

SUPER EXPANDING CREATURES

Super expanding creatures are made of sodium polyacrylate, a super absorbent polymer with huge water absorption capacity. These creatures offer a great way to engage students and integrate maths and science in your classroom.



Required

Expanding creatures	10	
Containers	10	(should be able to hold expanded creature)
String & Rulers	10	
Measuring cylinders 100ml	10	
Glass beaker 250ml	10	
Electronic balance measuring to 0.1g		
Paper towels to dry the creatures		
Water: The cleaner the better. Room temperature tap water does well. Do not use warm water.		

Safety

Do not allow students to taste the expanding creatures or put them in their mouths. IT IS NOT A TOY. Do not send the creatures home. Only to be used under teacher supervision.

Disposal

Because of students handling the creatures, over time they will lose some colouring and might tear. To discard: Cut into pieces and discard in the waste bin.

Expansion information

- The absorption and expansion take **2 to 3 weeks** and the shrinking about 2 weeks. Try to do this activity during a 3 - 4 week period uninterrupted by holidays. (The growth tempo is influenced by ambient temperatures so expansion in winter can be slower.)
- Students should take the measurements daily.
- Replace the water once with clean water within the first 3 days and then once again after a week. Squeeze the creature under the water to remove air pockets. At the end of the expansion cycle, the water is emptied and the shrinking process starts. Do not put the creatures in the sun.
- Have the students draw up data sheets for recording all data accurately each day.

Suggested procedure

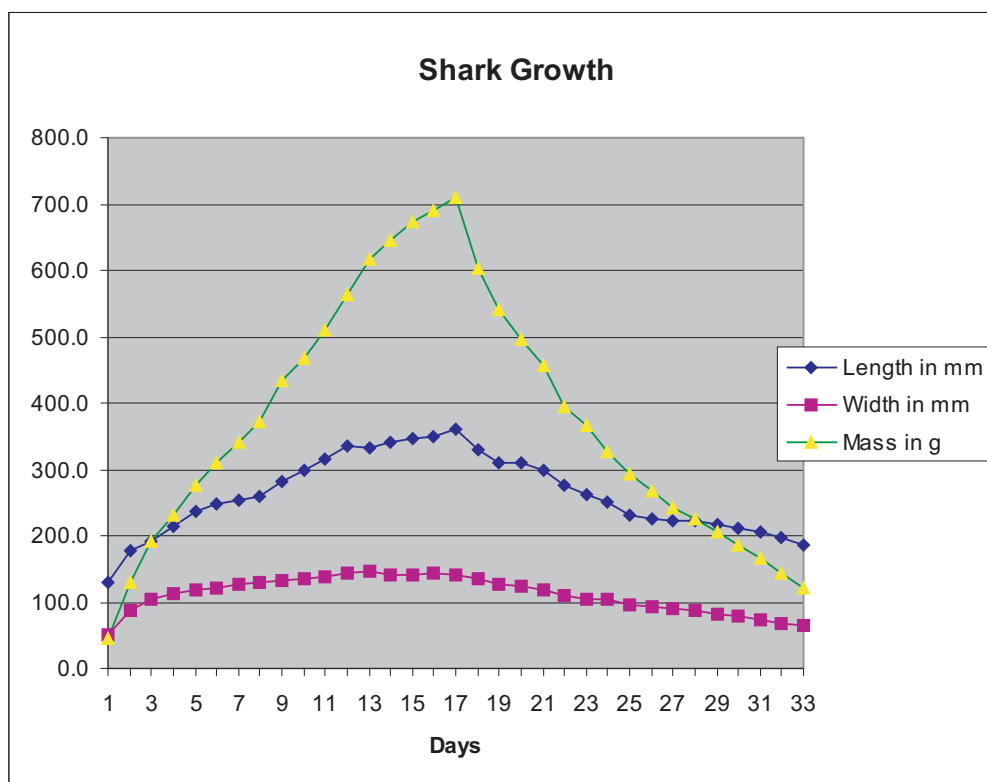
1. Organise your class into groups of two to four students.
2. Each group is allocated a creature to measure daily for the next three weeks. They could even name it.
3. Discuss the different measurements to be made:
 - Length:** This can be measured with a piece of string or ruler from the tip of the snout to the end of the tail. Students can measure to the nearest cm or mm depending on the grade level.
 - Width:** Same as with length, but measure the widest part of the body.
 - Mass:** Use a metric balance with accuracy to $\pm 0.1g$. Demonstrate the tare (zero) function of the balance to the students. A plastic container can be used for weighing to protect the balance from the wet body.

Volume: This is measured using the displaced water method. A glass beaker or measuring cylinder is filled to its brim with water. Students place the creature in the beaker, collecting the spilled water in a container. The volume of the spilled water is then measured in millilitres using a measuring cylinder. Make them repeat this 3 times and record all readings.

4. The first set of measurements is made before the creature is immersed in water.
5. The creature is then placed in a container filled with enough water to cover the creature.
6. The same daily routine is followed each day until around the 20th day when all water is emptied and the shrinking process recorded for the next 14 days.
7. At the end of the project all collected data can be graphed using bar or line graphs and a program such as MS Excel. We have graphed our data below.

Explanation

The creature is made of **sodium polyacrylate, a super absorbent polymer (SAP)**. It is one of only a few man-made polymers that are hydrophilic (water loving). The SAP has a high concentration of sodium or potassium ions which attract water through a process known as **osmosis**. Osmosis is the passage of water through a semipermeable membrane to an area with a lower water concentration (or higher salt concentration). It is a very important driving force in nature. The SAP turns into a gel as a result of absorbing the water. By sprinkling salt onto the gel, the reverse osmotic process is favoured. Water now passes through the membrane to the outer higher salt concentration (Try this by sprinkling salt generously onto the tail.)



Additional investigations

- Students place creatures in water with different salt concentrations eg. distilled water, tap water, 1 tsp., 2 tbs., 4 tbs salt in a glass of water. What influence does this have on the growth?
- Does hot or cold water influence a creature's growth?

Another highly popular activity with students is the production of "instant snow" a super absorbent polymer that expands 40 times in volume through an osmotic absorption process. You will find this under Molecules in our catalogue / online shop. (Instant Expanding Snow)

