG5 (ACTDEK032) Investigate ideal conditions for growth and development of an agricultural plant or animal

Activity: Feel Test

In this activity, students rely on touch and feel to guess the soil type. You may add an extra challenge by requiring that students wear a blindfold while doing this.

Materials

Samples of different types of soil — all 6 types if possible (sandy, silty, clay, loamy, peaty, chalky)
Blindfolds (optional)
Copies of Soil Feel Table

Teacher Preparation:

- Create stations with each type of soil from different locations.
- Each sample should be broken up into smaller amounts so that multiple students can make observations at the same time.
- Review the soil types and tell students that they are now going to use their own sense of touch to try and identify different soil samples.

Teacher Hints:

- Clay will feel sticky and roll into a ball when moist
- Sandy will feel gritty when wet and not roll into a ball
- Silty will feel smooth and forms a ball when moist but crumbly

Procedure: Student Instructions

1. One student will water a section of soil sample. Does the water on the surface disappear quickly? Then it's probably sandy. Does the water stay on the surface longer? Then it's likely clay.
2. Give a sample of the moist soil to the student partner with the blindfold.
3. Instruct students to pick up a handful of soil and squeeze it lightly. Does it form a ball? Does it stay in a ball or crumble? Or does it not form a ball at all? Read the hints above and make your best educated guess.
4. Divide students into groups so that they can rotate around the different stations.
5. Give each student the Soil Feel Table and instruct them on how to fill it out.
6. Each group will then go to a different table and begin making their observations. This should take only 2-3 minutes per table. Rotate groups until they have tested every soil sample.
7. Bring groups together to share guesses.
8. Reveal the soil types and allow students to compare their guesses.

Soil Feel Table

Soil Sample Number	Observations	Soil Guess	Actual Soil Type
1.			
2.			
3.			
4.			
5.			
6.			

Soil Texture Triangle

Learning Objectives:
Use mathematics and the soil texture triangle tool for more precise identification of soil content.

Curriculum Links: TE4-5AG (ACTDEK029) Investigate the importance of food and fibre production
TE4-2DP (ACTDIP025; ACTDIP026) Acquire and interpret data

Activity:
Materials needed:

Large clear jar with a flat bottom and lid (A peanut butter jar would be perfect)
Soil from the area you are testing (Take a good shovel full and mix well)
Note: Do not test potting mix.
Tap water

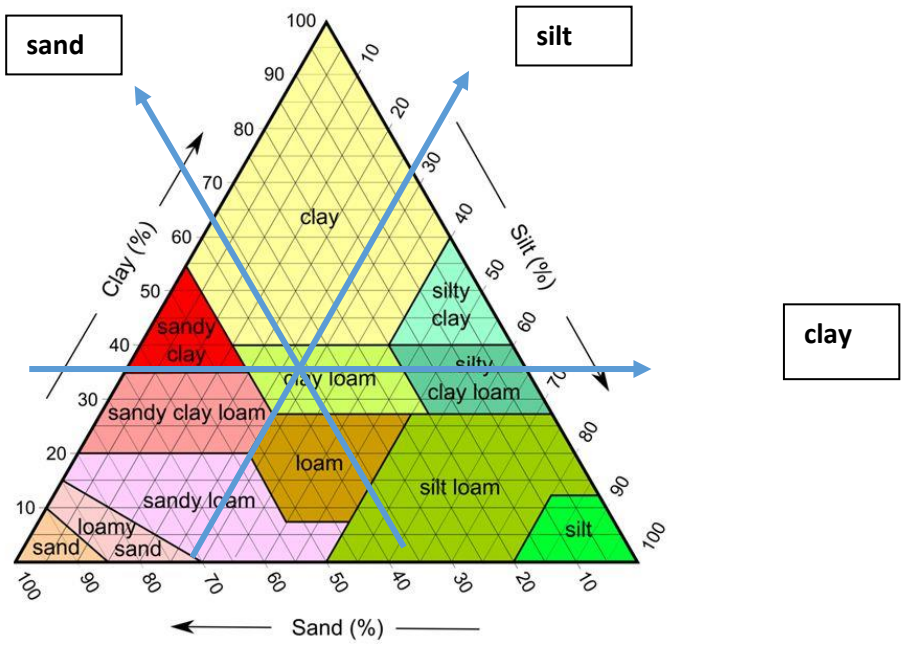
1. Show the soil triangle to students and explain that soil is made up of 3 components (sand, silt and clay) that the students will calculate as percentages for a more precise identification of soil makeup. **Note**: There are lots of Youtube video's to show your class how to calculate this.
2. Select the soil from your garden area and remove any noticeable plant roots, organic matter, worms etc before placing in the jar.
3. ¾ fill a clear jar with your soil.
4. Top up the jar with tap water, leaving a gap at the top of the jar to be able to shake up the jar and combine the soil and water well.
5. Place the jar on a table and wait 1 minute for the particles to settle.
   Note: Sand is heavier than silt and clay and will settle in less than 1 minute.
6. With a marking pen, label the outside of the jar at the top of where the sand settles.
7. Leave the jar for 1 hour for the silt to settle.
   Note: Silt is heavier than clay and will need 1 hour to settle.
8. With a marking pen, label the top of where the silt has settled. This will be your second mark.
9. Wait 24 hours for clay to settle since clay is made up of very small particles and will take time to settle.
10. Draw a line at the top of the clay level making sure to ignore any leaves, organic matter or debris that may be floating on top of the water. This will be the third line on the jar.
11. Empty the jar and wash it out, keeping the measurements on the side of the jar.
12. Measure with a ruler from the bottom of the jar to the top of the third line. This measurement will be the total for calculating.
13. Calculate each measurement as a percentage% of the total soil sample and map on the soil texture triangle to more accurately determine the soil content than the texture feel test.

Activity Sheet: Calculating Soil Components

Calculate % sand =
% silt =
% clay =

Total = 100 %

Soil Texture Triangle



At the cross section of the lines is the identification of the soil sample. In this sample it will be clay loam.

Example:
% sand = 40
% silt = 30
% clay = 30

Total = 100 %

Discussion:

- Does the soil need any modification prior to planting to meet the soil recommendations for planting tomatoes?
- Refer back to pH levels, soil texture triangle and research on how to change the soil type by changing nutrients if your soil needs modification.

Soil Under a Microscope

By looking at different soil types under the microscope, students will write a hypothesis which soil has the ability to store the most water.

Learning Objectives:

- Examine different types of soil through a microscope and determine which soil type will store the most water
- Explain the difference between well sorted, medium sorted and poorly sorted grains.
- Recording basic soil micro-morphological observations

Curriculum Links: TE4-AG5 (ACTDEK032) Investigate ideal conditions for growth and development of an agricultural plant or animal
Cross Curriculum Links: Humanities and Social Sciences (Geography) ACHASSK088 The importance of environments, including natural vegetation, to animals and people

Resources:

Microscopes
Teacher Fact Sheet
Activity Sheet
1 cup each of different soil or sand types (garden soil, beach sand, clay, compost, river sand)
Ruler

Student Activity 1:

- Explain to students that they will look at three different soil types under the microscope and observe the size of the grains to determine which soil is likely to hold the most water.
- Set the microscope to magnification 60X and hold it over a slide of one of the soil types. Estimate the amount, as a percentage, of air space between the grains as seen through the microscope.
- Sprinkle a few granules of the soil on the slide.
- Place the slide on the microscope stage and view the composition of the soil using the microscope on magnification 60X.
- Have students describe and draw what they see on the Microscope activity sheet. Things they should consider:
    - size of the individual grains (put a metric ruler under the microscope to get an idea of the size)
    - shape of the material (is it smooth or rough?)
    - type of material and colours that make up the soil
- Students repeat the above steps with the other soil types.
- Upon completion students decide which soil sample they think could store the most water and provide an explanation for their choice.

Student Activity 2:

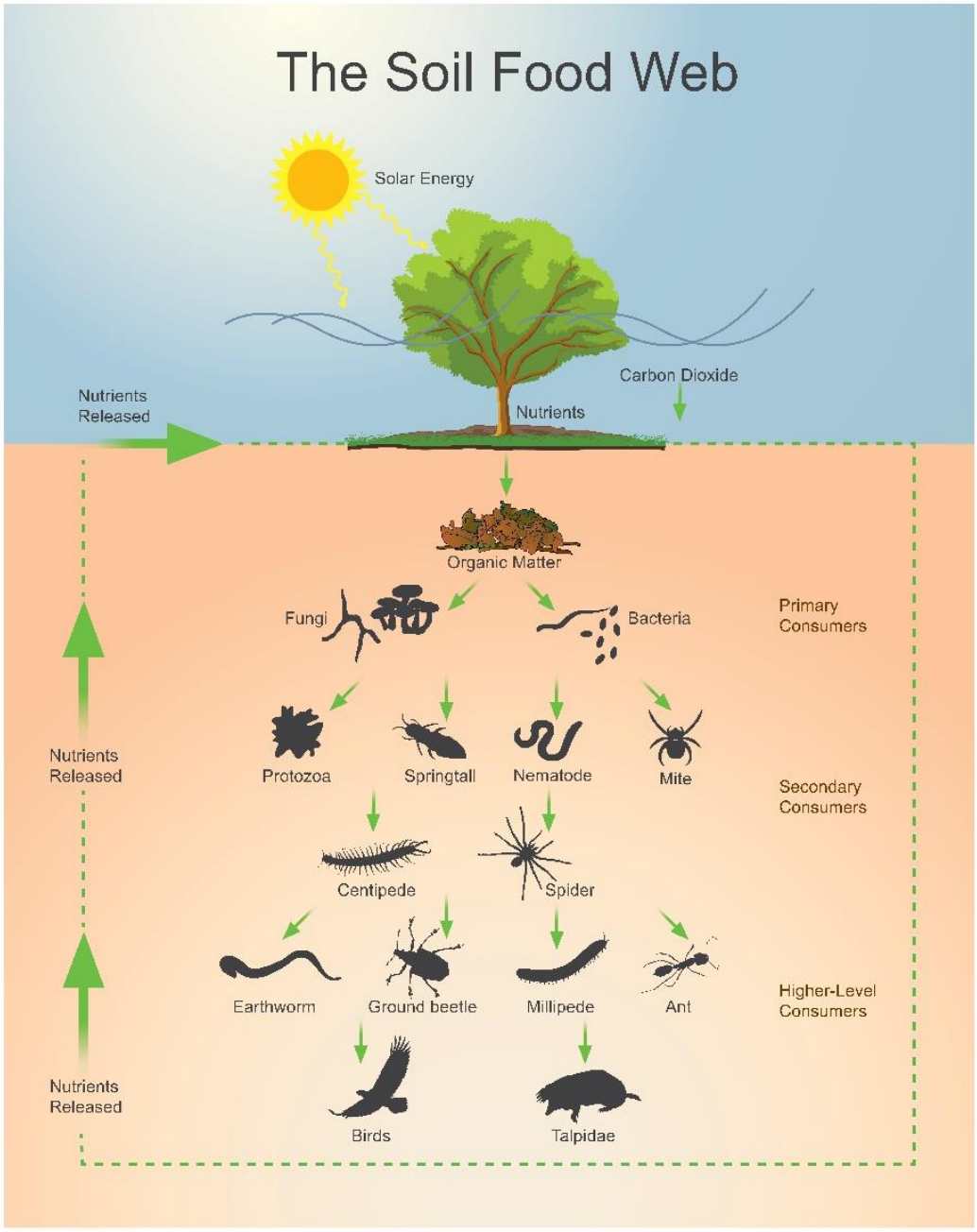
- After viewing three different soils under the microscope and recording the findings, draw a soil food web for each soil studied.

Group discussion: Individual participants are asked to briefly discuss their observations and to compare the characteristic features of the 3 different soils. They should be very different!

Note: Types of Soil
The inorganic particles in soil can be broken into three broad groups.

1. Sand has a high ratio of large, granular particles.
2. Silt is comprised mostly of medium-sized particles.
3. Clay is mostly super-fine particles.

Resources: The Soil Food Web



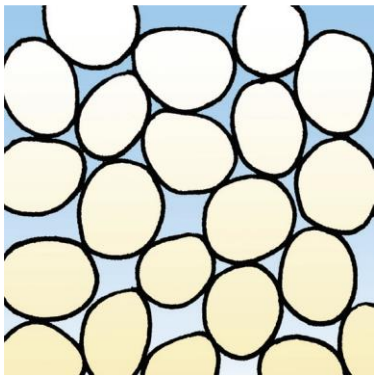
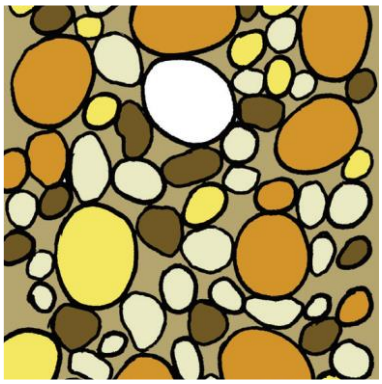
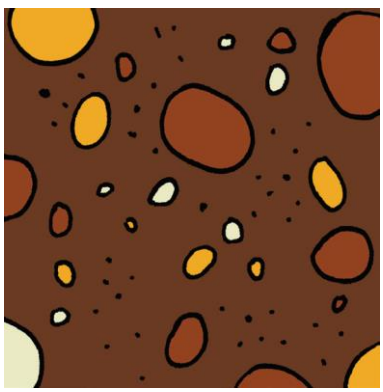
Teacher Fact Sheet

Did you know?
One tablespoon of soil contains more organisms than the entire population of people on Earth.

Key vocabulary

Clay: A very fine-grained soil that turns sticky when water is added
Permeability: The ability of a fluid to move through soil or limestone rock
Porosity: The amount of space in a rock or soil that is able to store water
Sand: A loose material consisting of grains of rock or coral

Soil type affects how well plants grow, and how effectively we can water them. Soil is a mixture of mineral particles, water, air, living organisms and decomposed organic matter. The size of the mineral particles determines the spaces available for the other elements and, hence, the fertility, water-holding capacity and drainage capability of the soil. Porosity relates to the ability of a soil to hold water in the spaces between individual particles or grains. Permeability relates to the ease with which a fluid is transmitted through the soil.

	Well sorted grains (uniform soil) The grains that make up the soil, sediment or sedimentary rock are said to be well sorted if most are about the same size. The grains may be large, medium, small or very small. Because they are well sorted, there is a high proportion of space between the grains. This type of material is able to hold a considerable volume of water, which flows through the soil easily. Soils of this type are porous and permeable. Examples: beach sand, river pebbles, marbles in jars.
	Medium sorted grains The grains that make up the soil are said to be medium sorted if they are of different sizes, but with a small range of size, and a majority of grains are the same size. There is a fairly high proportion of space between the grains, and large volumes of water can be held in the soil. Soils of this type are less porous and less permeable than well sorted soils. Examples: some garden soils, sandy soils, limestone soils.
	Poorly sorted soil grains The grains that make up the soil are said to be poorly sorted if the range of sizes is wide, and no one size is in a majority. Many of the grains are microscopic and are able to fill the spaces between the larger grains. The proportion of soil space is low, and little soil water can be held. Soils of this type have low porosity and low permeability. Examples: alluvial soils, loam.

Activity Sheet: Microscope Data Soil Testing

Name of soil sample:_____

Observations and sketches for 60x magnification

_____

_____

_____

_____

_____

_____

_____

Observations and sketches for 80x magnification

_____

_____

_____

_____

_____

_____

_____

Observations and sketches for 100x magnification

_____

_____

_____

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_____

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Upon completion students decide which soil sample they think could store the most water and provide an explanation for their choice.

Source: https://www.watercorporation.com.au/home/education/teaching-resources/find-a-lesson-plan/lesson-plan/soils-and-water-storage-under-the-microscope

pH Soil Testing

Farming starts in the ground for most plants and the composition of soil is critical to get right to achieve good production of any crop.

Learning Objectives:

- Learn various techniques that are used to modify the quality of soil

Curriculum Links: TE4-5AG (ACTDEK032) Plant species grown in managed environments; TE4-2DP (ACTDIP025; ACTDIP026) Acquire and interpret data

Materials:
Soil pH Test Kit
Soil (preferably soil that is planned for tomato production)

Activity:

1. Test the pH of your soil following instructions from Soil pH Test Kit.
2. Investigate what you can grow in the type of soil you have around the school.
   Discuss what pH means and what you are looking for in your soil.
   Note: To grow tomatoes if the pH of the soil is less than 6, the soil is too acidic and you will need to add some agricultural lime.
   If the pH of the soil is over 7, the soil is too alkaline and you will need to add some sulphur or leaf mulch, or pine needles to bring the pH level down.

3. Students research how to change the soil types by adding primary and secondary nutrients. Investigate how plants use Nitrogen, Phosphorus, Potassium, Magnesium and Calcium and products that contain these nutrients that can change soil composition.
4. Students record their research using the Activity Sheet: Nutrient Investigation

Activity Sheet: Nutrient Investigation

Nutrients	Reasons for plants needing this nutrient	Investigate how this nutrient be added to plants to improve soil.	Nutritional deficiencies in plants. Include a photo of a plant with this nutrient deficiency and explanation.
Nitrogen			
Phosphorus			
Potassium			
Magnesium			
Calcium			

Coding for Soil Moisture Testing

Learning Objectives:

- Explain the basic control structures in coding and how they can be used to control program flow during execution.
- Discuss some of the activities involved with coding, debugging and maintaining programs in coding.

Curriculum Links: TE4-2DP; TE44DP; TE4-7DI (ACTDIP025) collect and access data from a range of sources (ACTDIP030) implement a functioning user interface

Materials:
Arduino board and probe module
Computer with Arduino IDE installed
Coding for Agriculture resource document (included on RAS USB)

Activity:

Introduction to Arduino coding and measurement modules.
Arduino is a very popular and open-source electronics platform. Hardware components and software code are very easy to work with to perform a variety of agriculturally beneficial measurements or tasks. Our goal is to connect, code and take measurements utilising two separate Arduino prototypes to measure soil moisture, temperature and humidity

Tomato Production

We live in a world with more data than we could ever comprehend. Infographics are an important tool to make sense of data and provide quick visual understanding to the audience.

Learning Objectives:

Research tomato production in Australia to gather data as a stimulus to understand and create a digital map using abstractions to represent their data on growing conditions and the type of tomato produced in different locations

Curriculum Links:
TE4-2DP (ACTDIK024) investigates how digital systems represent text, image and audio with whole numbers

Activity:

- Research the main growing regions for tomatoes in Australia and then locate and mark these areas on a map of Australia. Encourage students to record their findings digitally using pins. Include quantity of tomatoes grown, regional climate and fun facts.
- Visit the www.tomatonews.com web site to study and discuss infographics supplied on global tomato processing in 2018 http://www.tomatonews.com/en/background_47.html.
- Students design and create a new infographic to show their findings.

Note: Whilst potatoes are by far the biggest vegetable commodity grown in Australia by volume, with over 1.3 million tonnes of potatoes grown for human consumption and processing in 2016-17. The next-largest crops were tomatoes (around 426,000 tonnes), carrots (around 318,000 tonnes), onions (around 277,000 tonnes) and head lettuce (around 128,000 tonnes) https://ausveg.com.au/

Research on Tomato Varieties and Growing Conditions

Learning Objectives:

Investigate a broad range of tomatoes to better understand how and why they are used

Curriculum Links: TE4-6FO (ACTDEK032) Investigate ideal conditions for growth and development of an agricultural plant

Activity:

- Students research the tomato types on display and the growing requirements for each of the tomato types identifying any particular growing requirements or conditions require to grow each variety.

- Once correctly identified, students complete the investigation to identify the best type of food processing applicable to the tomato type. A broad range of tomato types can be found year round at larger supermarkets or farmers markets to ensure tomatoes selected meet the range of processing from fresh, canned, bottling, preserving, dehydration, etc.

- Students discuss the best tomato for growing based on the location of the garden at the school. Space considerations and sun must also be taken into consideration when identifying growing crops.
- It may also be beneficial to experiment with multiple varieties to see which tomato crops grow best in the area you have available.

Teacher Note:

- Bigger tomatoes require infrastructure in the form of a stake or trellis. Smaller tomatoes can grow anywhere and will ripen very quickly so you need to process them over a short period of time. There are so many varieties, it is worth experimenting to see what grows best in the position and space you have available.

Class Discussion should include the type of facts students should be looking for:

- Varieties of tomatoes, nutritional facts, region characteristics for growing, products manufactured from tomato varieties.
- Make a table of the various types of tomatoes produced, a description of the tomato types and how the tomatoes are used in food production. A sample table has been provided although there are over 3000 varieties of tomatoes grown in Australia.

Description	Photograph of Tomato Type	Use: Salad, slicing, bottled, salsa, sauce, preserves, dehydrated
Grosse Lisse Example: These popular trussed tomatoes are also known as indeterminate tomatoes. They grow medium to large and have a great flavour which makes them very popular. They are an excellent source of Vitamin C. A and E.		
Father Tom		
Roma		
Pink Oxheart		

Description	Photograph of Tomato Type	Use: Salad, slicing, bottled, salsa, sauce, preserves, dehydrated
Lemon Drop		
Black Russian		
Sweet Bite		
Yellow Pear Tomatoes		

Description	Photograph of Tomato Type	Use: Salad, slicing, bottled, salsa, sauce, preserves, dehydrated
Sweet Grape Cherry Tomato		
Mixed Heirloom		
Costoluto		

Description	Photograph of Tomato Type	Use: Salad, slicing, bottled, salsa, sauce, preserves, dehydrated

Discussion: Why a tomato is scientifically a fruit but also known as a vegetable.

Learning Support: Students make a collage of various processed tomato products.

Analyse Local and Imported Tomatoes

Learning Objectives:

- Analyse the differences between local and imported tomatoes in the supermarket.

Curriculum Links: TE4-6FO investigate the characteristics and properties of a variety of nutritious foods

Activity:
Provide your class with the following scenario before your practical investigation on tomatoes.
Consider this scenario: You are visiting the local supermarket looking to buy tomatoes to make a sandwich for lunch. You notice that there are different types of tomatoes available at different prices.
You wonder what the difference is and why there is a difference in price. You decide to investigate and buy samples from a locally sourced Australian producer and samples from an imported producer.

Resources:

Local and Imported tomatoes
Chopping board
Knife
Ruler
Computer to create table or printout of table for recording measurements

Steps:

1. Record the price and the country of origin of the tomatoes you produce.
2. Make note of any packaging if any around the produce.
3. In groups generate a hypothesis regarding the differences you expect to find.
   Note:
   Hypothesis Example: The imported tomatoes will have less flavour and fewer seeds inside.
   Hypothesis Example: There will be no difference between the two types of tomatoes
   Hypothesis Example: The skin of the imported tomatoes will be thicker.
4. Slice each tomato to observe the inside. Photograph a sample of each for your results section.
5. Measure the inside wall of each tomato from the outer surface to the seed section and record measurements. Measurements should be taken from at least 3 different points and averaged to ensure accuracy.

6. Observe and record the seed structure and the thickness of the septa (branches of tomato flesh running from the wall to the centre of the tomato.
7. Students should use the data generated to record their findings to support or rebut your hypothesis.
   Students should further research why there might be differences to support their findings.
   Note: The data should support that imported tomatoes have greater thickness in the walls due to genetic makeup and to allow them to withstand transport. Imported tomatoes are often picked earlier when green to remain firm and ripened with ethylene gas to ripen during transport. Flavour may also be identified as vine ripened are often sweeter due to allowing them to ripen naturally on the vine whilst imported tomatoes are ripened with gas.
8. As a class discuss the findings.

Discussion:

1. Explain why the different tomatoes have different flavours.
2. Explain the nutritional benefits of tomatoes to a healthy diet.
3. Discuss how tomato growing has changed over the past 50 years.
4. What are the desired traits of the perfect tomato?
5. Discuss the relationship between the thickness of tomato skin and whether the tomato is imported or not.
6. Discuss how food scientists have played a role in the changes to tomatoes in supermarkets.

Extension:

7. Consider the environmental issues associated with tomato farming and year round supply to supermarkets.
8. Investigate the carbon footprint associated with the transport of tomatoes from different countries versus locally grown tomatoes.

Exploring our Supply Chain

A supply chain is a network of people and activities that help move a product from start to consumption by the end user.

Learning Objectives:

- Describe the interdependence of consumers and producers of food in the market
- Explain the importance of short and long term planning to business success
- Explain how food manufacturing has evolved over time and the effects on the economy and sustainability of resources and food supply

Curriculum Links: TE4-1DP (ACTDEP038, ACTDIP027, ACTDIP031) Develop criteria to evaluate processes and solutions, the functionality and a range of constraints eg accessibility, economic, resources, safety, social, sustainability, technical. (ACTDEK032) Investigate how food production is managed in environments as a system and how sustainability can be improved

Resources:
Supply chain sample
Paper for sketching
Squeeze bottle of tomato sauce

Background:
The fresh produce you buy is often in distant farms before it is packed, transported, distributed and they are put on sale. Consider the differences between the supply chain from growing your own vegetables and picking them from your garden to tomatoes that have been grown a distance away and kept under refrigeration and transporting long distances. Consider the energy used, machinery in manufacturing, storage and transportation, and effects on nutrition machinery and energy required in manufacturing the greater loss of nutrients and flavour.
Explain that food processing transforms raw food and ingredients into new products.
Consider the following terms; fresh, moderately processed, highly processed.
As a class discuss what foods would be classified under each category that are tomato based.

Activity:

1. Introduce the concept of a supply chain.
2. Provide a sample of supply chain to review for another product.
   Note: Encourage students to think about how the complexity of a supply chain might vary for different types of products; for example, produce that is sold at a farmers market versus bottled tomato sauce.
   Note: You could also provide a variety of different products for class investigation.
3. Explore a real example. Ask students to help identify the various ingredients and processes needed to make tomato sauce.
4. Discuss and write the ingredients on the board as individual students think of them.
5. Ask students to pinpoint on a map where the raw ingredients and materials for packaging come from.
6. In pairs have students sketch the supply chain process for the tomato sauce.
7. Have pairs of students explain their work. Ask each pair to briefly present their drawing and explain their thinking to the class. Highlight the key supply chain stages by writing them on the board as students say them and drawing arrows between them.

Key stages could include:

- Supply—raw materials supplied to manufacturing
- Manufacturing—focuses on building, assembling, converting, or furnishing these raw materials into finished products
- Distribution—focuses on ensuring these products reach consumers through an organized network of transporters, warehouses, and retailers
- Consumption—customers

Extension:

1. Discuss what is the relationship between how processed food is and how healthy it is?
2. What is the relationship between food processing and food safety?
3. Explore the pros and cons of food processing.

pH and Food Processing of Tomatoes

Learning Objectives:

- Determine the pH of common food ingredients
- Determine the ideal temperature for canning tomatoes.

Curriculum Links:
TE4-5AG; TE4-6FO (ACTDEK033) identify a range of feed preparation techniques and analyse the impact on nutrient value (ACTDIP025; ACTDIP026) Acquire and interpret data

Activity: The pH of Foods

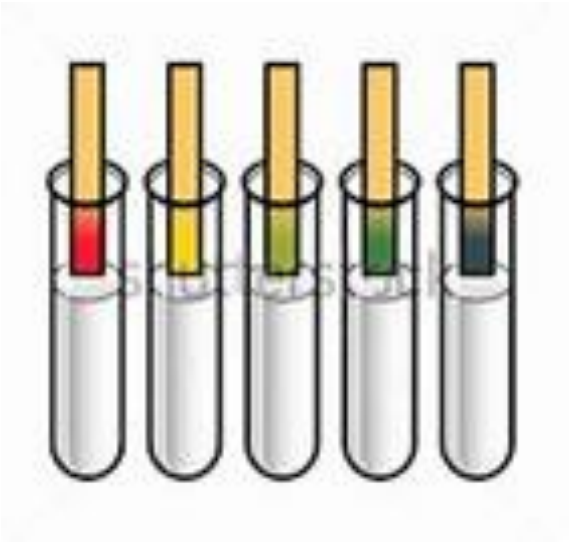
Background Information:

When food is preserved, the microorganisms causing food spoilage are destroyed or slowed down. This is done by using extreme temperatures, changing the moisture level, or altering the acidity of the foods. The temperature of canning is extremely important for safety reasons. Foods with a pH higher than 4.6 must be canned at 115^{o}C or greater. Foods that are more acidic, having pH measurements less than 4.6, may be preserved at 100^{o}C. This difference in temperature can affect food taste and cost.

Materials:

1 test tube rack per group of students with 6 test tubes.
pH paper 1-11 range (plus colour chart to read the pH paper)
Labels
Tweezers
Data Sheet
Food Ingredients

1. Lemon Juice
2. Pear Juice
3. Carrot Juice
4. Tomato Juice
5. Spare
6. Spare



Introduction:

- Discuss reasons and ways tomatoes are preserved in manufacturing.
- NB. You will have previously discussed the importance of pH in soil. In this lesson, we will look at the importance of pH in food preservation.
- Discuss the importance of acidity in preservation and canning.
- Explain what pH is again and how scientists in food production would determine the pH of a substance.
- Introduce the litmus indicator to test a range of acidity in different products. Discuss how to use the litmus in the experiment to test the acidity of a range of juices.
- For ease of testing, only juices will be used.

Procedure:

1. Label each test tube with the corresponding number and juice to be tested.
2. Half fill each test tube with the juice to be tested, ensuring equal quantities in each test tube.
3. To determine pH, using tweezers, dip one end of litmus into one test tube and record the pH of the juice being tested. Repeat this for each test tube.
4. Match the colour of the pH with the colour chart provided
5. Record your results on the data sheet provided.

Evaluation:

- Discuss which products could be preserved at lower temperatures and which would need to be canned at higher temperatures.
- Discuss where tomatoes fit into this test?
- When do you think food scientists should check the pH of food items to be canned?
- Evaluate a variety of different brands of canned tomatoes to assess additives that are used in canning to aid preservation.

Teacher Notes:

- Canned tomatoes often contain lots of salt. If you check the label, you'll typically find anywhere from 100 to 300 milligrams of sodium per serving – that's 4 to 13 percent of the daily recommendation.
- You may also find preservatives like citric acid and calcium chloride on some products. Both are considered safe to eat. Citric acid helps preserve colour, while calcium chloride helps keep diced tomatoes nice and firm.

Extension:

- Investigate what could be done to change the pH of foods tested. Use test tube 5 and 6 to experiment with altering pH levels after researching additives on a range of different brands of canned tomatoes.

Activity Sheet: Information that Must Appear on a Label

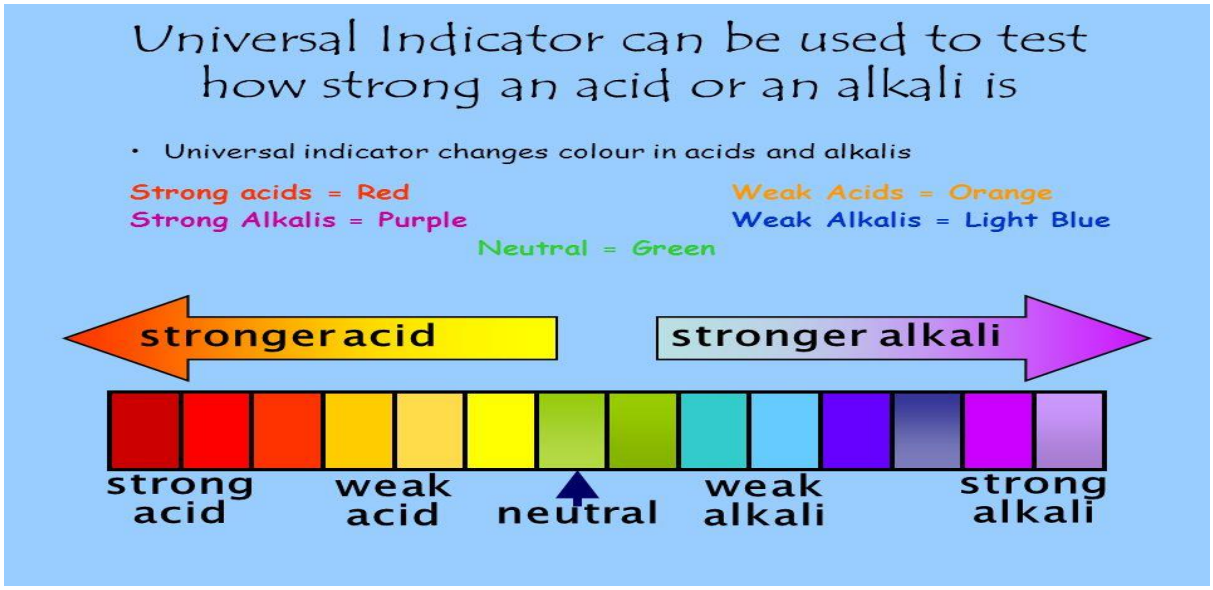
The Food Standards Code states that all food labels must contain the following information:

- Name and/or description of the food
- Identification of the 'lot' number *
- Name and Australian street address of the supplier of food *
- List of ingredients
- Date mark
- Nutrition information panel (NIP)
- Country of origin of the food
- Warning and advisory statements

This information must be legible, prominent and in English. If a label is in another language, that's okay so long as essential information is also in English.

Data Sheet

Test Tube	Juice Sample	pH: Acid, Neutral or Alkaline
1.	Lemon Juice	
2.	Pear Juice	
3.	Carrot Juice	
4.	Tomato Juice	
5.		
6.		



Practical Applications Taste Testing Salsa Challenge

Learning Objectives:

- Determine the best ingredients to add to tomatoes to make a tomato salsa
- Create a recipe for a tomato salsa.

Curriculum Links: TE4-6FO (ACTDEP039) Produce an implement an agricultural project and or produce nutritious food

Activity:

- Following the research on different tomatoes, invite students to taste test different tomatoes and take the Tomato Salsa Challenge.

Resources:
School Kitchen with bowls, chopping boards, measuring equipment etc.
Basil, salt, pepper, lemon, sugar, olive oil, vinegar, capers, rosemary, tomato sauce, chilli flakes, corn kernels, lime, coriander, garlic.

Tomato Salsa Practical Challenge

- Challenge students to invent a recipe for a delicious tomato salsa.
- Explain that they will work in small groups to make their recipe.
- The groups will decide which and how much of the ingredients to include.
- Point out that they may use no more than six ingredients in their recipe from the provided list, their recipe must include tomatoes, and that students must measure their ingredients so others can make the recipe.
- Groups should also choose a scribe to ensure that they write down their ingredients, what they use and how.

- Divide the class into small groups and give them copies of the “Tomato Salsa Challenge” student handout. Direct students to decide within their group which ingredients they want to use in their recipe, creating a “shopping” list. Encourage them to think about flavours they enjoy and what would complement the tomato. Have groups bring you their shopping lists. Fill their orders by placing the requested ingredients on a plastic plate to take back to their tables.
- Allow groups time to measure their ingredients, mix ingredients together, taste the salsa, and then adjust the recipe to the palate.
- When they are happy with the results, groups should come up with a name for their salsa and complete the recipe card portion of the student handout. Encourage creativity in naming the salsas.
- Invite groups to present their recipe to the rest of the class, explaining how and why they chose their ingredients and sharing the name and description of their salsa.
- After all groups have presented, conduct a taste test of the different salsas, using tortilla chips to sample each one. Have students vote to choose their favourite salsa. To avoid the problem of everyone just voting for their own, you might have students vote for their top two.

Salsa Challenge Student Handout

You are about to make a tomato salsa using a selection of ingredients from this shopping list.

You are only permitted to choose 6 ingredients from this shopping list to make a tasty and satisfying salsa recipe.

Each ingredient chosen must have measurements so that you can complete a recipe card as part of this salsa challenge.

Shopping List

Basil, salt, pepper, lemon, sugar, olive oil, vinegar, capers, rosemary, tomato sauce, chilli flakes, corn kernels, lime, coriander, garlic.

My ingredients	Measurement	Why I chose this ingredient

My Recipe Card

Image of Salsa:
Ingredients:
Method:
Serving Suggestions:

Preservation and Value Adding with Tomatoes

Learning Objectives:

Develop a deeper understanding about food selection and preparation
Select and use a range of tools safely in food preparation

Curriculum Links: TE4-6FO; (ACTDEP039) produce and implement an agricultural project and/or produce nutritious food TE4-3DP (ACTDEK037) Select, justify and use a range of appropriate tools and techniques in an agricultural project and/or food production.

Activity 1: Vinegar Pickled Tomatoes Practical

This is a great way of adding a little extra flavour to your salad dressings or to stir into soup. The tomatoes have a sweetness which pairs really well with vinegar.

Ingredients:
150g cherry tomatoes
200ml cider vinegar (or enough to top up a jar)
2 tsp sugar (optional)
1 bay leaf
1 garlic clove, smashed
1 tsp black peppercorns

1. To work out how much vinegar you will need put your tomatoes in a screw-top jar and pouring in enough water to fill the jar. Pour the water into a measuring jug to work out how much vinegar you will need. This quantity of tomatoes needed is 200ml.
2. Pour the vinegar into a stainless-steel saucepan. Add the sugar, bay leaf, garlic and peppercorns. Bring to the boil and then simmer until the sugar has dissolved. Remove from the heat and set aside.
3. Put the tomatoes in a sterilised screw-top jar. Pour over the vinegar together with the bay leaf, garlic and peppercorns. Leave to cool before sealing. Leave in a cool place for about 2 weeks to allow the flavours to develop. Use the vinegar in your favourite salad dressings, drizzle over soups or to add a hint of acidity to stews or marinades.

Note: Make an insertion in the tomatoes with a sharp knife, and then squash the tomatoes slightly. If you can give the jar a shake every few days it will speed things along. Strain the vinegar into a clean jar or bottle. Add the remaining pulp to salad dressings and stews for more tart flavours.

Activity 2: Tomato Seed Crackers Practical

Ingredients

½ cup sunflower seeds
½ cup pumpkin seeds
½ cup sun dried tomatoes
2 carrots, roughly chopped
1 garlic clove (optional)
½ teaspoon sea salt
1 Tablespoon fresh oregano
1 cup LSA mix (Ground linseed, sunflower kernels and almonds)
¼ cup whole flaxseed

Method:

4. Soak the sunflower and pumpkin seeds overnight in cold water.
5. Soak the sun-dried tomatoes in warm water and set aside for 30 minutes.
6. Place the sun-dried tomatoes, carrots, garlic, salt and oregano in the bowl of a food processor and pulse until smooth.
7. Transfer mixture to a large mixing bowl. Add LSA mix and whole linseed and stir to combine.
8. Drain the soaked seeds and place in a food processor. Gently pulse until the seed mixture is coarsely chopped.
9. Pour seeds into the mixing bowl and combine with all ingredients until mixed thoroughly.
10. Line trays for the dehydrator with grease proof paper. Spread mixture to approximately 5mm and smooth over the surface.
11. Dehydrate at 40oC for 8-10 hours. If you don't have a dehydrator use the oven on the lowest setting and then turn off overnight.
12. Place another sheet of paper on top of the surface and flip over the crackers. Using a sharp knife, score the crackers to size.
13. Dehydrate for a further 8-10 hours until the desired crispness is achieved.
14. Once fully dried, snap the crackers along the scored lines and store in an airtight container.

Activity 3: Tomato Passata Recipe

Ingredients
2.5kg ripe red tomatoes, washed, halved
250g onions, chopped
½ garlic bulb, cloves separated, peeled, bruised
1/4 cup (125ml) olive oil
1/2 bunch basil, leaves torn
2 teaspoons salt
½ teaspoon freshly ground black pepper

Method

1. Preheat oven to 180°C. Grease baking trays
2. Spread tomatoes, onion and garlic evenly across prepared trays, then season with 1 tbs salt flakes and 1 tsp freshly ground black pepper. Drizzle oil evenly over tray and toss to combine. Roast for 45 minutes or until tomatoes are blistered and onion has softened. Set aside to cool, then stir through basil.
3. Pass tomato mixture through a sieve into a bowl. Repeat several times, pressing the seeds and skins each time to gain as much flavour as possible. For a finer passata use muslin in the sieve, extracting as much juice as possible.
4. Sterilise bottles and lids and pour passata into hot jars. Tap jars on a work surface and run a clean knife around the inside to remove any air bubbles. Wipe the rim of the jars with paper towel
5. Line the base of a large stockpot (it should be deep enough to submerge the jars under water) with a tea towel and, working in batches if necessary, add jars, making sure they don't touch the sides of the pot or one another.
6. Roughly matching the water temperature to the temperature of the jars (this prevents the jars breaking when the water is added), pour in enough water to completely cover the jars. Slowly bring to the boil over medium heat. Boil for 40 minutes, adding more boiling water when necessary so the jars are completely submerged at all times, or until the jar lids are puffed up and convex. Using a heatproof jug, carefully remove enough water from the pot to allow you to carefully remove jars from water using oven gloves or a thick tea towel. Set aside at room temperature overnight.
7. The next day, the jar lids should be concave, confirming they are vacuum sealed. If lids are not concave, passata should be stored chilled and used within 2 weeks. Sealed jars can be stored in a cool, dark place for up to 1 year.

Quick Tomato Passata

Ingredients
800g canned tomatoes
¼ Cup olive oil
2 Tab sugar
1 teas salt
½ bunch basil torn

Method

1. Place all ingredients in saucepan and bring to simmer.
2. Simmer and stir occasionally until sauce thickens and reduces to required consistency. This will take approximately 30 minutes.
3. Bottle in sterilised jars or use straight away.

Class Activity:
As a class, compare the two products by evaluating taste, differences in cooking techniques, manufacturing processes and the quality of the end products.

Practical Assessment - Technology and Recipe Development

Curriculum Links:
TE4-6FO; TE4-10TS (ACTDEK033) Identify a range of food preparation techniques and analyse the impact on nutrient value (ACTDEP039) Investigate and communicate how a recipe can be improved to enhance nutritional value, and justify the recipe adjustment.

Activity:

- Students will conduct research on one technological advance in food processing (eg: canning, freeze drying, dehydrating, drying (air or mechanical), vacuum packaging, pickling)
- They will explore why the advancement was invented and what problem it addressed in food production.
- Analyse the benefits and costs and discuss your opinion on whether it has led to a societal benefit.

Recipe Development:

Research products in the supermarket that use tomatoes and involve processing. Students will write their own recipe using fresh ingredients to create the same product. Submit a food order and prepare this recipe for one serve in a practical lesson in the kitchen. Examples could include tomato soup, pasta sauce, tomato paste, dehydrated tomato soup, tomato chutney, sundried tomato ravioli etc.

Evaluate the process of writing, costing and making this recipe with fresh ingredients. Discuss whether this was challenging and the pros and cons of making this recipe from raw ingredients versus using a processed food item. Evaluation may reflect the time to make, costing, ingredient availability, nutritional value, manufacturing processes, taste.

Case Study - Costa Tomatoes

Costa's Guyra facility is one of the largest growers of tomato plants in NSW.

Curriculum Links: TE4-5AG (ACTDEK032) Investigate how food production is managed in environments as a system and how sustainability can be improved.

Activity:

- Students research how Costa manage their facilities to ensure environmental sustainability.
- Create an infographic to represent the main points gathered during research with reference to environmental sustainability.
- Students present their infographics to the class and discuss findings.

Resources:
https://www.theland.com.au/story/5814622/relishing-a-tomato-future-at-guyra/

https://www.northerndailyleader.com.au/story/5605713/costa-group-to-expand-guyra-tomato-farm-and-deliver-150-more-jobs/

http://investors.costagroup.com.au/FormBuilder/_Resource/_module/YfnrttzbYEyUJyNrb86SEg/file/Costa-Group-Sustainability-Report-2018.pdf

Extension:

- What technological developments do you think we will see in futuristic farming to improve sustainability?