barbican

Teacher Lab

Activities to Support the Primary Science Curriculum

GUILDHALL SCHOOL

Contents

An Introduction to Teacher Lab

Our Teacher Lab project promotes creative practice in the classroom by supporting cross-curricular teacher and artist exchanges. We offer teachers direct access to a variety of artists, in order to re-imagine the curriculum and develop practical tools for learning through the arts.

Greenleaf Primary School were the first to take part in our Teacher Lab pilot project in 2019/20. After consultation with Greenleaf to identify a relevant need in the curriculum, the school was matched with an artist – actor and mathematician Victoria Gould. Victoria worked with Greenleaf staff to find creative ways to help pupils understand the current science curriculum, with a focus on pull and push forces. Year 2 teacher Christina Paul worked with Victoria to create and co-design activities and training across two weeks; one at the school, and one at the Barbican.

By the end of their week at our centre, a 'tool-box' had been created by the teacher and artist. This included a teaching resource talking through exercises, a series of how-to films and a CPD session with all teachers at Greenleaf.

Within the tool-box are a number of different activities which have been created to meet the ability and learning needs of each primary year group, working alongside the National Curriculum and the Early Years Foundation Stage Framework. For Early Years, activities include exploring the effects of push and pull using pieces of string. The activities are developed through the year groups, with Year 6 identifying the function of forces within the cardiovascular system.

A series of films from the pilot which have been produced as a resource for teachers can be found on our website. We will also be sharing and discussing findings from the project at future TeachMeet events.

> *"The learning all linked together and can be connected to lots of different areas of the curriculum in the EYFS (Early Years Foundation Stage), not just science – from collaboration to working together and coordination. I loved the simplicity of it. Using not many resources to explore the physical sense of push and pull made it simple and effective – I wouldn't have thought beforehand it would have met quite so many objectives!"* Reception Teacher

Victoria Gould, Artist

It is a wonderful and very rare thing for me to hear a teacher say, "This is what I really want!" The Teacher Lab pilot project is a marvellous and unique opportunity to really explore a teacher's creativity and vision, rather than just add my own ideas to their heavy workload.

My time in school was a delightfully immersive experience, and I was cheerfully welcomed into teacher Christina's Year 2 class. Despite the exhausting complexity, pace, and endless multi-tasking of teaching a full Year 2 class in a vibrant and busy primary school, the thing that stood out the most clearly was how much the class enjoyed activities where they could learn by speaking, singing or moving as a group with Christina. I also spent time observing Science lessons throughout the whole school.

Through conversations, it became clear that Christina wanted to explore the teaching of forces. Crucially, she wanted to root the work in the Early Years Foundation Stage, exploring push and pull, and then build on this throughout each class of primary education.

I was thrilled about this, as I have a background in maths and physics teaching and am particularly interested in the ways in which scientific concepts originate from bodily experience. My experience in ensemble theatre became very useful, as ensemble work can be a useful and fun tool for teaching science. So, the concept of embedding the sensations of forces at the earliest opportunity, and then building on them later made perfect sense.

During our time working at the Barbican, with Christina and an ensemble of theatre makers, two key aspects of the work began to emerge: Clarity and Collaboration. We focussed on simplifying the exercises as much as possible, so that the sensations of 'pushing', and 'pulling', could be felt clearly in the body.

The power of this simple activity was confirmed when we took the exercises back to Greenleaf. The experience of working collaboratively, often in silence, required concentrated cooperation from the pupils. It was exciting to watch them adapt, using adjustment, anticipation, and reaction, leading to some beautifully focussed imaginative problem-solving.

My advice to anyone taking on a project of this nature is to really listen to what the teacher wants to achieve, and then don't be afraid to be rigorous in the rules you use to set up the work. The biggest lesson I took from this project is that the clearer and simpler the rules of the activities are, the safer the participants can feel. This clarity and safety provides them with the freedom to explore, collaborate, and learn.

Christina Paul, Teacher

I came to the Teacher Lab project with two goals in mind. The first was to focus on push and pull forces because, after many years of teaching, I have found that children struggle to understand the abstractness of forces. My second goal was to start from the early years curriculum and work up. This was to ensure that there were no 'watered-down' activities for the younger years and to guarantee the ideas we came up with were tailored to each year group's curriculum and that they were suitably progressive.

I thoroughly enjoyed this project as I got to spend time just exploring one subject which is very rare in primary education. Working with Victoria and the Barbican Guildhall Creative Learning team allowed me to be creative and really understand how performing arts can enable all children to delve into many areas of the curriculum. No matter what subject you teach or lead, this project will allow you an opportunity to really get to the heart of a challenging topic and explore ways of bringing it to life.

I would say to just approach the project with a topic, age range and objective in mind and let your imagination go wild. Think outside the box and be open to exploring many different areas. You never know what you could learn or come up with along the way.

Exercises

The following exercises were conceived, commissioned and designed by Victoria Gould and Christina Paul as part of the Barbican Guildhall Creative Learning commissioned Teacher Lab programme.

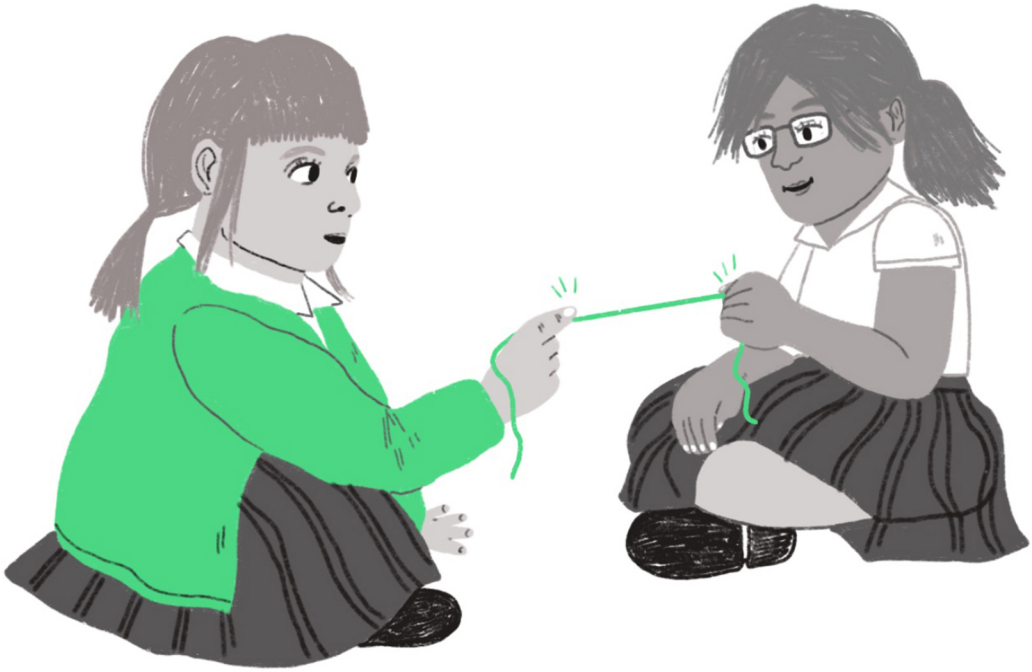
Resources

Small rods (Reception)
Elastic (Reception)
String (Reception, Year 3)
50cm canes (Year 3)
Masking tape for floor (Year 5, Year 6)
Different colour tops (Year 5)

Optional Resources (for Year 2 activity)

Foam tubes
Paper
Wool
Elastic
Blu Tack
Playdough
Cardboard
Rubber
Pipe cleaners
Crinkly plastic
Light rods
Wood
Sponges
Speakers for music (optional for all year groups)

Early Years Foundation Stage – Reception



Curriculum links

Communication and Language

- Children listen attentively.
- Children follow instructions.

Physical Development

- Children show good control and coordination in large and small movements.

Personal, Social, Emotional Development

- Children work as part of a group or class and understand and follow the rules.
- Children play cooperatively, taking turns with others.

Activity

Resources: small rods, elastic and string.

1. Sat down – push the air in front of you. Pull the air towards you. What do you notice?

- ***This activity is demonstrated in the video Reception: Communication and Language – Example 1.***

2. Sat down – using the palms of your hands; push a partner gently and pull a partner gently. What do you notice about your hands?

3. Sat down with a partner – put a small wooden rod between each of your pointing fingers so that it is supported. Push the rod back and forth between you. What do notice you are doing? Can you pull the rod with your fingertip?

- ***This activity is demonstrated in the video Reception: Communication and Language – Example 2.***

4. Sat down – using a piece of string individually, pinch both ends and hold it up in the air as tight as possible. Push fingers all the way together so the string is loose and then pull the string back so it's tight.

- ***This activity is demonstrated in the video Reception: Communication and Language – Example 3.***

5. Sat down – using a piece of string with your partner, pinch each end of the string. Pull the string back and forth between you. Can you both pull at the same time? Can you do this and still keep it tight? What do you notice is happening?

- ***This activity is demonstrated in the video Reception: Communication and Language – Example 4.***

6. Sat down – using a piece of elastic with your partner, each pinch one end and hold lower than your shoulders. Pull the elastic back and forth between you and your partner. Can you both pull at the same time? What do you notice is happening? How does the elastic differ to the string?

- ***This activity is demonstrated in the video Reception: Communication and Language – Example 5.***

7. Sitting in a small group – pinch a piece of string with your right hand. Reach out with your left hand and pinch the other end of the string held by the person on your left. Keep pulling with both hands. Explore different ways of keeping the string tight e.g. could you stand up and keep the string tight? How can the group move around and keep all the string tight?

- ***This activity is demonstrated in the video Reception: Communication and Language – Example 6.***

Key Stage 1 – Year 1

Curriculum links

Animals including Humans

- Identify, name and label basic parts of the human body.
- Learn the names of the main body parts (i.e. head, neck, arms, elbow, legs, knees, face, eyes, ears, hair, mouth, teeth) through games, actions, songs and rhymes.

Materials

- To become familiar with properties such as hard/soft, stretchy/stiff and bendy/not bendy.

Activity

Optional resources: a range of objects made from different materials to demonstrate different properties

1. Standing in a space – can you make part of your body (naming different body parts) feel soft, hard, bendy, stiff or stretchy?
- ***This activity is demonstrated in the video Year 1: Animals including Humans – Example 1.***

2. Standing in a space – can you push and pull different body parts?
- ***This activity is demonstrated in the video Year 1: Animals including Humans – Example 2.***

3. Working in small group – can you touch a different body part on the person next to you and make a circuit? Then form a large class circle. Can you all link by touching different body parts? Which parts conduct electricity using the energy stick?

Key Stage 1 – Year 2

Curriculum links

Everyday Materials

- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Activity

Optional resources: foam tubes, paper, wool, elastic, blu tack, playdough, cardboard, rubber, pipe cleaners, crinkly plastic, light rods, wood, sponges

1. Standing in a space with a partner – one person to hold a hard, soft, stiff, stretchy or bendy position. Can you gently squash your partner? Can you gently bend your partner? Can you gently twist your partner? Can you gently stretch you partner? How does you partner (who is being squashed, bent, twisted or stretched) feel after each movement? Does it feel the same or different? Can you find different ways to squash, bend, twist, or stretch your partner?

- ***This activity is demonstrated in the video Year 2: Everyday Materials – Example 1.***

2. Standing in a space with partner – what can you do to your body so it cannot be squashed, bent, twisted or stretched? How does this relate to materials of objects?

3. Sitting in a circle – try to squash, bend, twist and stretch different materials. Can each material be squashed, bent, twisted or stretched?

4. Optional – group leader to teach pupils the 'Push and Pull' song to the tune of the Hokey Cokey. Lyrics are as follows:

   Push your right arm in, pull your right arm out.
   Push, pull, push, pull – bend it all about.
   You do the push and pull song and you twist around.
   That's what it's all about!
   Oh, the push and pull song.
   Oh, we're pushing and pulling,
   Oh, we're squashing and squeezing.
   Knees bent, arms stretched, push and pull.

- ***This activity is demonstrated in the video Year 2: Everyday Materials – Example 2.***

Lower Key Stage 2 – Year 3

Curriculum links

Forces and Magnets

- Some forces need contact between two objects, but magnetic forces can act as a difference.

Activity

Resources: Long 50cm canes and string

1. With a partner, put a cane between the ends of each of your pointing fingers so that it's supported. Gently push the cane back and forth between you. How much force do you need to use to keep the rod safe between you? How much movement can you achieve while keeping the rod safe? What do you notice you are both doing? How freely can you move while keeping the rod safe?

2. One partner should stand still whilst being able to rotate the rod. The other partner should walk around whilst keeping the rod safely between you both. What do you notice about how the free partner can move (link to magnetic field of a button magnet)? Now do the same activity with a piece of string. Are you pushing/pulling? What do you notice? How is this different from the rod?

- ***Activities 1 and 2 are demonstrated in the video Year 3: Forces and Magnets – Example 1.***

3. Without the rod, can you keep the same relationship and/or distance between you and a partner? Can you keep the same relationship but extend the imaginary rod? What do you notice you are both doing? Group leader to check that pupils are maintaining the correct distance without the rod.

- ***This activity is demonstrated in the video Year 3: Forces and Magnets – Example 2.***

4. Sitting on the floor, opposite a partner. Group leader to specify who is partner one and who is partner two. Partner one – put your hands up in front of you, palms facing inwards. Partner two – do the same inside partner one's hands. Partner two to push against partner one's hands as hard as possible, whilst partner one presses against partner two's hands. Hold this for one minute, then relax. If you were partner one and your hands were on the inside, what do you feel? Can you push your hands together?

- ***This activity is demonstrated in the video Year 3: Forces and Magnets – Example 3.***

5. Optional – play with a partner. Walk around the room. When you face your partner, you will repel one another (like the same poles of a magnet). When you face your partner's back you attract each other (like the opposite poles of a magnet).

Lower Key Stage 2 – Year 4

Curriculum links

Electricity

- Construct a simple series electrical circuit.
- Identify whether or not a lamp will light in a simple circuit.
- Recognise that a switch opens and closes a circuit.

Activity

Resources: paper hats for pupils allocated as battery and bulb/buzzer (optional – instructions overleaf)

1. Sit in a circle with palms touching those of your neighbours. One pupil is the battery. One pupil is the bulb or buzzer. The battery should check to see if all pupils are connected – the circuit is complete if everyone is touching palms.

2. The battery should push the palm of a partner. This push will get passed around the circle. When it reaches back to the battery the bulb will start to 'light up' (jump/bounce up and down) / the buzzer will start to make a sound. Keep sending the push around the circuit.

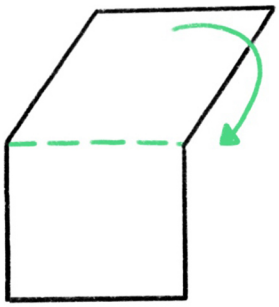
3. Introduce a switch. If the switch is open (i.e. one child is not touching their neighbour's palm) then the battery must say that the circuit is incomplete and stop pushing. The bulb will then stop lighting up (jumping/bouncing) / the buzzer will stop making a sound. What do you notice about the push when the circuit is closed and when the circuit is open?

- ***The above activities are demonstrated in the video Year 4: Electricity – Example 1.***

Paper Hat Instructions

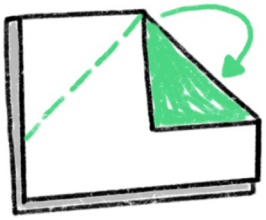
Resources: paper, pen

1.



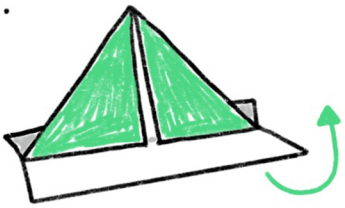
Fold your piece of paper in half.

2.



With the folded side at the top, fold the right-hand corner into the middle and then fold the left-hand corner down to meet it.

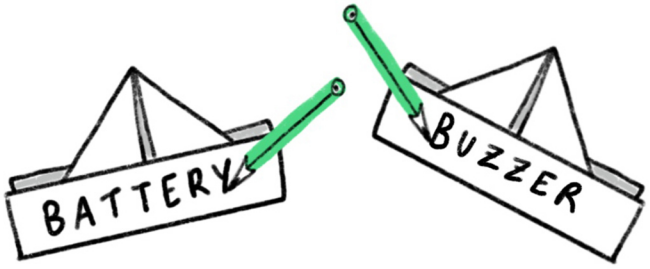
3.



4.

Fold the bottom flap of paper up on each side along the base of the triangle. Your paper hat should be complete!

5.



Write battery, buzzer, or bulb on your hat to indicate your role in the circuit.

Upper Key Stage 2 – Year 5

Curriculum links

Properties of Materials

- Compare and group everyday materials based on their properties.
- Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution.
- Use knowledge of solid, liquid and gas to decide how mixtures might be separated including through filtering, sieving and evaporating.
- Demonstrate that dissolving, mixing and changing of state are reversible.

Activity

Resources: masking tape for floor, different coloured tops for everyone in the room and fabric to act as representation of heat

1. Explore ways in which you and others can model how a solid, liquid or gas moves/behaves (i.e. bonding).
- ***This activity is demonstrated in the video Year 5: Properties of Materials – Example 1.***

2. Introduce rules and practice: when the group leader says 'separate', position yourself so you are surrounded by people of the same colour tops. When the group leader says 'mix', position yourself so you are surrounded by people wearing a different colour (in front, behind and either side).
- ***This activity is demonstrated in the video Year 5: Properties of Materials – Example 2.***

3. Some people to be in one colour top (e.g. white) while the others to be in another colour top (e.g. green). Those in the white tops should stand at the bottom of a beaker marked out on the floor with masking tape. 'Pour' in the green tops (pupils walk into the beaker in a line) and disperse using the 'mix' rule described above.

4. 'Heat' the bottom of beaker – you can add some fabric to show flames if available. Everyone in the solution is allowed to move slowly and at random in the beaker. Pick up speed. After about one minute the first pupils wearing white tops should 'evaporate' out of the top of the beaker by leaving the area and moving to the side of the room (acting as water vapour). Continue until all the white tops have left the beaker leaving only the green tops behind.

- ***Activities 3 and 4 are demonstrated in the video Year 5: Properties of Materials – Example 3.***

5. Those in white tops should stand in a line with equal gaps and link in some way. The green tops should try and get through the gaps whilst acting as different properties (i.e. hard, soft, bendy, stretchy or stiff). What do you notice about how you can get through?

Upper Key Stage 2 – Year 6

Curriculum links

Animals including Humans

- Identify and name the main parts of the human circulatory system and describe the functions of the heart, blood vessels and blood.

Activity

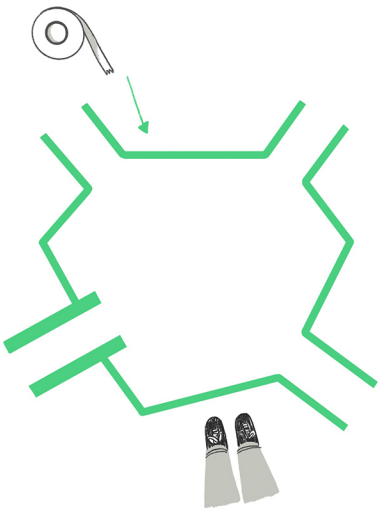
Resources: masking tape for floor (preferably two different sizes or colours)

1. Mark out the heart on the ground using masking tape.

2. Line up in a figure of 8 through the heart.

3. Explore modelling the human circulatory system in a figure of 8 motion. Where is the blood being pulled? Where is it being pushed? How would you show what the blood would look like if we were exercising? Can the blood move in a different way when it is oxygenated and deoxygenated?

- ***The above activities are demonstrated in the video Year 6: Animal including Humans – Example 1.***



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About Barbican Guildhall Creative Learning
Barbican Guildhall Creative Learning is a creative alliance pioneering new models for cultural learning across the art forms. Our mission is Creative Skills for Life and every year we deliver more than 40 programmes and events alongside 150 partners to over 22,000 participants.

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