

Margaret Roper summer science activities – keeping children entertained.

Dear parents and children,

I've chosen a few of my favourite science activities that you might try at home with the children over the summer holidays. I've chosen so that any activity needs a minimum of resources and is low cost and stress. The most important thing in all of these activities is talk – let the children talk about what they are doing, why, and ask them to describe what they do and see. This is real science – not just play – but children will 'experiment' naturally and this is how good science happens.

I've suggested a few activities (not in any particular order. See which ones suit you and interest you. There's so much more you can do also, if you search for science activities for kids – enough to keep you going the whole summer!

- *Sand volcano*
- *Colour changing chalk*
- *Making 'square bubbles'*
- *Building structures*
- *Garden safari*

The key scientific skills for children are observing, communicating, classifying, inferring, measuring and predicting. However, the most important thing to do is to provoke curiosity and excitement.

*I hope you find these useful. I'd **love** to see photos of anything interesting you find out or do!*

Mr Mooney

Science Co-ordinator

Sand Volcano Experiment

WOW the kids this summer and **make a sand volcano**

You can easily set this activity up at the beach or right in your sandbox at home..

How to Make a Sand Volcano

Materials

- Sand
- A Sand Bucket or cup
- Baking soda
- Vinegar
- Optional: food colouring

Method

- Begin by placing a sand bucket in the sand **right-side-up**.
- Then, pack sand up and around the bucket to form the shape of a **volcano**.
- A bucket makes the perfect core, and you most likely always have one on hand when playing in the sand or visiting the beach.
- I have found that using a taller, skinnier bucket produces a better volcano shape.
- You can also use an empty cup.

Note: If you fill the bucket acting as the core halfway with sand before adding the baking soda and vinegar, you don't have to use as much and you can have more eruptions. You could also use a tall skinny tube in the sand volcano, such as a thin cut down bottle.

Making Your Volcano Erupt

Add **1-2 cups of baking soda** to the volcano, pour in the desired amount of vinegar, and then **WATCH IT GO!**



What is the science behind it?

The reaction is known as an 'Acid-Base' reaction.

Baking soda is a base, and vinegar is an acid. Vinegar isn't just an acid, it is an acid in water, which is important.

The water in the vinegar acts as a host where the base and acid react. During the reaction, when the baking soda is mixed with the vinegar, the baking soda (Base) takes a proton from the vinegar (Acid). The reaction causes the baking soda to transform into water and carbon dioxide. The carbon dioxide is a gas which is released during the reaction, which gives it the bubbling effect.

Colour-Changing Pavement Chalk

Materials

- Squirt bottles (you could use almost any squeezable bottle)
- Cornflour
- Baking soda
- Food colouring or washable liquid watercolors
- Vinegar

Method

- Begin with at least six empty squirt bottles.
- Fill three of the squirt bottles 2/3 of the way with a baking soda and cornflour mixture, using roughly equal amounts of both ingredients.
- In order to make a variety of changing colours you will want to begin with one red, one blue, and one yellow chalk. **Add more colours as desired.**
- Add several drops of food colouring to each bottle, and then fill them the rest of the way with very warm water.



- Use a butter knife or similar to stir the ingredients. Then, place the caps on and shake the bottles until blended.
- Fill the remaining three bottles with vinegar, adding food colouring to each bottle.
- You will want at least one red, one yellow, and one blue vinegar as a base for creating a variety of colours.

That's it! Head outside, and the play can begin!

Try it on the pavement or somewhere that will be easily hosed down (or wait for rain!)

Try combining colours to magically create new colours.

What colours are made by mixing yellow and blue? What about Blue and Green?

Adding the coloured chalk and a different coloured vinegar makes the colours change and fizz!



Combining the blue vinegar with the red chalk gives you purple fizzing art, and the red **chalk** with the yellow vinegar magically gives you orange.

Top tip.

- It's a good idea to wear play clothes during this activity, as food colouring can stain clothing. You could also use washable watercolours in place of food colouring to colour your chalk, and this would eliminate any possible staining.

What's the science behind it?

When you mix colours through paint, or printing, you are using the subtractive colour method. The primary colours of light are red, green and blue. If you subtract these from white you get cyan, magenta and yellow. Mixing the colours generates new colours as shown on the colour wheel. Mixing these three primary colours creates black. As you mix colours they tend to get darker, ending up as black. This is the system used in computer printers.

How to Make an Amazing Square Bubble!

Materials

- Straight Straws
- Pipe Cleaners
- Bubble Solution- Homemade or Store Bought

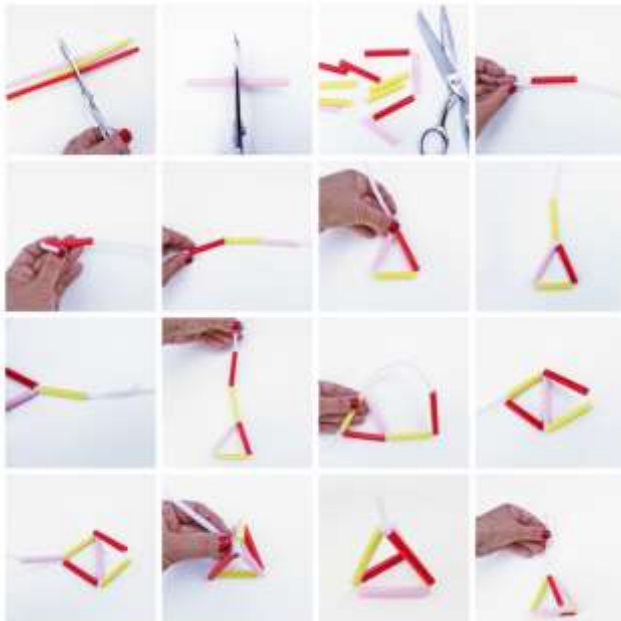
Homemade bubble solution is basically water and washing up liquid in a ratio of about 6:1. If you add about 4 teaspoonfuls of glycerine the bubbles will not pop so easily. Glycerine is available in big stores like Tesco, Boots and from amazon. It's not essential but if you plan ahead, it does make the bubbles stronger.

- Tall Tupperware container to mix or store your mixture.

Instructions

I recommend starting with a pyramid shape for your first geometric bubble wand.

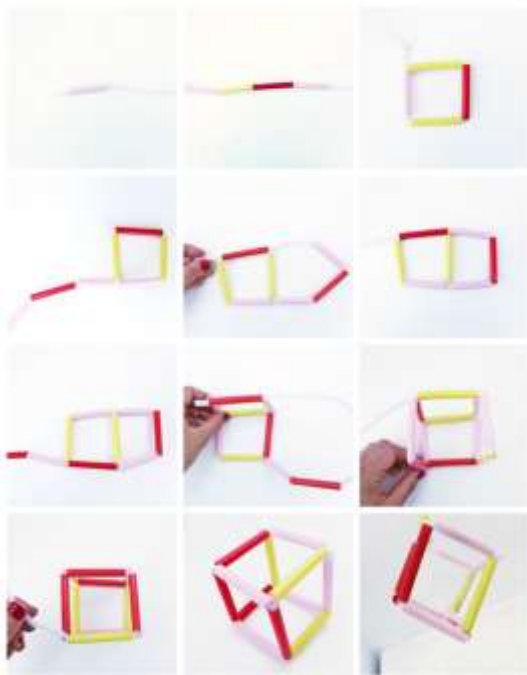
Pyramid (Tetrahedron) Bubble Wand



- **Step One** Cut your straws. First cut each straw in half, then cut in half again. You will get 4 straw sections from each straw.
- **Step Two** Thread a pipe cleaner through one straw and bend the end of the pipe cleaner to secure it at the end.
- **Step Three** Thread two more straws onto the pipe cleaner.
- **Step Four** Bend the long end of the pipe cleaner back to meet the starting point and twist the two ends around each other.
- **Step Five** Add two more straw sections onto the end of the pipe cleaner.*
- **Step Six** Thread the pipe cleaner through one of the adjacent straw sections.
- **Step Seven** Add one more straw section and bend it back to one of the straw joints to form a pyramid.
- **Step Eight** Thread the pipe cleaner through an adjacent straw section to secure everything in place. If desired, add a straight section of straw onto the end of the pipe cleaner to form a handle.

*Add additional pipe cleaners as necessary and twist the ends together to secure.

Bubble Cube Wand



- **Step One** Cut your straws. First cut each straw in half, then cut in half again. You will get 4 straw sections from each straw.
- **Step Two** Thread a pipe cleaner through one straw and bend the end of the pipe cleaner to secure it at the end.
- **Step Three** Thread three more straws onto the pipe cleaner.
- **Step Four** Bend the long end of the pipe cleaner back to meet the starting point and twist the two ends of the pipe cleaner around each other. You will now have a square shape.
- **Step Five** Add three more straw sections onto the end of the long pipe cleaner.*
- **Step Six** Thread the pipe cleaner through one of the adjacent straw sections.
- **Step Seven** Add two more straw sections.
- **Step Eight** Bend the shape to form two sides of a cube and thread the end of the pipe cleaner through one of the straw sections on the edge of the cube.
- **Step Nine** Repeat Step Eight to form another side to the cube.
- **Step Ten** Add one final straw section to complete the cube. Thread the pipe cleaner through an adjacent straw section to secure the final shape. If desired, add a straight section of straw onto the end of the pipe cleaner to form a handle.

* Add additional pipe cleaners as necessary and twist the ends together to secure.

You're done! Now it's time to make a square bubble!

Make the Square Bubble

To make your square bubble have a tall container full of bubble solution. You can use homemade solution or store bought, we tried both and each worked well.

Carefully dip your wand into the solution; some frothy bubbles will form on the top of the solution as the straws are submerged. You can scoop them away with a spoon. Now lift the wand out of the solution SLOWLY. You should see a bubble cube with multiple faces! If you don't, dip the wand into the solution again until you get an inverted bubble cube.

- The bubble cube can be tricky to make at times. I found that depending on the condition of the bubble solution and breeze we were sometimes able to make cubic bubble after cubic bubble every time and sometimes it took many attempts of dipping the wand in the solution to make one. Don't give up if you don't get a cubic bubble right away! Try it again when the bubble solution has had time to settle. Also sometimes gently tapping the sides of the wand causes the solution to move and change and cubic bubble to form.
- For the best bubbles you will want to avoid too much froth on the surface of the solution. Scoop away the bubbly froth that forms with a spoon as necessary.
- This project can also be done without straws by simply bending pipe cleaners into 3D shapes. This will help avoid the bubbles that form on the surface of the solution when the wand is submerged. I liked using the straws to help give rigidity to the shapes, however.
- Make your own shapes! Explore what happens to your bubbles when you add more straw section onto your wand at the joints. Expand your wands with additional sections and check out the cool bubbles that form as a result.
- Do this project outside or over a watertight surface. Plenty of bubble solution will drip off the wands.
- Wind and even a slight breeze will blow these bubbles apart so do the project in a place with still air.

What's the science behind it?

There's lots of talking about shapes, both 2d and 3d. You can also talk about structures and why cube frameworks are inherently less rigid than triangular structures – that's why you brace a cube with internal struts – the forces in a triangle all push against each other which provides rigidity.

In order to investigate structures more, try looking at the 'structures' activities below.

What Is a Bubble?

A bubble is a thin film of soapy water. Most of the bubbles that you see are filled with air, but you can make a bubble using other gasses, such as carbon dioxide. The film that makes the bubble has three layers. A thin layer of water is sandwiched between two layers of soap molecules. Each soap molecule is oriented so that its polar (hydrophilic) head faces the water, while its hydrophobic hydrocarbon tail extends away from the water layer. No matter what shape a bubble has initially, it will try to become a sphere. The sphere is the shape that minimizes the surface area of the structure, which makes it the shape that requires the least energy to achieve.

You can talk about solutions here – what things dissolve and what things stay solid in liquid. Does it matter what the temperature of the water is? Try using sand, salt, sugar, pepper, coffee. This is a good kitchen store cupboard activity and children love making potions!

Have a look at <https://www.thoughtco.com/bubble-science-603925#:~:text=A%20bubble%20is%20a%20thin,two%20layers%20of%20soap%20molecules.> – Lots more bubble fun and science here.

Building Structures

Following on from structures when making bubble wands, try building some structures. This video from science Max is worth watching and has a lot of great science knowledge in it. It is sure to get the children interested in how structures work.

<https://www.youtube.com/watch?v=HoZoxj3UwKU>

(It's about 20 minutes long, so you can look at it in stages if you want to)

Try building a structure from rolled up newspaper tubes. You could build a tower, making the tubes to a uniform length and fastening them with Sellotape. You could even have a competition in the family in pairs or groups to see who can make the best/tallest tower in a fixed time, say 30 minutes.

Try to model for the children how to roll a tube of paper and fix it; for many their first attempts might be less successful. Of course the temptation is to do it for them, but by making they are learning, and so try to avoid 'taking over' but do show and make suggestions.

This video has a demo of a very simple experiment with tower structures but models how tubes can be made. If you find it too restrictive, try increasing the amount of newspaper.

<https://www.youtube.com/watch?v=w5f95zfBVi4>

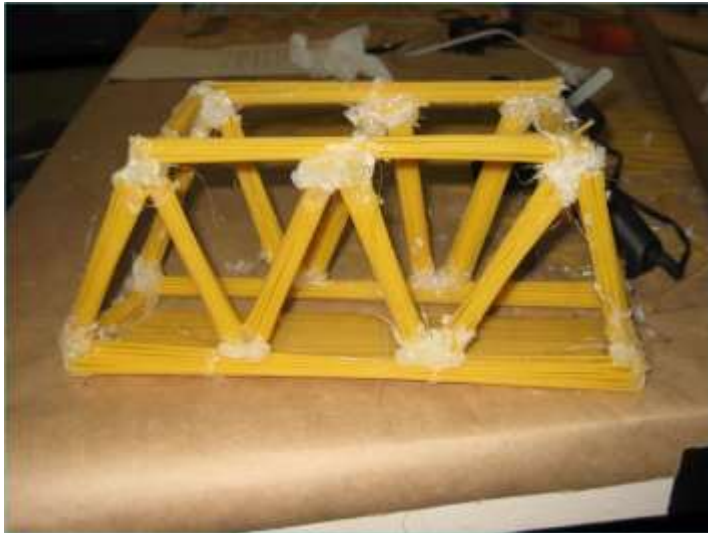
You can also make structures using spaghetti. This can be surprisingly strong when bundled together properly and taped or wound with elastic. It's also fairly cheap!

I recommend that you don't eat the spaghetti afterwards. Also, because Spaghetti splits and cracks, I suggest you don't do it over your deep pile carpet, but somewhere it's easier to sweep up afterwards!

You could try to make bridges out of spaghetti. Again, allow experimentation – we learn more from our failures than we do from being given the solution

"I have not failed – I have found 10 000 ways that don't work." Thomas Edison

What could you set as a challenge for your bridge? To span a 20cm gap between two tables? To support a favourite toy car on it?



The bridge doesn't need to be complicated – but it can be as the sophistication of the design increases.



You could also learn about different types of bridges – beam bridges, suspension bridges, cantilever bridges. The sky really is the limit!

<https://www.youtube.com/watch?v=oVOnRPefcno>

What's the science here?

We are talking lots about forces and structures. This is called STEM (Science, Technology, Engineering and Mechanics). The more children learn about how forces work on objects, the more they will be able to apply this knowledge to how they see the world working. Forces are what act on an object to change it – for instance pushes and pulls when looking at stresses on bridges and structures. By learning about how forces act, children are starting to see the application of Newton's laws in action. This video explains Newton's laws really well. Don't think they can't be understood by even young children.

https://www.youtube.com/watch?v=aA_mqSzbkM0

Garden Safari

How about creating a safari in your own back garden, or even in the park. All you need is some paper and pencils and possibly some little plastic animals.

One of the things we notice in school, and I'm sure you notice at home, is that children nowadays generally don't practice sitting still and looking closely. With media as it is, children are accustomed to immediate gratification and want results that moment!

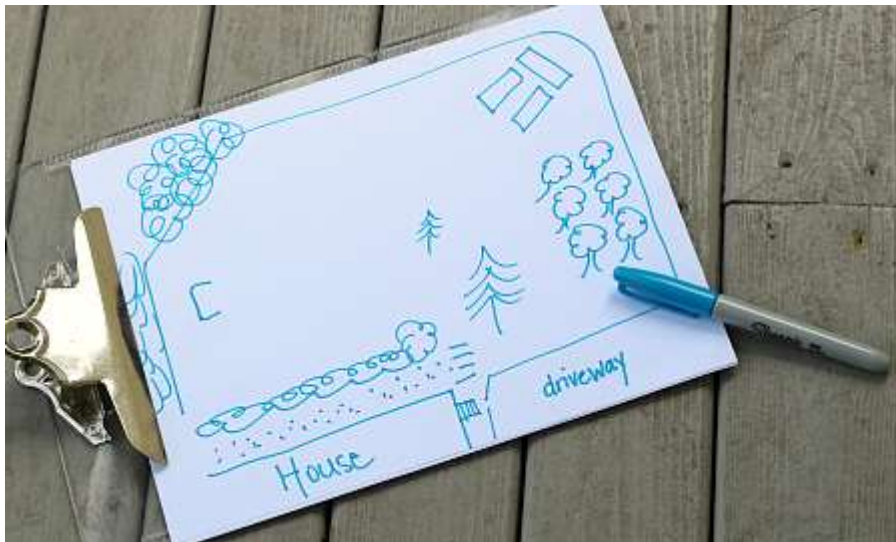
Or perhaps I'm getting old!

One way of helping children to train themselves to look closely and for sustained periods of time is to have a garden safari. That way, as your eye is trained to look closely, you begin to notice things on a small scale that you never saw before – probably because you just didn't look closely enough!

Start with this to get their interest

Find some little toy animals in your house. They could be anything. Or even make some pictures of animals. The advantage of plastic ones is that they're waterproof and durable.

Make a simple map of your garden or wherever you are. You could make this with the children- that way they will understand the symbols you use and orientation of the map.



You might need a few tries to get a map you are happy with. Then, without your children seeing this part, place the animals in various parts of the garden and mark them with an x on the map.

Then encourage your children to dress and equip themselves as if they were explorers on safari. (This is completely optional!)

Depending on the age of your child(ren) you might accompany them on safari or alternatively let them work with the map to find and record the animals they 'discover'. They could draw a picture of them or even take a photo.

Why not then turn it round – ask your children to make a map or do this together again and then you go on safari using your children’s recording to find the wildlife. Really, you could use any plastic animals or whatever you have – it’s a map making exercise to practice recording but also an opportunity to talk about different sorts of animals and how they are described – for instance mammals, birds, fish, reptiles, insects etc.

Looking closely

Moving on from this, how about marking out a small specific area in your garden/park and spending 5 minutes recording/drawing everything you see there.

If you are still and look closely, you begin to tune in your eyes and notice things you didn’t before. For instance what types of plants are there? How could you describe those plants? How many different types can you find? I suggest an area about the size of a hula hoop – if you had one you could just place it down and look within its boundaries. If you don’t how about a meter square. You could even make an observation square quickly out of anything you could find, even a cardboard box.

Once you have done this, try moving the square to a different area and seeing what you found there. Different areas will have some different wildlife and plants. Even a square of patio will have some life in it, probably.

Do some animals like cool dark places? Do some like sandy places? Can you count the animals you have found? What about a simple tally chart?

Maybe repeat this activity in a different place; for instance on grassland? Farthing Downs and Riddlesdown are amazing in their diversity of plants and animals at the moment. How about woodland. What do you see when you disturb a big stone or rotten log? The possibilities are endless. It’s all about observing, discussing and describing.

What’s the science behind it?

It’s not essential to be able to name every plant and animal – just looking closely and starting to describe the natural world is enough. If your children are a little more sophisticated they might like to start to classify the plants and animals. This is called ‘classification’ (the posh scientific word is ‘taxonomy’) and helps us to order the natural world.

It’s important to remember that not even all scientists agree on how to classify some aspects of the natural world. However, if you think that you can see a number of different types of beetles, for instance, then how can the similarities between them be described? They will be related but different for different species.

Once children really start to look at the natural world around them most of them will develop a real fascination for it – just make sure they wash their hands after being on safari and try not to be too squeamish about ‘creepy crawlies’!