Girlguing London and South East England
Ambassadors

Becky Haywood's "I'm a STEMinist" badge in a night!

Becky is a specialist biomedical scientist at UK Health Security Agency where she is studying for a PhD in virology.

"The key to being a STEMinist is:
Question like a scientist
Design like a technologist
Build like an engineer
Deduce like a mathematician
But most importantly... play like a child."
-Becky Haywood

Want to earn your "I'm a STEMinist" badge? Spend a night having a go at the activities in this pack. You can do as many as you like, but have a think about which activities will suit your unit best. Some are aimed at Rainbows and Brownies, while others are more for Guides and Rangers. You'll find the badge in our shop.

1 What is a scientist?

Get into small groups of 4-6. Using pens and a large piece if paper, draw a picture of a scientist. What might they look like? What clothes would they wear? What items might they have with them?

Discuss in your group what things a scientist needs to have. Do they need to be curious? Hardworking? You could write some of your thoughts around your picture.

Take some time to come together and show your drawing to the other groups. Did other groups think of something your group didn't? Is there anything that lots of groups drew or wrote?

Often girls will write things like 'clever', 'smart' etc. This is a good opportunity to emphasise that there are different types of cleverness, and you don't need to be a genius like Einstein to be a scientist! Resilience and persistence are important qualities as experiments often don't work. Another point often missed is scientists must be creative, as they must think of new solutions to problems and new ways to find out information.

If a lot of the groups have drawn a male scientist, have a chat about gender stereotypes at the appropriate level for the section.

2 Absorbing sugar cubes

You will need:

- Sugar cubes
- Plate
- Water
- Food colouring
- Aluminium foil
- Cling film
- Paper
- Kitchen roll/tissue

1. Add a few drops of food colouring to a little water and pour onto the plate.
2. Add a stack of sugar cubes and watch what happens. The coloured water should move up the stack of cubes and eventually make them collapse. Check how many cubes the coloured water passes through before stopping.
3. Try adding a small sheet of foil on top of one sugar cube and stack some more on top. Does this stop the water reaching the top cubes?
4. Try the same with some cling film, and some paper or tissue. Which work the best?
5. Can you try to predict which material will stop the water spreading through the cubes the best?

So, what's happening?

The sugar cubes absorb the water, which you can see by the sugar cubes changing colour. Paper and tissue are porous and allow water through. Foil and clingfilm stop the water from passing to the next sugar cube.

3 Oobleck: the non-newtonian fluid

You will need:

- Cornflour
- Water
- Mixing bowls (one per group)
- Newspapers or disposable table covering (optional)
- Food colouring (optional)
- Sieve (optional)

1. Add 2 cups of cornflour to a bowl.
2. Add one cup of water very slowly. Mix with your hands until you get a sticky, slimy gloop. Add a few drops of your food colouring if you're using it - be mindful that this can stain skin and clothes.

3. Play! See how the slime behaves as you try different things. Can you make it into a ball? Can you throw and catch it? What happens if you throw it onto the table? What happens if you squeeze it and then open your hand?

So, what's happening?

Oobleck behaves like a solid or a liquid depending on the pressure exerted on it. Press it together and it feels solid, let is sit in your hand and it drips like a liquid. The proper term for this is 'non-Newtonian fluid'. The cornflour molecules are suspended in the water but not bonded to it, giving it it's unusual properties!

Carry on the experiment by making your ooblek using tonic water - this should cause the oobleck to glow under a UV light!

Time to clean up

Oobleck can be wiped off hands, clothes and surfaces with a damp cloth.

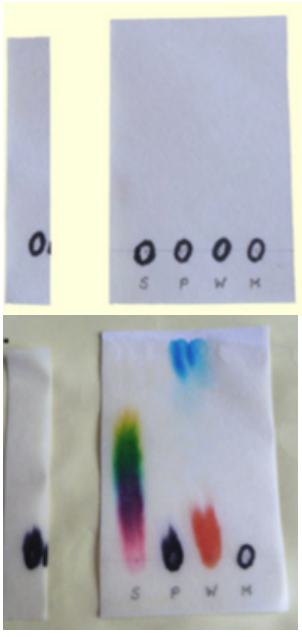
Allow the oobleck to dry before disposing of it in the bin. Do not wash it down the sink as it can block drains.

4 CSI chromatography

Setting the scene

Someone is holding an item for ransom. They have sent the victim a ransom note demanding they send them money. You are investigating the case and need to work out who on the list of suspects wrote the note.

There are a collection of pens that have been collected from suspects - one pen per suspect. The goal of this experiment is to determine which of the pens was used to write the ransom note. If you can work out who wrote the note, you can identify who committed the crime!



You will need:

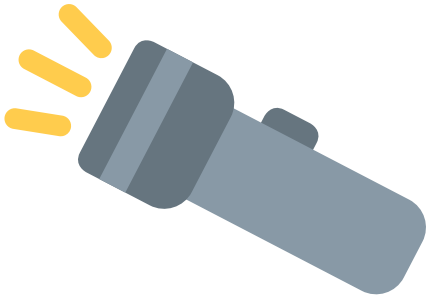
- A pre-prepared 'ransom note' written in black felt tip pen on filter paper (coffee filters work well)
- Coffee filters/other filter paper
- The black felt tip pen used to write the note
- A selection of other black pens (preferably different types such as permanent markers, dry wipes, biro etc)
- A small bowl per group
- Water

Leaders, you might like to attach a name to each pen to make it easier for the groups to identify the suspects. For example, the black felt tip was taken from Marina, the biro was taken from Simon...

1. Cut the ransom note into strips and give one strip to each group.
2. Using the collection of pens, draw a small dot at the bottom of another piece of filter paper. Make sure you label each dot with which pen is was pencil.
3. Dip the bottom of the strip of ransom note in water and allow the water to move up the filter paper.
4. Dip the bottom of the other piece if filter paper with the different pen types in water and allow the water to move up the filter paper.
5. After a few minutes take the paper out of the water and allow it to dry.
6. Compare the pattern made by the ransom note with the pens collected from the suspects. Do any of them match?
7. Come together and share who you think wrote the ransom note. Were you right?

5 Fibre-optic water

You will need:



- Small glass jar
- Hammer
- Large nail
- Duct tape
- Small, bright torch
- Water
- Large bowl

1. Using the hammer & nail, punch two holes in the lid of the jar – a small one at one side of the lid, and a larger one opposite it.
2. Cover the sides of the jar with duct tape. Tape the torch to the bottom and cover any uncovered glass with duct tape.
3. Fill the jar about two thirds full of water, turn off the lights and let the light shine through onto the ceiling. Notice how the water is all 'splashy' and disorganised.
4. Put the lid on the jar tightly. Hold the jar over the bowl and tilt the jar so that the water runs out of the large hole in a smooth stream.
5. Look at the stream of water and notice how the light is contained in the water rather than spilling out. Put your finger under the stream and observe the tiny dot of light on your finger.

So, what's happening?

When the water is a smooth steady stream, the light cannot escape due to total internal reflection – the light reflects back into the water when it reaches the boundary of the water and air. The light bounces within the water until it reaches the end of the stream when it is released. Fibre-optic cables work in the same way but are made from glass not water.