SUPER POWER: Hinges and Levers!

ELBOWS

LAB NOTES...

BUILD TIME 10 MINS

YOU WILL NEED

- Strong card
- Wooden skewer
- 2 x Elastic bands
- Scissors
- Pencil
- Tape
- Blue tack
- Ruler

ELBOW LEVERS

Levers help us to move heavy objects more easily. If you can't lift a heavy object by yourself, putting it at the end of a long lever could help you. This is because a lever works by reducing the amount of force needed to move an object or lift a load. A lever is a rigid object which moves around a fixed point which we call the fulcrum. Levers make the work easier by spreading out the effort over a longer distance.

Our bodies are full of levers, our arms are one example. The pivot is at the elbow which is a hinge joint and our forearm acts as the lever. When you hold something heavy in your hand and try to lift it, your lower arm is acting as the lever. The weight is at one end (in your hand), and at the other end is the fulcrum - your elbow hinge. That's the thing that stays in one place while the lever moves around it. You can prove this by putting your elbow on a table and lifting something with your hand while keeping your elbow on the table. You know that your elbow is the fulcrum because it doesn't move. You know that your arm is the lever because it does move.

When we throw something using our arm, the power comes from our upper arm muscles called the bicep and tricep. These two muscles work together and as a pair when one is stretched out the other one is contracted. There are lots of other muscles in your body that work together like your quadriceps and hamstrings in your legs.

TO MAKE YOUR ELBOW MODEL...

1. Watch Nanogirl making her own elbow model.
2. On the card, measure and cut out two oval shapes, both 15cm long and 5cm wide in the middle. These will be the upper and lower parts of your arm.
3. Use the skewer to make one hole at one end of both ovals.
4. Take one oval and label it 'humerus'. This is the long bone in the upper arm. It is located between the elbow joint and the shoulder
5. Make two more small holes at the other end to the hole you already made.
6. Cut both of your elastic bands so they become strings instead of loops. These will represent your muscles - the bicep and the tricep.
7. Poke one end of each elastic band through each of the two holes you made next to each other in the humerus, tie a knot at the back of the card.
8. Take the other oval and label the radius at the top and the ulna below it. These are the bones in your forearm.
9. Make two more holes in the forearm, one on the left and one on the right of the original hole.
10. Push the long ends of the elastic bands through to these two holes in the forearm and tie at the back. The band that attaches to the left-hand hole will be your tricep and the right your bicep.
11. Cut 3cm off one end of your skewer and push half-way through the empty hole in the upper arm and the centre hole in the forearm - this is your elbow joint. Secure with blu-tack.
12. Draw and cut out a cardboard hand and stick to the end of the forearm.

Place your hand around your upper arm when you lift something heavy upwards. Can you feel which muscle stretches and which muscle relaxes?

Measure your abilities: what's the furthest you can throw a ball of scrunched-up paper?

Can you find any other hinge joints or levers on your body?

Try throwing with your arm bent then with your arm totally straight - which was more powerful?

Can you think of any animals that are great at throwing? Do they have long or short arms compared to us?