Contents

Introduction

Hello! We hope you enjoy using this revised book and CD and that the ideas in it help add to your toolbox of resources for teaching science.

About the book

The main idea behind *Using Stories to teach Science Ages 7-9* is to use stories as a different way of initiating a science lesson. A science concept is presented in a format that shows how science can relate to normal (or imagined!) life and that helps the children learn about science concepts in a fun way. The more ways, especially fun ways, we look at a subject we're learning, the more likely we are to understand it and to remember it!

The stories and poems in the book have been written and road-tested over a number of years in schools across the UK. Inevitably, over the years the science curriculum has changed and been modified, however as the core skills and concepts children need to learn at any age are essentially the same, we have been able to link the stories to the new curriculum.

We hope that the stories and poems can provide a resource for initiating or supporting work to cover the Programmes of Study for each year group. Therefore in the teachers' notes accompanying each piece we quote the Programmes of Study and supporting Notes and Guidance specified within the new curriculum. In the teachers' notes we also suggest follow-up work, often incorporating worksheets or the illustrations that accompany the pieces, which you can use to create a whole lesson, or several lessons, around each piece.

In each case the story and its associated lesson could be used to introduce each topic or could be incorporated into the series of lessons you are planning for that area of science. Of course suggested lesson plans are only a guide and so you can pick and choose the suggestions and ideas that will work best in your school, with your class etc.

Reading the story

When you read the children the story we recommend that you read them the story twice. The first time as a story in its truest sense – a story they can listen to and enjoy as a piece of narrative, without it being broken up and dissected as it's told. Hopefully the enjoyment they get from the story will enhance their enjoyment of the science they are learning. However, on the first reading of the story, they may have been so involved in the plot etc. that they miss some of the science ideas that are used in the story.

On the second reading, you can get the children to focus on the science ideas by stopping at the points where a new science concept enters into the narrative and discussing its role in the story, using an enlarged copy. This also means that the children will be able to enjoy seeing – and learning from – the illustrations as well and many of the children will enjoy reading the story with you.

Using the lesson plans

For each story we have highlighted the sections that the stories/lessons cover most fully along with the National Curriculum areas that are covered.

Within the planning we have added reference statements headed **WALT**, **WILF** and **TIB** as these or similar systems are often used to ensure lessons are focused, objective led and in context for the learner. They help summarise purpose of the lesson, what is required of the children in order for them to successfully learn that lesson and why what they are learning is important.

WALT stands for "We Are Learning Today."

WILF stands for "What I'm Looking For."

TIB stands for "This Is Because."

The worksheets/record sheets are designed to support the learning the children are making in science. We recognise that completing them will often require literacy skills, which in a few cases the children will not have at the required level. In order that the work remains focused on science, we suggest that you or your classroom assistants etc. scribes for such children so that their capability in science is not held back by specific difficulties with literacy. The investigative lessons support assessment for learning by enabling time for teachers and/or classroom assistants to record comments made by the children as they plan experiments/discuss predictions etc.

Links to curriculum

Story	Maths topic(s) covered	Curriculum links Year Three	Curriculum links Year Four
		Programme of Study (PS)	Programme of Study (PS)
		Notes & Guidance (NG)	Notes & Guidance (NG)
		Follow-up material from each section supports "Working scientifically" requirements.	Follow-up material from each section supports "Working scientifically" requirements.
Problems propagating plants	Factors stimulating growth of plants	Plants (PS & NG) Also useful;"Rose tours" *USS 9-11* "Flowers" *USS 5-6*	
Robina Crusoe	Rocks	Rocks (PS & NG)	
Hoppy springs back into action	Magnets	Forces and magnets (PS & NG)	
Romeo and Juliet II	Light and shadows	Light (PS & NG)	
Bone holiday	Role of the skeleton	Animals, including humans (PS & NG)	
The tooth about Tooth Fairies	Dental health Different types of teeth		Animals, including humans (PS & NG)
Gas poem **Living in a material world poem**	Gases, liquids and solids		States of matter (PS & NG)
Wendy the water molecule	Changing state		States of matter section (PS & NG)
Mrs Millet	Transmission of sound		Sound (PS & NG)
Flea football	Changing sounds		Sound(PS & NG)
Food Chain Utd vs Ecosystem City	Interdependence and adaptation		Animals including humans (PS & NG)
Fabulo's exotic pets	Classification keys		Living things and their habitats (PS & NG) Also useful: "Classification calypso" *USS 9-11*
Mouse story **Ernie the electron**	Electricity		Electricity (PS & NG) Also useful: "Conductors vs Insulators" *USS 9-11*
Breaking down digestion	The digestive system		Animals, including humans (PS & NG)

Problems propagating plants

Links to curriculum

Year Three
Plants
Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. (PS)

Pupils might work scientifically by: comparing the effect of different factors on plant growth. (NG)

Also useful for this topic: "Rose Tours" in *Using Stories to teach Science Age 9-11* and "Flowers" in *Using Stories to teach Science Age 6-7.*

Background

This unit explores the needs of plants in a humorous way; as a crocodile called Pincer who has turned vegetarian through necessity needs to learn how to grow plants and of course has very little experience of doing so and finds it difficult to ask anyone before they run away. (He hasn't kept his teeth clean so they've fallen out, so the story also has a link with the previous story about teeth and eating.)

This unit builds on the work the children would have done earlier involving growing plants and looking at plants and animals in the local environment, so you may find our stories "Where's the wildlife?" in the age 5-6 book and in particular "Flowers" in the age 6-7 book a useful introduction to the work in this unit. (More advanced information about plants is given in our story "Rose Tours" in the age 9-11 book where tiny aliens study the structure of a rose by flying around it in their tiny spaceship).

The follow-up work outlines an experiment looking at the effect of different factors, such as water, light and temperature, on the growth of seeds. One interesting aspect of this activity is that many children think plants need soil in order to grow but they will notice that the seeds germinate on cotton wool.

The differentiated activity sheets could be used for the recording of results, which is an important part of this unit.

Plants need water to germinate, as when it is taken up by the seeds, it rehydrates the cells in the seeds that were largely dehydrated as the seeds were formed. This allows enzymes in the cells to become active, particularly the ones that allow the food stores to be used for new growth. Perhaps surprisingly seeds also need oxygen from the air as well though, so if the seeds are waterlogged, as in one set of experiments suggested here, they won't be able to get any oxygen so they would be unlikely to grow.

Plants need light for photosynthesis, the process by which they make their own food for growth. However, although the first half of the process is driven by light energy, the second half of the process is a chemical sequence that is affected by temperature. That is why plant growth is affected by all three of the factors being examined i.e. correct water supply, exposure to light and also warmth.

Resources

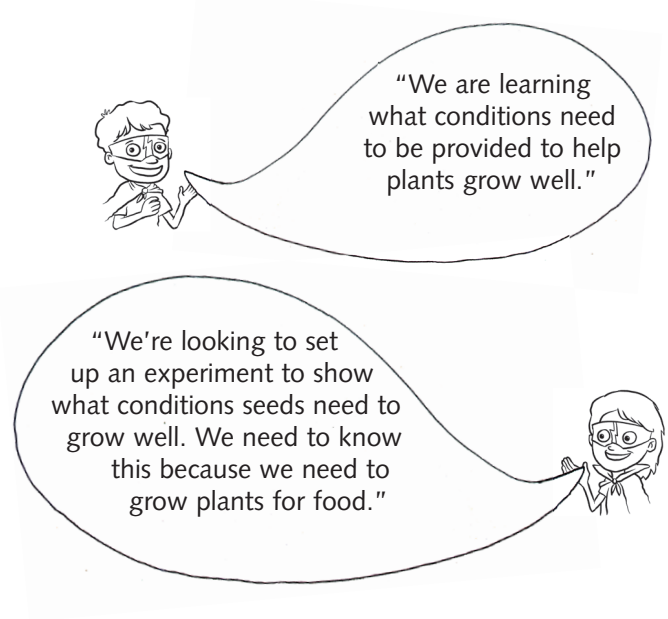
- Differentiated worksheets for recording results
- Seeds – we particularly suggest broad beans but you could also use cress seeds, sunflower or marrow seeds.[N.B. Some seeds from garden centres may have been treated with pesticides; seeds from health food shops are normally safe.]
- Cotton wool
- Teaspoons (8)
- Labels (16)
- Containers to grow seeds in – for example either Petri dishes or chip shop trays (16)
- Measured out quantities of water x8 (i.e. enough to half-fill the container in four cases and enough to completely fill the container in the other four cases.)
- Four areas in which to grow the plants. One needs to be warm and light, e.g. on a window ledge near a radiator, another needs to be warm but dim – you could place the plants in a similar area but stick black paper on the window by the plants placed here. Another needs to be cold/cool but in the light – again it could be in a similar area away from the radiator – and one area needs to be cold and dim. If necessary the plants could be placed in the dark.

Lesson plan

Explain to the children that the lesson will be about learning what conditions seeds need to be provided with in order to grow into healthy plants.

Tell the children that the story is a funny way of looking at the things plants need to grow. Explain that the experiments the children are going to do after they've heard the story are going to be based on some

of the ideas tried out by a crocodile called Pincer to grow plants for food.



Read the story

Ask the children if the can help you make a list of all the conditions Pincer tried to grow the plants in.

Ask them what conditions she provided for the plants when they grew best in the story.

Ask the children whether they think these or other conditions need to be provided to get the best growth possible from the plants. Ask them why they think those conditions might benefit the plants and also how they as scientist could be sure that the conditions they think are the best for growing plants actually are the best for growing plants. They need to do fair tests to check their predictions!

Remind the children about how important it is for scientists to make predictions but that it's fine if our predictions prove not to be correct – they give us a starting point from which to base our experiments.

Ask the children why they think it's important for us to know what conditions are needed to grow plants well – we rely on plants for our food, either directly or indirectly (if they're used to feed livestock etc.)

Explain to them that in the class experiment you're going to suggest you're going to divide the class into eight groups, with each groups setting up two versions of the same experiments each time. Ask them why it's good that they are being asked to set up more than one version of the same experiment. (Replicated experiments are more likely to avoid poor results when a particular experiment doesn't work/is set up wrongly – scientists will always repeat the same experiments several times over to check that it's correct.)

Explain to the children that you want them to scatter a teaspoonful of seeds over the cotton wool they're going to put in their container. Ask the children why you want each group to use roughly the same amount of seeds and the same amount of cotton wool in each experiment. Ask each group to put a label on their containers stating the conditions they are going to be grown in – this will make it easier to examine the plants at different times and then return them to the correct conditions. The conditions being tested are:

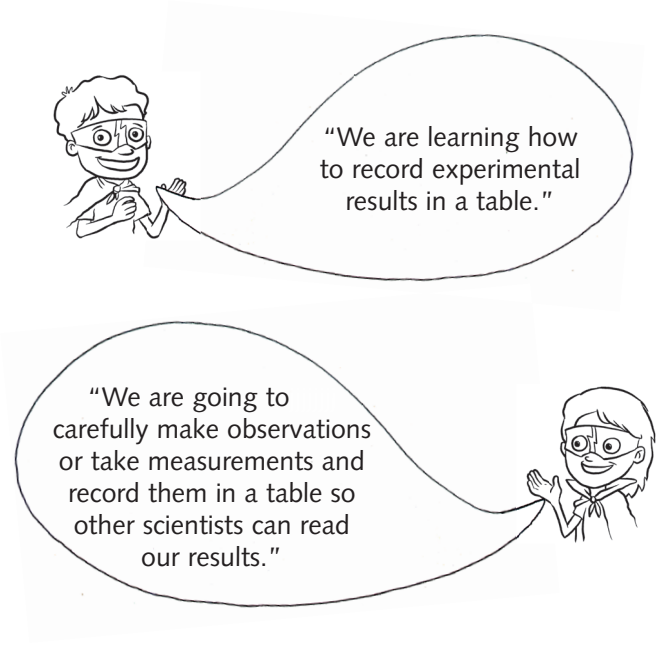
- ½ water, warm, light
- ½ water, warm, dim
- ½ water, cold, light
- ½ water, cold, dim
- full water, warm, light
- full water, warm, dim
- full water, cold, light
- full water, cold, dim.

Ideally, as explained in the resources section, when each group have set up their experiments, all the containers should be placed in as similar a place as possible e.g. by the window but with varying heat and light. Ask the children why the containers should all be placed near each other. Stress the importance of keeping everything constant, the same, apart from the conditions being tested (the "variables").

You will then need to give the seeds time to grow.

When some of the seeds have begun to grow you could then give each child/pair/group a differentiated record sheet to record the results.

The lower achiever record sheets ask the children to record growth or lack of growth with verbal description (e.g. "the seeds grew a lot") and drawings, the average achiever record sheet requires the children to record the number of seedlings that grew successfully and record this information on a bar chart and the higher achiever record sheet requires the children to measure the amount of growth and record this information in a way which they consider appropriate (they might discuss this with you and or could use an IT package that would help them display their results – e.g. by automatically calculating averages.)



Plenary

Discuss the results of the experiments with the children. Remind them that the purpose of the lesson/experiment was to find out something about the conditions plants need to grow to grow well. What did the children find out? How does what they've found out help us to know how to grow plants for food?

Further suggestions

Another aspect of plant growth the children need to study is the importance/role of leaves and roots. The children could repeat all or some of the experiments (maybe they could now limit them to the conditions they know are best for growth) but remove the leaves or roots of the plants as they form and see how well they grow without them.

They could make a mind map showing the things plants need to be able to grow well.

Problems propagating plants

Pincer was a stubborn and grumpy crocodile. Now admittedly most crocodiles are stubborn and grumpy – it comes with the job of being a crocodile – but Pincer was more stubborn and grumpy than most. Qualities that sooner or later are not going to be to your advantage but which make up ideal materials for stories… like this one.

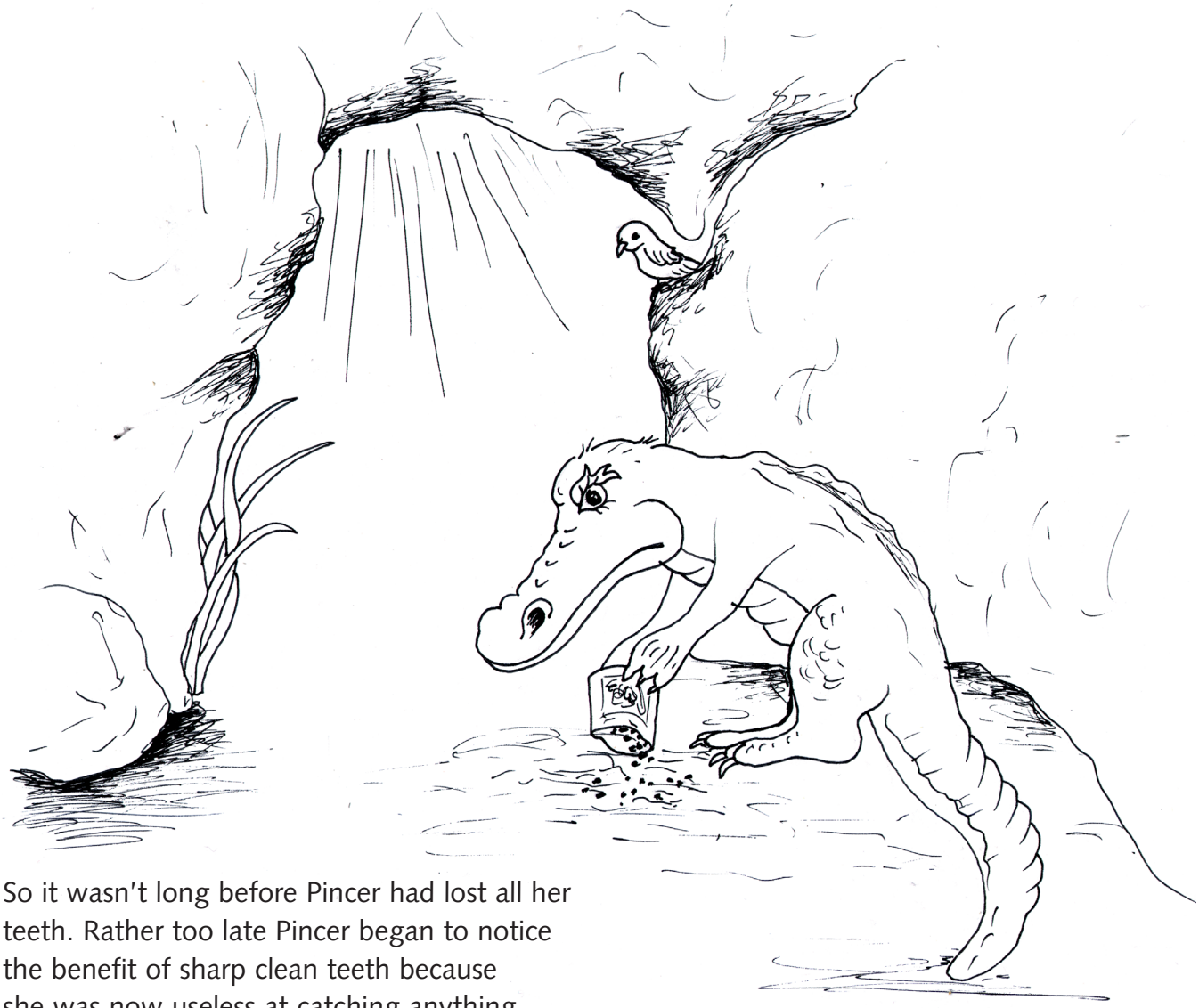
As you may know, while they are basking in the sun after a good meal, crocodiles open their mouths and let little birds called plovers clean their sharp meat-eating teeth by picking out the scraps of meat that get caught between them. The birds use their beaks like natural dental floss to stop the crocodile's teeth decaying, which they would do very quickly if the plovers didn't clean their teeth for them. All the other crocodiles appreciated the work the birds did for them but not Pincer. She resented them getting a free meal at her expense, forgetting the benefit she was getting from the plovers keeping her teeth sparkling clean.

"Huh, I go to all the effort of catching something to eat, face the danger of fighting it and then have to go through the effort of dragging it ashore before I can eat it. After I've done all that why should I let these cheeky little birds dance around inside my mouth getting a free lunch?" Pincer thought to herself.

"Well from now on around these teeth there's no longer any such thing as a free lunch!" Pincer decided and to the amazement of her friends and the horror of the plovers (especially the ones in her mouth) she slammed her jaws shut and enjoyed a very tiny plover snack.

As you can imagine, after that, none of the surviving plovers went anywhere near Pincer, especially her teeth and just helped all the other crocodiles keep their teeth clean.

It didn't take long before Pincer began to regret her decision. Without her teeth being regularly cleaned, her teeth began to decay very quickly and very painfully. Her friends suggested she apologise to the relatives of the plovers she'd eaten and let them back into her mouth (if they were happy to go back) but Pincer was so stubborn she refused to go back on her decision and admit her mistake. Like a lot of stubborn people she blamed her mistake on others and not herself and so she came to resent the plovers even more and snapped at any that forgetfully came anywhere near her.



So it wasn't long before Pincer had lost all her teeth. Rather too late Pincer began to notice the benefit of sharp clean teeth because she was now useless at catching anything. Well she *could* still catch things but they slid straight out of her toothless jaws and so it would be more accurate to say that she became useless at catching anything for more than a few seconds.

It soon became obvious that Pincer was going to have to find something other to eat than meat, or else she was going to starve. Even she wasn't stubborn enough to starve to death to prove a point. She realised that she would have to start eating soft fruits and vegetables by growing fruit trees and vegetable plants.

Well there were always plenty of fruit and vegetable seeds left around by the local animals that normally ate fruits and vegetables and so Pincer collected them together and began growing some plants for her to eat.

The trouble was, never having had anything to do with growing plants before, Pincer didn't know what conditions they needed to grow well. As all the animals she tried to ask ran away before she could, Pincer was forced into working out how to grow the plants herself.

"You probably have to give plants lots of protection to help them grow," she thought. "So I'll put them in this dark, damp cave because it'll be warm and protected there.

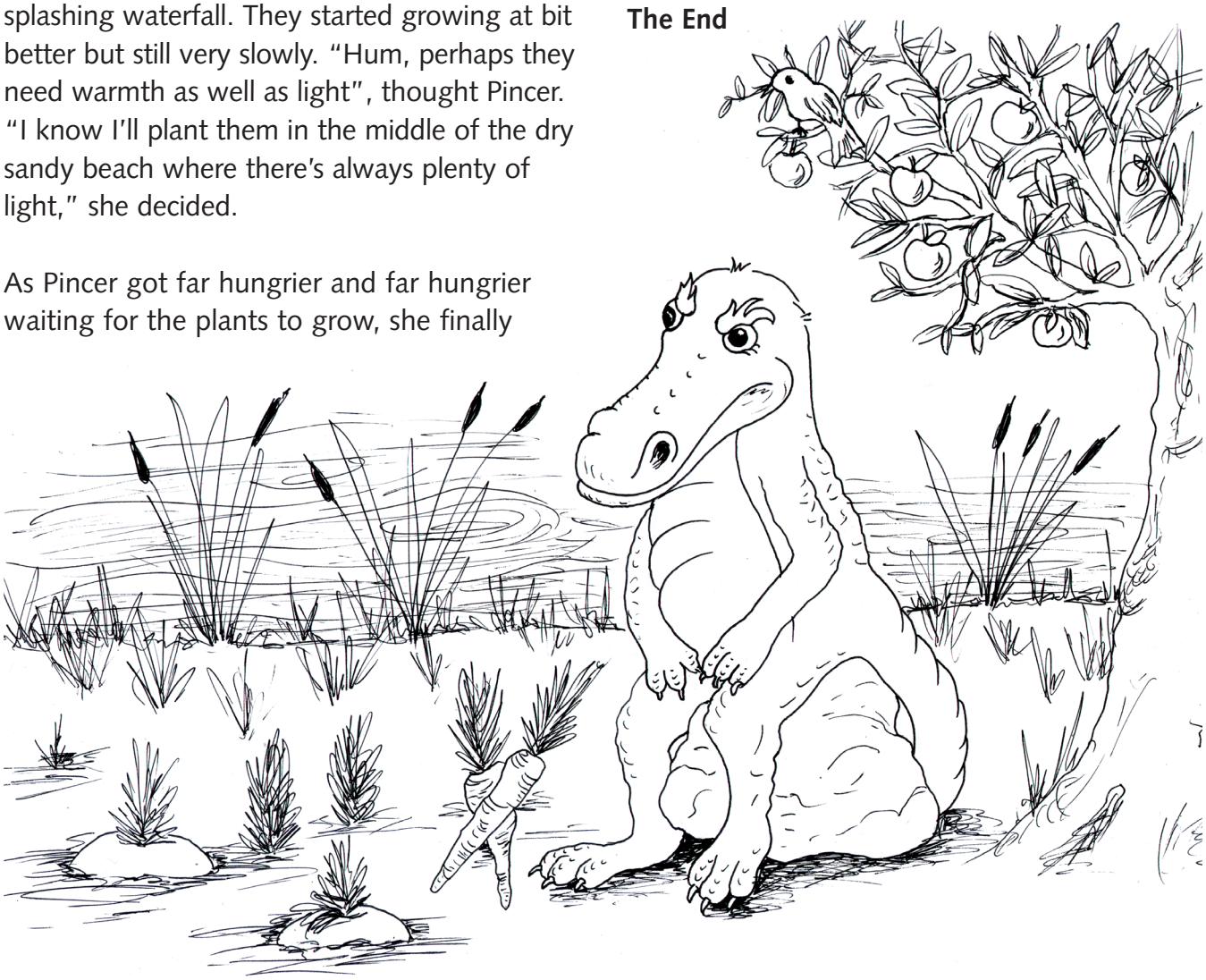
As Pincer got hungrier and hungrier waiting for the plants to grow she finally realised that the plants weren't growing at all. "Maybe it's too warm for them," thought Pincer eventually. "I've noticed that plants can wilt when they get too hot. I know I'll plant them in the coolest shadiest spot I can find." So Pincer planted some more of her seeds in a very cold shady spot near a tiny waterfall.

As Pincer got even hungrier and even hungrier waiting for the plants to grow she finally realised that they were *still* hardly growing at all. "Maybe they need some light," she realised at last. So she moved them so that they were in the light but still kept nice and cold by the splashing waterfall. They started growing at bit better but still very slowly. "Hum, perhaps they need warmth as well as light", thought Pincer. "I know I'll plant them in the middle of the dry sandy beach where there's always plenty of light," she decided.

As Pincer got far hungrier and far hungrier waiting for the plants to grow, she finally realised that they were hardly growing at all *again*. "I wonder if they need some water," she wondered at last. So she planted the last of her seeds where it was warm and bright and where the soil was moist. Finally the plants began growing healthily and well and not long after, just before she nearly went half crazy with hunger, Pincer was able to enjoy eating some soft fruit and vegetables.

However, whilst five portions a day of fruit and vegetables is wonderful for a human, five portions of fruit and vegetables a day is never quite as good as fresh meat if you're a crocodile.

The End



Growing healthy plants

Name: _____

Use this record sheet to show **whether the seeds grew well or not in the experiments**.

	Did the seeds grow well? Describe the growth of the plants
½ water, warm, light	
Tray 1	
Tray 2	
½ water, warm, dim	
Tray 3	
Tray 4	
½ water, cold, light	
Tray 5	
Tray 6	
½ water, cold, dim	
Tray 7	
Tray 8	
Full water, warm, light	
Tray 9	
Tray 10	
Full water, warm, dim	
Tray 11	
Tray 12	
Full water, cold, light	
Tray 13	
Tray 14	
Full water, cold, dim	
Tray 15	
Tray 16	

Draw pictures of some of the plants that grew well and some of the plants that grew poorly.

Which conditions did the plants grow best in?_____

_____

Growing healthy plants

Name: _____

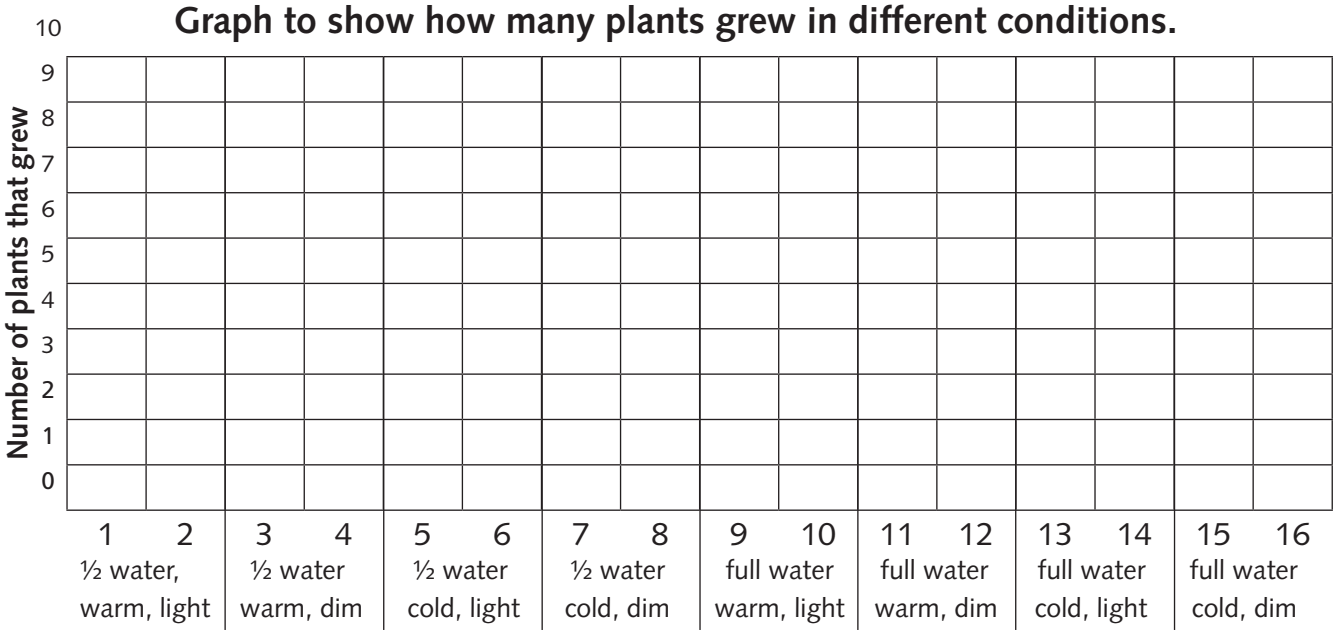
Use this record sheet to show **how many plants grew in each set of conditions**.

	Number of plants that grew
½ water, warm, light	
Tray 1	
Tray 2	
½ water, warm, dim	
Tray 3	
Tray 4	
½ water, cold, light	
Tray 5	
Tray 6	
½ water, cold, dim	
Tray 7	
Tray 8	

	Number of plants that grew
Full water, warm, light	
Tray 9	
Tray 10	
Full water, warm, dim	
Tray 11	
Tray 12	
Full water, cold, light	
Tray 13	
Tray 14	
Full water, cold, dim	
Tray 15	
Tray 16	

Record the results on the bar chart below.

Graph to show how many plants grew in different conditions.



Conditions the plants were grown in

Which conditions did the plants grow best in? _____

_____

Growing healthy plants

Name: _____

Use this record sheet to record the **length of the plants that grew in each set of conditions**.

	Length of plants
½ water, warm, light	
Tray 1	
Tray 2	
½ water, warm, dim	
Tray 3	
Tray 4	
½ water, cold, light	
Tray 5	
Tray 6	
½ water, cold, dim	
Tray 7	
Tray 8	
Full water, warm, light	
Tray 9	
Tray 10	
Full water, warm, dim	
Tray 11	
Tray 12	
Full water, cold, light	
Tray 13	
Tray 14	
Full water, cold, dim	
Tray 15	
Tray 16	

Think about how to record your results. You may want to discuss how you record them with your teacher.

Which conditions did the plants grow best in? _____

How do you know this? _____