SUPER POWER: Amplification!

GUITAR

LAB NOTES...

WATCH & BUILD 20 MINS

YOU WILL NEED

- Empty tissue box or similar ... ◯
  e.g. shoe box, cereal box or similar sized empty cardboard box
- At least 3 elastic bands ..... ◯
- Small piece of thick, strong cardboard ..... ◯
- Tape ..... ◯
- Scissors ..... ◯
- Ruler ..... ◯
- Pencil ..... ◯

This week, we've learned about sound and vibrations. You know that you can make sound by vibrating an elastic band like you did with your buzzing bee device but in this example it made a different sound.

What's going on?

We also found that sound waves can bounce around in longer spaces to make a different pitch than shorter spaces from our paper xylophone. We also learned that we hear different vibrations as different pitches, or notes.

Today, you put all that knowledge together to make a guitar. On its own a vibrating elastic band does not make a very loud noise. The reason why your tissue box guitar sounds so loud is because of the hole. This hole leads to an empty space in the box and when the elastic band vibrates it causes the air inside the box to vibrate too which produces a much louder sound...

The hole in the box lets the vibrations spread out into the air and into our ears

This is called amplification where we can make a sound seem louder. The different notes in this guitar come from how stretched out your elastic bands are. The bands which are more stretched should make a higher note when you pluck them because they vibrate faster or with a higher frequency.

TO MAKE A GUITAR...

1. Watch Nanogirl make her guitar!
2. Take your empty tissue box, and if it doesn't have a hole in the middle of one side, cut a small one out.
3. Decorate your box! You could make it look like a guitar, or choose any other design!
4. Stretch one elastic band around the box, making sure that it runs over the hole, and pluck it with your finger. Listen to the sound that it makes.
5. Now stuff the hole in your box with something soft like tissues or a soft cloth. Stretch the elastic band back over the stuffed hole and pluck it again. Does it sound the same?
6. Take the stuffing out of the box.
7. Take a piece of thick cardboard. Measure and draw a rectangle 6cm wide and about 7cm long.
8. Draw a triangle on top of one of the 6cm ends of your rectangle with a base of at least 8cm.
9. Cut it all out. This will be your bridge.
10. Cut three V-shaped notches in the top diagonal edge of the triangle, evenly spaced along the edge. They need to be deep enough for a rubber band to sit in
11. Cut a small 6cm slit in one side of the tissue box close to one end of the hole, just big enough to slide the rectangle part of your bridge into. The slit needs to line up with the centre of the hole in the middle of your guitar.
12. Slide the rectangle of the bridge into the slit, and tape it in place to make sure it stays upright.
13. Take your elastic bands one at a time and stretch them over the box again and over the bridge, making sure that each elastic band sits in a different notch on your bridge.
14. Pluck each elastic band, and listen to see if each one makes a different note!

Can you make different notes by using different sizes and thicknesses of elastic bands?

What happens if you build a different bridge shape that stretches the elastic bands even more?

How were the sounds different when you stuffed the space in the guitar, and what do you think is happening to the vibrations when you do?

How do you think you could modify your guitar to make the sound even louder?

Can you play your epic superhero theme tune on this guitar?