Growing Toy - Teacher Notes

Safety First

The material inside the growing toy is non-toxic.
Do not leave the growing toy in direct sunlight – or the material inside the toy will degrade.

About this Activity

This activity is about:

- Measuring quantities (length and/or weight);
- Recording these values in a table;
- Presenting the data in a visual format.

The measurements are made on a 'growing toy'. (Many of the children will already have similar items at home, so the idea of a 'growing toy' will not be new to them.)

Note – it will take **several days** for the growing toy to reach full size – and then several more days if you plan on measuring it as it returns to its original size again. (The measurements each day will only take a few minutes.)

Before You Start

Equipment needed:

- A growing toy. There is one growing toy (usually an alligator) included in the Amazing Science pack. You can buy additional ones from toy shops, or places such as Tesco, pound shops, etc. However, many of these are often round or egg-shaped, which makes it difficult to measure their length. If possible try to get ones which are long and thin (like the alligator).
- A large bowl, bucket, or similar.
- Ruler, weighing scales – and some pieces of string (optional).

Worksheets:

This experiment is ideal for use as a 'whole class' activity, so rather than having individual worksheets you may wish to have just one class worksheet. (You can blow one up to A3 on the photocopier and pin it on the wall near the growing toy.)
There are three different versions of the first page of the worksheet (**Growing Toy p1A / p1B / p1C**). These allow you to measure: just the length of the growing toy; the length and weight; and the difference in the length and weight each day.
There is also an additional individual worksheet (**Growing Toy p2**) for the pupils to record the overall results of the experiment.

Growing your Growing Toy

Day 1: Begin by measuring the length (and weight) of the growing toy and record your measurements on the worksheet.

- If you are using the alligator, the simplest way to measure its length is to place it on a ruler with the tip of its nose next to the zero mark – and then simply measure how far it extends along the ruler. So you will be measuring to the 'bend' in its tail. (In some instances, as it starts to grow the bend in the tail becomes more pronounced –

so you may wish to stretch the tail out a little to take the measurement. You will have to use your judgement to decide what is a reasonable amount of stretching!)

- A more accurate way to measure the length is to use the 'string method': Place one end of the string on the alligator's nose, then stretch the string along the alligator's back and around the curve of its tail. Cut the string at the position of the end of the tail – and then measure the length of the piece of string. (You may wish to keep this piece of string to make a 'String Chart' – see below.)
- You can measure the length to the nearest centimetre if you wish, or for more accuracy you can measure in millimetres. (Remember to record in your table whether the measurements are in cm or mm.)
- To measure the weight ideally you will require electronic scales which measure to the nearest gram – although scales which measure to the nearest 10 grams would be adequate. (Of course, you are actually measuring the 'mass', rather than the 'weight' – but since this is an experiment for younger children I will use the term 'weight' in these notes and in the worksheets.)

Now place your growing toy in a large bowl of water – and leave it there!

Once you have obtained your Day 1 measurements, you may wish to start putting your data on a chart (see below). It is nice to see your chart 'grow', rather than waiting until you have all your data.

Day 2: Take your growing toy out of the bowl. You should notice that it is visibly larger than it was on Day 1. Repeat the measurements that you made on Day 1, and record the values on the worksheet. (You may also wish to change the water before you put it back in. There is some evidence that changing the water each day allows it to grow bigger. However, I have also noticed that if you change the water once it has reached maximum size it may actually shrink slightly!)

Repeat the measurements each subsequent day – at about the same time each day if possible – until it stops getting any larger or heavier. (You do not need to fill in all the spaces in the table on the worksheet.)

Note – there will be some missing data for the weekends – unless you are keen enough to take the growing toy home with you! Do not ignore these days, simply leave them as a blank space in your table. For example, if you start the experiment on a Monday, then there will be no data for Days 6 and 7, and on the following Monday you will record the measurements against Day 8. (Incidentally, since the growing toy usually grows most rapidly in the first few days, it would be best to start the experiment on a Monday or Tuesday – so that the days with missing data occur when the rate of growth has slowed down.)

If you are using **worksheet p1C** notice that the columns for difference in length and weight are marked 'per day'. On most days you will simply write in the difference from the previous day, but if you have two missing days you need to take the difference between the previous measurement and the current one and divide by 3 to get an average figure. You can then use these values to estimate the length and weight on the days when no measurements were taken. (If you do this then you need to indicate on your table – e.g. using a different colour of ink – that these values are estimates, rather than actual measurements.) If all of this is too confusing for the children then just leave these columns blank on the days when you don't have measurements **and** on the first day after

the missing measurements.

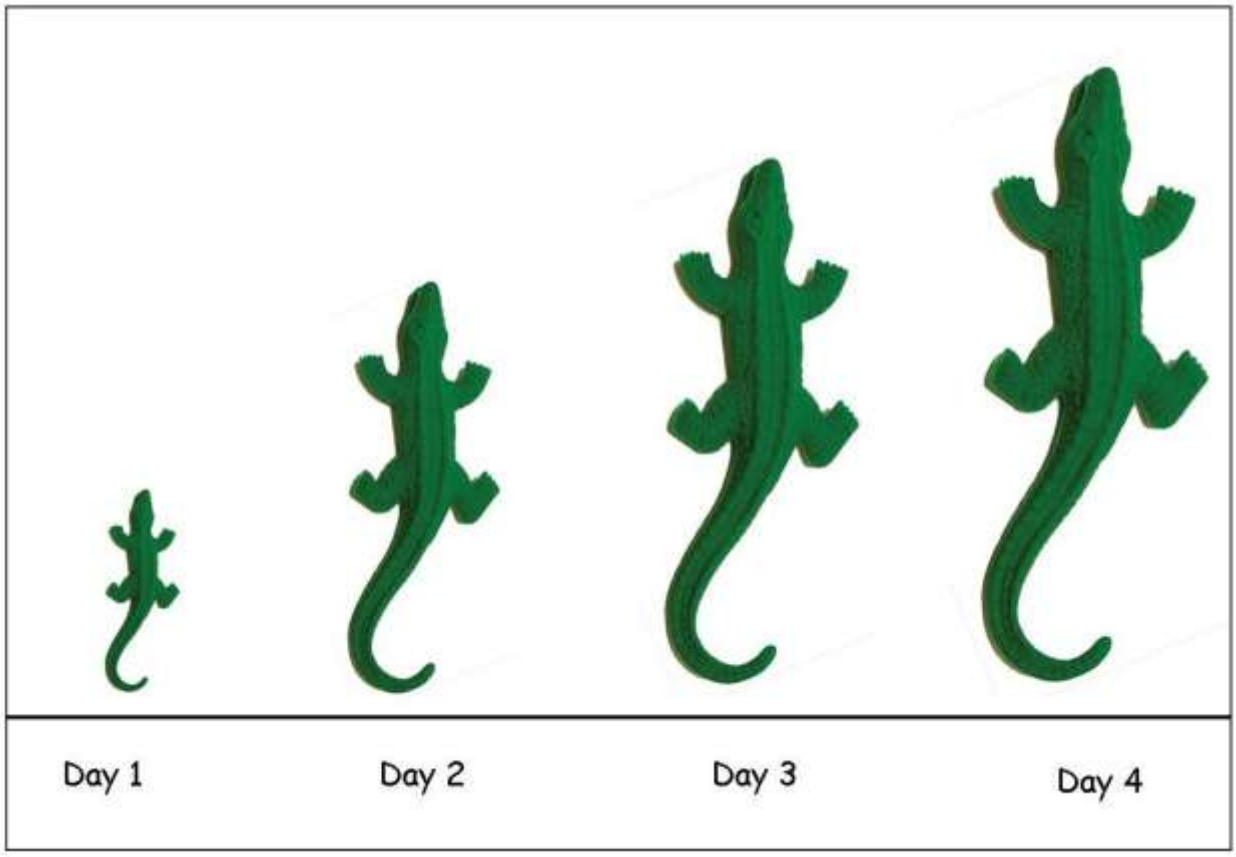
Worksheet p2 can be completed once the growing toy has reached maximum size. The children record the initial length and weight, the final length and weight, and also work out how much it increases in length and weight. In this last section they can simply subtract the initial measurement from the final one, e.g. if it grows from 12cm to 37cm then it grows by 25cm. Alternatively, with more able pupils you can ask them to work out how many times bigger it gets. Rather than use a calculator, they can simply make a rough estimate. Using the above example of the toy growing from 12cm to 37cm, we can see that 3 times 12 is almost equal to 37, so we can say that the toy grows to 'about 3 times' its original length.

Visualising your Data

There are several ways that you can present your data in a visual format. Of course, you can use a conventional bar chart or line graph, but here are a few alternative ideas.

Make an alligator chart:
This is ideal way to present your data if you measured the alligator by placing it on a ruler.

Draw a full-scale picture of the alligator each day, and then stick them on a chart, as shown below. (You will need to allow quite a lot of space for your chart: The alligator typically takes about 10 to 16 days to grow to full size, and by that time it will be between 30cm and 40cm long!)



Remember that you will need to leave a gap for any days (such as weekends) when you don't have data, i.e. if this occurs on Days 6 and 7, you still need to mark these days on your baseline.

If you don't think your artistic skills are up to drawing an alligator, I have provided a couple of alligator pictures at the end of these notes. The smallest one should be about the right size for your alligator on Day 1. For the other days you will have to either use a photocopier or photo imaging software to enlarge the images.

Make a string chart:
This is perfect if you measured the length of your alligator with the 'string method'. Again you will have a baseline starting at Day 1, Day 2, etc. On each day simply stick on the piece of string that you used to measure the alligator.

Representing the weight:
A nice way to appreciate the changing weight of the growing toy is to represent the toy by something of the appropriate weight for each day. For example, you can use bags filled with sand or rice. So on Day 1 make a bag of sand which is the same weight as your growing toy – and clearly label it 'Day 1'. Then do the same thing on each subsequent day.
After several days you can lift the different packets in turn and 'feel' it getting heavier.

Shrinking your Growing Toy

If you take the growing toy out of the water, the water that it has absorbed slowly evaporates and the toy shrinks. So once your growing toy has reached full size you can perform another set of measurements to find out how long it takes to return to its original size. You can use **worksheets p1A / p1B / P1C** as before, except this time the toy will have maximum length and weight on Day 1. (Note that it usually takes significantly longer for the toy to shrink than it did to grow.)

Does the growing toy return to its original size and weight? Just about, but I find that usually they are a little bit longer than they were originally. Another thing that you may notice is that they do not look quite the same – they tend to end up a bit more shrivelled and wrinkly!

Is the 'shrinking chart' a mirror image of the 'growing chart'? No. We have already noted that the growing toy grows most rapidly (in both length and weight) during the first few days, with the rate of growth becoming much smaller as it approaches maximum size. When the toy shrinks, the same thing happens – it shrinks most rapidly in the first few days, but changes less and less per day as it gets closer to its original size. So the 'shrinking chart' actually looks quite different to the 'growing chart'.

Can you use the growing toy again? Yes you can. Once your growing toy has shrunk back to its original size you can store it in a plastic bag or an airtight container – until you want to use it again. However, in my experience they don't work quite as well the second time you grow them.

Further Ideas

Here are some further activities that you can do with your growing toy. For most of these activities you will need two identical growing toys.

How much water does a growing toy need? Place one growing toy in a large bucket full of

water and place an identical one in a small bowl. (Not too small – make sure that the growing toy is covered in water and has enough room to grow.) The one in the bucket grows substantially larger.

It is not obvious why this happens. Although the one in the small bowl has less water, it does not absorb all of the water, i.e. it is not simply a case of it having used up all the water. I think that the answer is to do with osmosis. If you look at the water, particularly in the small bowl, you will see that it is a bit cloudy. It seems that a small amount of the powder leaks out of the growing toy into the water. Once the concentration of the powder in the water becomes too great, water ceases to seep into the growing toy – so it stops growing.

Changing the water. Place two identical growing toys into two identical bowls of water. One will just be left to grow (although you can take it out and measure it each day), whereas the other will have a change of water each day. (Make sure you label them clearly - so that you always change the water of the same one!)

The one which has a change of water each day should grow significantly bigger. This again seems to be due to osmosis (see above) – and again you will notice that water which has not been changed has turned a bit cloudy.

Where is the best place to shrink your growing toy? Since they shrink due to evaporation of the water, the best place to shrink the growing toy is somewhere warm – but not too hot! - and somewhere where there is likely to be some movement of air. A window sill is fine – but not a south facing window as direct sunlight degrades the growing toy. Near a heater or radiator is another good choice – but obviously do not place it directly on a hot surface. (If you wanted to compare how quickly they shrink in different places you would need to have several identical fully grown growing toys. You can do this experiment with the Water Jelly Cubes.)

Alligator in a bottle. This makes a novel classroom attraction – a bit like a ship-in-a-bottle. You will need an empty 2 litre pop bottle. It is usually a bit difficult to get the growing alligator into the neck of the bottle, so you may need to soak it in some water for an hour or so until the legs become soft. Once you have squeezed the toy into the bottle, fill the bottle with water, screw on the cap – and leave it. After a week or so the bottle will be almost full of alligator – leaving the children to wonder 'How on earth did it get in there?'

Additional Information

Growing toys get larger in water because they contain a type of powder called sodium polyacrylate. This is what scientists call a super-absorbent polymer. This material is capable of absorbing huge amounts of water. So when the growing toy is placed in water, the polymer absorbs the water – and the toy gets bigger.

As a loose powder, sodium polyacrylate would absorb the water almost instantly. However, in a growing toy the powder is enclosed within an (almost) watertight covering. The water seeps in slowly through this cover, so it takes several days for the toy to reach full size.

Sodium polyacrylate is also used in disposable nappies and in Instant Snow powder.