

Salty Seeds Unit Overview

Age 9–10

Objectives

- To show where Mexico is located in the world
- To describe some of the geographical features of the country
- To demonstrate how the germination of seeds is dependent on the environment
- To understand that dissolving salt in water is a reversible change of state
- To ask relevant questions to extend my understanding
- To argue my point of view and consider and evaluate different viewpoints

The Big Questions

- What problems do Mexican farmers have?
- Can plants be helped to grow in difficult places?
- Should we buy food from poorer countries?



Pepper - Shutterstock.com / cloki

Unit Summary

The idea behind this unit is for children to use science to solve a problem faced by real farmers in Mexico – how to grow strong, healthy plants that can survive and thrive in difficult conditions. During the activities, children will develop their skills in working scientifically, conducting an experiment under fair test conditions and in researching and debating real issues of global significance. Note that the experiment in Lesson 2 will take place over several days or up to five weeks. Complete the experiment before moving on to Lesson 3, so that children can refer to their results.

Background Information

Population growth has outstripped food production in recent years – the world's population is projected to increase to 9 billion by 2050. Demand for food is expected to increase, but the amount of land suitable for food production is likely to decrease. Drought, salt water, flooding, high temperatures, pests and disease are making it harder for farmers to produce food.

The Senora region of Mexico faces big issues caused by irrigation and water shortages in the region. Irrigation, applying water to soil in areas that are very dry or have periods of low rainfall, results in salinised soils as salt that has accumulated in the soil layers is drawn up towards the surface. Modern scientists are looking at how to speed up germination times and initial growth rates, so that the emerging roots pass quickly through soil which sometimes presents a hostile environment for young plants. Halo priming (soaking seeds in salty water before planting them) is a very simple way of changing an uncommon variable to modify the way a plant grows. It was developed with children in Northern Ireland by the University of Belfast.

Curriculum Links

England Year 5

Living things and their habitats

Describe the life process of reproduction in some plants and animals.

Properties and changes of materials

Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.

Demonstrate that dissolving, mixing and changes of state are reversible changes.

Working scientifically

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate

Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

Using test results to make predictions to set up further comparative and fair tests

Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

Identifying scientific evidence that has been used to support or refute ideas or arguments

Wales KS2 Interdependence of organisms

Pupils should use and develop their skills, knowledge and understanding by investigating how animals and plants are independent yet rely on each other for survival.

They should be given opportunities to study through fieldwork, the plants and animals found in two contrasting local environments, e.g. identification, nutrition, life cycles, place in environment; the environmental factors that affect what grows and lives in those two environments, e.g. sunlight, water availability, temperature.

How humans affect the local environment, e.g. litter, water pollution, noise pollution.

Northern Ireland KS2 WAU

Pupils should be enabled to explore:

Strand 1: Interdependence

How living things rely on each other within the natural world.



Strand 3: Place

Ways in which people, plants and animals depend on the features and materials in places and how they adapt to their environment.

Positive and negative effects of natural and human events upon place over time.

Strand 4: Change over time

The effect of positive and negative changes globally and how we contribute to some of these changes.

Scotland: Curriculum for Excellence

First: Properties and uses of substances: I can make and test predictions about solids dissolving in water and can relate my findings to the world around me.

Second: Topical science: Through research and discussion I have an appreciation of the contribution that individuals are making to scientific discovery and invention and the impact this has made on society.

I can report and comment on current scientific news items to develop my knowledge and understanding of topical science.

Second: Biodiversity and independence: I have collaborated in the design of an investigation into the effects of fertilisers on the growth of plants. I can express an informed view of the risks and benefits of their use.

Second: Inheritance: By investigating the lifecycles of plants and animals, I can recognise the different stages of their development

Wider curriculum

Geography: Locate the world's countries, using maps to focus on Europe (including the location of Russia) and North and South America, concentrating on their environmental regions, key physical and human characteristics, countries, and major cities.

Cross-curricular opportunities

Geography: Learners will learn about some geographical features and climactic conditions in Mexico, and how human populations rely on them.

English: Learners will develop an understanding of how to conduct a debate.



For extra drama opportunities, consider preparing and performing the Theatre of Debate Play-in-a-Day, For Richer, For Poorer.



Viva Mexico!

Lesson Notes 1

What's It All About?

Children will learn about the problems faced by farmers in Mexico as a result of irrigation and water scarcity. They will begin to develop hypotheses about how the strength and yield of crops could be improved.

Learning Outcomes

- I can show where Mexico is located in the world.
- I can describe some of the geographical features of the country.

Working Scientifically

- Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

Big Question

- What problems do Mexican farmers have?

Key Words:

borders, desert, annual rainfall, irrigation



Equipment



From The Crunch Kit:

Resource Sheet 1: Mexico Map (Teaching Notes, p84)
 Resource Sheet 2: Mexico Task Instructions (Teaching Notes, p85)
 Mega Map



From The Crunch Website:

Salty Seeds PowerPoint (Lesson 1)

Other Things You Will Need:

Two strips of paper (1220 mm and 752 mm)
 A variety of colouring pencils
 Sticky notes
 Access to the internet or library for research



Preparation

Cut out and label two strips of paper that are 1220 mm and 752 mm long.

Copy Resource Sheet 2 and cut it into strips to provide differentiated tasks for different children.

Appetiser

Give each child a small sticky note. Show the children the Mega Map and ask for volunteers to put their sticky note where they think Mexico is on the map.

Ask the class to confirm if they think each position is (a) close, (b) totally right or (c) totally wrong, then reveal which estimate was closest. Ask the children to look at the countries on Mexico's borders. In small groups, the children should talk about what they think each country might be like in terms of population, climate, vegetation and wildlife, for example.

Main Course

Explain that now you've agreed where Mexico is, you are now going to think more about what the country is like. Tell the children that they are going to create a Mexican Fact File.

Give the children the blank map of Mexico on Resource Sheet 1, and the relevant task for each child from the differentiated tasks on Resource Sheet 2, or displayed on the Salty Seeds PowerPoint. Less able children should complete Task 1, most children should complete Task 2 and more able children should complete Task 3.



Ask the children to use maps or the internet to conduct some research and complete the features listed on their task sheet. You may also want to ask the children to make a key for their maps.

Ask the children to share their maps with the class. Which two features on their maps are the same as in our country, and which two are different? The children may notice that there is a lot of desert in Mexico.

Now show the children the paper strip showing 1220 mm, and tell them that that represents the average amount of rain that falls in one spot in the UK in a whole year. Ask for volunteers to use a whiteboard pen to mark on how much water they think falls in Mexico on average. Now show them the paper strip showing 752 mm. Explain that this represents average annual rainfall in Mexico. Given the small amount of rain that falls in Mexico, explain that farmers have to apply a lot of extra water to their crops (irrigation) to grow enough to feed the people in their country in order to keep them healthy.

Dessert

Tell the class that they are going to play a Mexican Challenge game. Divide the class into small groups. Tell them that you will choose two of the groups. Each group will take turns to name something that is the same or different about Mexico and their area, or a fact about irrigation. Whoever gets one wrong or can't think of anything drops out. The winning team moves on to play the next team. The winner is the team who has given the most answers.

An Extra Helping

Research more facts about the country of Mexico. Use maps or the internet to compare rainfall in different countries throughout the world.



Stressing Seeds

Lesson Notes 2

What's It All About?

Looking at possible ways of improving plants' germination and rate of growth.

Learning Outcomes

- I can demonstrate how the germination of seeds is dependent on the environment.
- I understand that dissolving salt in water is a reversible change of state.

Working Scientifically

- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- Using test results to make predictions to set up further comparative and fair tests

Big Question

- Can plants be helped to grow in difficult places?

Key Words:

dissolving, germination



Equipment



From The Crunch Kit:

Resource Sheet 3: Seed Hypothesis (Teaching Notes, p86)

Resource Sheet 4: Seed Results (Teaching Notes, p87)

Tomato seeds

Compost nodules

Measuring spoons

Test tubes and stoppers

Test tube stands

Measuring beakers

Sodium chloride (table salt)

Plant pots

Other Things You Will Need:

Metre rulers

Labels and pencils

Preparation

Photocopy one copy of Resource Sheets 3 and 4 per group.



Safety

If you choose to buy packets of seeds, be aware that some bought seeds are coated in fungicide to help them last longer. Children should wash their hands thoroughly when handling bought seeds, or they should wear gloves throughout.

The compost supplied in The Crunch kit is safe to use with children. However, if you use your own compost in future, please use current year compost that has been stored in a cool place away from the sun. The compost should be damp. Open bags carefully in a well-ventilated area using sharp scissors or a knife. Pot up plants in a well-ventilated area. Avoid making dust. Children should always wash their hands after handling compost. Please check the [CLEAPSS](#) and [SSERC](#) websites for current advice. Please note that these sites are password protected.

Appetiser

Ask the children what they learned about Mexico in Lesson 1.

Remind them that Mexican farmers use irrigation to grow crops, and explain how this causes the soil to become very salty. This can affect the growth of crops and reduce the amount of food produced for people.

Tell them that scientists are trying to find ways of increasing food production. One way of doing this may be by 'stressing' seeds (soaking the seeds in salted water before sowing them). This is called Halo Priming. Ask the children to predict what effect they think this will have on their seeds.

The Science Behind It: In many hot countries, the top layer of soil often has a high concentration of salt in it. This is because, if the land is irrigated, the water will often go deep into the soil, dissolving mineral salts found there. These are then drawn up towards the surface, where they are deposited when the water evaporates. Roots therefore need to get to soil below this salt layer as quickly as possible, in order to have the best chance of growing.

Main Course

Divide the children into mixed ability groups and give each group Resource Sheet 3. Explain that children are going to carry out an experiment, soaking tomato seeds in salt water before sowing them. They will observe the germination and growth of the seeds over about five weeks to see what effect this has. Ask each group to follow the instructions on the sheet. Encourage each group to select their own amounts of salt for the other three test tubes. Check the salt solutions carefully, they may need to be made up in beakers and then transferred to test tubes, before adding the seeds. Ask children what they think would happen if they put more or less salt into the solution.

Remind the children that they need to ensure that they are changing only one variable (the amount of salt).

All other elements must be exactly the same, including the amount of water in the test tubes.

Once the children have hydrated the compost nodules and sown their seeds, tell them that they must treat each plant pot in the same way. Why do they think that is? The compost needs to be kept moist but not over-watered so keeping the compost moist for all pots is as fair as it's possible to be. Once the seeds germinate however, larger seedlings need more water.

Demonstrate how to safely remove a plant from a pot so as not to damage its roots. When the plants have developed at least two proper leaves, ask the children to carefully remove each plant from their pots and measure the lengths of the roots. They should record the longest from each pot on Resource Sheet 4.



The Science Behind It: The stressed seeds germinate and grow faster than the control seeds. It is thought that this is because they are trying to quickly produce roots which will reach down below the hostile environment (salty soil) in which they find themselves, to more suitable soil below.

Dessert

Discuss what variables the children could change in this experiment to investigate other things. Could the activity be repeated using different concentrations of salt? Consider asking the children to investigate what happens to plants grown in sandy soil. Can they predict if the outcome will be the same as or different to the outcome for plants grown in salty soil?



The Big Debate

Lesson Notes 3

What's It All About?

Learning to look at, evaluate and accept other points of view.

Learning Outcomes

- I can ask relevant questions to extend my understanding.
- I can argue my point of view and consider and evaluate different viewpoints.

Working Scientifically

- Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- Identifying scientific evidence that has been used to support or refute ideas or arguments

Big Question

- Should we buy food from poorer countries?

Key Words:

sustainability, debate



Equipment



From The Crunch Kit:

Resource Sheet 5: Writing Frame (Teaching Notes, p88)
Resource Sheet 6: Debating Cards (Teaching Notes, p89)



From The Crunch Website:

Salty Seeds PowerPoint (Lesson 3)

Other Things You Will Need:

Scrap paper
Pencils
Water bottles to encourage loud speaking voices!

Preparation

If the children have never debated an issue before, look together at the writing frame on Resource Sheet 5 and discuss how this structure can be used to formulate an argument and participate in a debate.

Appetiser

Ask the children to recap what they learned in Lesson 2 about growing crops in Mexico. How do the climate and geographical features of Mexico make it difficult to grow crops? What can be done to make it easier?

Tell the children that today you will be asking them to participate in a debate. Spend some time explaining the rules and structures of a debate for children who have never participated in one before. Explain that you will use some time to plan and organise, that they should listen carefully to others when they speak and always answer people's questions respectfully. Show the writing frame on the Salty Seeds PowerPoint to demonstrate how to build and present an argument.



Once you are happy that the children are ready, introduce the motion 'This House believes that Mexico should stop exporting food'. Display the debating framework on the Salty Seeds PowerPoint and explain that there are arguments both for and against this statement.

Main Course

Divide the class into eight groups. Ask four groups to formulate arguments against the motion and four groups to argue for the motion.

Give the children the writing frame and the debating framework (Resource Sheets 5 and 6) and give them time to research their arguments.

Encourage them to draw on what they have learned about Mexico and about stressing seeds in the previous lessons.

Ask them to write out their speeches. They should put their arguments in order of importance. They will need to practise their speeches with their teams and decide who will make the best spokesperson.

Running the debates could be done in a variety of ways. For example:

- (a) one team from each side could be asked to volunteer to present their arguments, while the rest of the class listen and judge each team's contribution
- (b) a series of smaller debates could run concurrently, with certain children chosen as judges to listen and evaluate each of these smaller debates.

Dessert

Ask the children to summarise some of the arguments they have heard.

After listening to the arguments, what do they think Mexico should do? Does the class believe that Mexico should continue to export food or not? Is it a clear cut issue?

An Extra Helping

Consider preparing and performing the Theatre of Debate Play-in-a-Day, For Richer, For Poorer. Explore the causes and effects of malnutrition. What happens to our bodies if we don't have a balanced diet?



Resource Sheet 1

Name

Date

Salty Seeds – Lesson 1

Mexico Map





Resource Sheet 2

Name

Date

Salty Seeds – Lesson 1

Mexico Task Instructions

Task 1

1. Give your map a title: **Mexico**.
2. Colour the land in **orange**.
3. Colour the sea in **blue**.
4. Put Mexico's capital city on your map, like this: ● Mexico City
5. Put a pointer to North on a corner of your map. Draw an arrow pointing straight up and put a capital N at the top of the arrow.

Task 2

1. Give your map a title: **Mexico**.
2. Using the internet or an atlas, find out where the arid lands are in Mexico and colour them in **orange**. Then colour the rest of the land in **green** and the oceans in **blue**.
3. Put Mexico's capital city on your map, like this: ● Mexico City
4. Put a pointer to North on a corner of your map. Draw an arrow pointing straight up and put a capital N at the top of the arrow.
5. Draw the Colorado River and the Rio Grande on your map. Label them in very small writing.

Task 3

1. Give your map a title: **Mexico**.
2. Put a compass in the bottom left of your map, pointing North.
3. Find out what the capital of Mexico is, and mark it on the map.
4. Find out where all the rivers are in Mexico, mark them on the map and label them. You may have to use very small writing!
5. Using the internet or an atlas, find out where the arid lands are in Mexico and colour them in **orange**. Then colour the rest of the land in **green**.



Resource Sheet 3

Name

Date

Salty Seeds – Lesson 2

Seed Hypothesis

Step 1: Write your hypothesis (I think that... because...)

Step 2: Prepare the seeds

1. Fill one of the test tubes with water.
2. Put a stopper in the test tube. Write 0 salt onto a label and stick the label on the test tube. This is your control sample.
3. Put $\frac{1}{8}$ of a teaspoon of salt into a beaker with 100mL of water. Stir until all the salt has dissolved, and then pour some of this solution into the second test tube. Put a stopper into it. Write $\frac{1}{8}$ salt onto a label and stick the label on the test tube.
4. Decide how much more salt you are going to put into each of the other 3 test tubes. Make up each salt solution in a beaker then transfer it to a test tube. Label each test tube with the amount of salt in it. **Don't use more than 2 teaspoons of salt.**
5. Put 5 seeds into each of the 5 test tubes, and leave them to soak for between 2 and 24 hours.

Step 3: Sow the seeds and grow the plants

1. Label 5 plant pots with the amount of salt used in the 5 test tubes. Put compost in each pot.
2. Sow the 5 seeds in each pot, making sure that you sow the seeds in the pot with the same label as the test tube.
3. Watch the containers over the next few days and note how many in each pot germinate each day.

Step 4: Gather the results

1. When the seedlings have at least one set of true leaves, take them out of the compost.
2. Record and compare the lengths of their roots.
3. Re-pot the individual seedlings and continue to grow them to compare their growth rates.

Step 5: Test your hypotheses

Was your hypothesis right? How do you know?



Resource Sheet 4

Name _____

Date _____

Salty Seeds – Lesson 2

Seed Results

Record your results in the table.

| Amount of salt | Date sown | Date of first germination | Length of longest root after _____ days |
|----------------|-----------|---------------------------|---|
| Control (0) | | | |
| | | | |
| | | | |
| | | | |



Resource Sheet 5

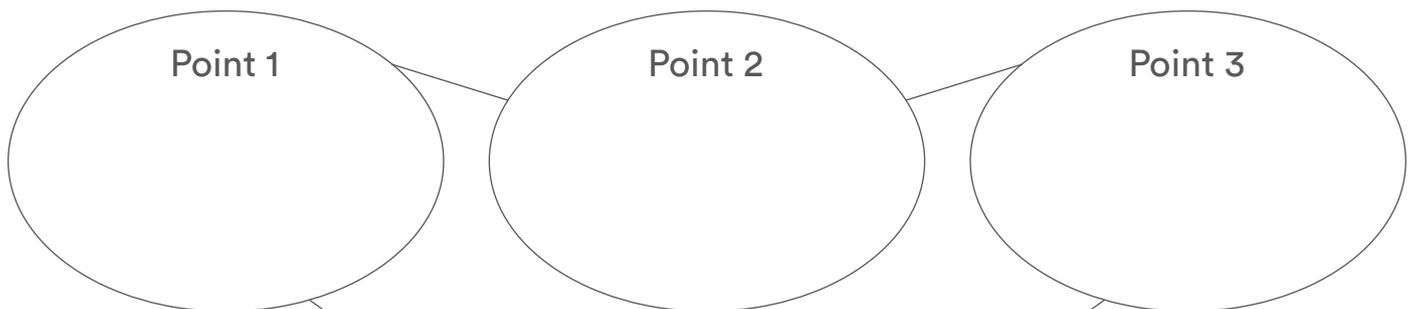
Name

Date

Salty Seeds – Lesson 3

Writing Frame

Introduction



Recommendations

Conclusion



Resource Sheet 6

Name

Date

Salty Seeds – Lesson 3

Debating Framework

This House believes that Mexico should stop exporting food.

Use this framework to develop your argument.

Arguments for:

A large, empty speech bubble with rounded corners and a tail pointing towards the bottom left. It is intended for writing arguments in support of the motion.

Arguments against:

A large, empty speech bubble with rounded corners and a tail pointing towards the bottom right. It is intended for writing arguments against the motion.