



Pentagon
For Learning and Play



Using Your Pentagon Play Products for
STEAM Learning -

Inspiring Outdoor Lesson Ideas for EYFS, KS1 and KS2

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STEAM is a forward-thinking, integrated approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics to guide children's questioning, critical thinking and dialogue.

The idea is that children will learn how to take thoughtful risks, engage enthusiastically in experimental learning, work well with others and work through creative processes. It's all about encouraging the innovators, educators, leaders and learners of the future!

STEAM is in the essence of much of what we do here at at Pentagon. We have created a huge range of outdoor educational play and learning products for schools and nurseries that are absolutely ideal for, and go hand in hand with, STEAM learning.

We promote positive outdoor learning and play experiences, hands-on kinaesthetic learning, creative problem solving, investigation and discovery, experimentation and yes, getting a bit messy and generally having a lot of fun in the process!

Outdoor Science Table

An [Outdoor Science Table](#) is an essential STEAM learning resource for all nurseries and primary schools.

Our Tuff Spot Table is popular as it offers easy, immediate and communal access at standing height so children feel confident using it. The table surface itself has a raised edge, so it's great for mixing and messy experiments.

It also has handy integrated storage for tools and materials and is easy to wipe down for repeat experiments.

You can move the Tuff Spot Table around and place it in direct sunlight or shade to suit the activity being undertaken.

We recommend equipping your Outdoor Science Table with items from the following (non-exhaustive) list of manipulatives which you can store in the boxes underneath.

- Magnifying glasses
- Tweezers
- Basters and pipettes
- Plastic squirt bottles
- Plastic test tubes
- Tea strainers/sieves
- Funnels
- Measuring cups and jugs with unit markings
- Scoops and spoons
- Wooden ice lolly sticks
- Empty egg boxes and cardboard rolls
- Ice cube trays



Your well-equipped science table is now ready to go for all sorts of wonderful outdoor science experiments. There are so many things that you can do and it's impossible to list them all.

One of our favourite activities is to create "exploding volcanoes" by mixing vinegar and bicarbonate of soda at the table. The acid reacts and causes fizzing bubbles.

Carry out the experiment in different vessels and allow children to discover for themselves what quantities and which size and shape vessels work best. Funnels and small narrow plastic bottles are best as they allow the foam to rise and "explode" out of the top.

Add a few drops of food colouring to colour the foam. Experiment with mixing colours together; see what happens and discuss why. Add a few drops of washing up liquid for an even better reaction.

It's great fun and allows loads of opportunity for trial and error, open discussion and problem solving. Children will enjoy taking it further and getting creative by building their own volcano structures out of moulding clay around a small plastic bottle.

Talk about the chemistry behind the reaction in this experiment, or use it to capture interest and explore how real volcanic eruptions happen and why.

Den Building Challenge

Den building is an excellent STEAM activity for children as there are so many different problem solving and creative elements to it and very few limitations.

At Pentagon, we have created a number of different and versatile den building products, which you can [view here](#).

You can use any of these resources as a den base upon which children can design and build their own dens.

Offer them a selection of resources and materials to use:

- Ribbons
- Cardboard
- Mesh
- Net
- Rope
- Tape
- Glue
- Staples
- Wool
- String
- Tin foil
- Needle and thread etc

Encourage them to be creative in making their own suggestions as to what would work well.

Freestyle den building is great because they will be open to really experimenting and trying everything out without inhibition.

Next time, ask them to think about and draw out their designs first. Then encourage them to continually assess as they go and consider what adaptations they might need to make to their plans to make their dens better and stronger,

waterproof or wind resistant.

There are plenty of physics based concepts and vocabulary to explore and discuss along the way.



Changing Water Experiments

Water is a wonderful STEAM learning resource for children in every way. It's ever changing and moving and children find it not only fascinating but also therapeutic to play and experiment with.

Use your [Water Table](#) for exploring features and properties of water and carrying out water based science experiments with the children.

Talk about what factors influence its temperature and what happens to water when it reaches boiling or freezing point:

- During the winter months, place all sorts of different things out in the Water Table to get trapped in the ice.

Let children predict and discover.

Let them break up the ice play and with it and describe what they see.

- Carry out an evaporation experiment using different sized containers and tubs, bottles and lids items from your recycling bin.

Ask the children to fill each vessel with the same amount of water from the water table using measuring jugs (we'd recommend 10-20ml). If some of your vessels are the same

size, fill them with different amounts of water.

Cover some with foil, cling film, paper or mesh. Place them all together in a warm or sunny part of the playground, or stand them in your Water Table or on your Tuff Spot Table and observe over the course of the week.

If you don't have space to do this with a number of containers, use the Water Table itself. Fill it to 20cm with water and use waterproof stickers to mark the water level twice a day over the course of the week. Record the results on one of your outdoor [Mark Making Panels](#).

The idea is for children to discover what evaporation is and what factors affect the rate of evaporation. Ask them to predict from which containers they think the water will evaporate the fastest and the slowest and why.

- Incorporate floating and sinking experiments and teaching of water displacement with different porous and non-porous objects and small world toys.

Observe how the water affects these objects and vice versa, and what causes them to float or sink in the water (mass, weight, design etc).



for STEAM learning. The pulley systems are enclosed in clear casing to allow children to observe them working and introduce them to basic mechanisms.

- Use it as a visual resource to teach velocity ratios.
- Teach children about load and effort comparisons by asking them to fill the bucket with all different types of materials.
- Weigh the materials before placing them in the bucket.
- Notice the strength of their own force needed to pull the ropes depending on the weight in the bucket.
- Notice the impact that the speed of the pulley has on the contents of the bucket.
- Can they fill it full of water and transport it from one end to another without spilling a drop? How?
- What is friction? One surface moving over another creates friction. How does this help the pulley to move if at all?
- What is kinetic energy and what factors (e.g. gravity) influence it?



Rope and Pulley System Discovery

Our [Rope and Pulley Materials Mover](#) is a really popular messy and heavy play resource at playtimes and children love using it to transport mud, sand and water (and anything else they can find!) between their other experimental play pieces.

There is a lot more to it than this and it's a brilliant resource



Maths and Science Experiments with Soil

Sometimes children just want to dig in the dirt and get lost in their experimental play. Take advantage of this love for all things mucky with some mud-making science experiments!

Our collection of [Mud and Sand](#) outdoor play and learning resources perfectly facilitate investigative soil science experiments. You can use the recommended resources stored in your Tuff Spot Table, including vessels for measurements, and you need some pH paper for the testing.



Experiment with pH levels. Soil pH is a measure of the acidity or basicity of the soil. Pop some pH paper into the soil in your dig pit and mud kitchen (the wider the range of sources the better) and observe what happens.

Why does this matter? The pH of soil can affect how plants grow and even what colour some flowers are! Hydrangeas are a good example of this.

You can add water and other liquids to see if this makes any difference to your results. Don't worry too much if it doesn't. It's a great opportunity to talk about and test hypothesis and to understand that the answers to our questions or predictions are not always what we might expect.

Mud, sand and water are excellent interactive materials for teaching and experimenting with all sorts of mathematical concepts - timing, counting and measuring to include but a few. For more outdoor Maths ideas, have a look at our suggestions for [Maximising Your Playground for Outdoor Maths Lessons](#).

Gravel, Travel & Energy

Our [Waterfall Channels](#) and [Gravity Table](#) are designed especially for learning through experimental play, both cascading water and other objects from one level to another in different ways.



Encourage children to pour water and drop all sorts of other resources of your choice into them (small balls work well), predict and observe what happens.

Observe. The power of observation cannot be underestimated in science. Get back to basics and play in your Dig Pit, Sand Table and Mud Kitchen.

Pick up the soil, look at it with a magnifying glass, feel it between your fingers, talk and write about what you see.

Draw comparisons between the textures and the properties of the soil and the sand. How do they look different close up?

Experiment with Water. How does water affect sand and soil?

Fill little containers with soil or sand (or a mixture) and pour on water. Measure out quantities.

Test tubes are best for this as you can see all around the way around. What happens to each when they get wet?

Can you see any air bubbles as it gets displaced?

Children can discover for themselves what can be done to stop the flow (if anything!) or to influence speed and course.

- What role does gravity have to play?
- What happens if you place items in carefully or throw them in forcefully?

Children can experiment with viscosity, mixing water with flour to make it thicker, or sand (will it all mix up together?) and see what impact this has on the flow.

- Talk about how water is used for transportation and for generating energy.
- How do you think this works?

Try it out for yourselves using leaves/sticks/small world toys.

The Water Cycle

Our impressive [Water Wall](#) is a firm favourite for investigative play, with a hands-on nature that allows children to build their own water course and influence the flow.

It's also an outstanding resource for teaching children about the science behind the water cycle and where rain comes from:

- The reservoir at the bottom acts as the main water "source" - imagine it's just like a lake or river!
- Children can pump the water up to the top reservoir - imagine this is the effect of the sun causing evaporation, turning the water into vapour which rises up into the sky to form clouds - why?
- As the vapour rises it cools and forms in clouds. Place the wall mounted Rain Cloud at the top of the Water Wall as a visual tool.

What happens next? Condensation! Watch the cloud fill with water - this is what happens to real clouds, until they are so full and cold that the vapour turns back to water which falls back down as rain.



It lands on the earth and most of it collects and travels to rivers, lakes and the sea (or in this case through the polycarbonate channels and back down into the reservoir!) and so the cycle goes on.

There is super array of new scientific vocabulary and concepts to discuss here. Depending on ability, discussion can be expanded to include other influencing factors and obstacles, environmental issues and human impact.

Our Water Wall can be used for a whole host of other STEAM based learning activities. For further information and ideas, have a look at [The New Pentagon Play Water Wall](#) and our [Water Wall Activities and Lesson Ideas](#).



Wildlife Gardens for Biodiversity & our Planet

Biodiversity projects continue to rise in popularity in nurseries and schools across the UK.

Wildlife areas are a marvellous way of teaching children first hand about life sciences, ecology, ecosystems, environmental issues, life cycles of plants and animals – the list goes on! They also set an example to children about the importance of looking after our environment and the world around us.

Our guide on [How to Make Your School Pollinator Friendly](#) talks about this in more detail, introducing our range of natural playground equipment to help you to create your own wildlife areas that support a big chunk of outdoor STEAM learning topics, and how to keep children involved.



A [Wildlife Area](#) is a fantastic environment to learn all about how plants grow, seed germination and plant reproduction. Children can grow their own plants from seeds, explore, pick and pull apart!

Get them exploring for themselves, using magnifying glasses or microscopes where necessary to closely examine seeds and all the composite parts of leaves and flowers.

A [Bug Hotel](#) can be used to challenge children to investigate and identify different mini beasts. They can learn how to spot the differences and common characteristics between insects, arachnids, those that have exoskeletons and so on.

Consider the difference between things that are living and things that are non-living. Talk about natural habitats. Learn about and observe life cycles of some of the creatures that come to visit.

As you continue to grow your natural learning areas (an ongoing process with great longevity!), use them to capture children's interest in observing Earth's journey around the

sun through the changing seasons.

- Follow shadows (when the sun is high in the sky and low in the sky) and mark their outline with chalk.
- Take photographs to make comparisons throughout the year.
- Observe how the plants change and how different types of creatures come to visit or hide away at different times of the year.
- Draw pictures and write about your observations.
- Get them really thinking, noticing, observing light and shade, changing colours, water properties, outdoor temperatures etc. Why is this happening?

Through observing their outdoor environment, you can encourage children to find answers to some of their really big questions about how our planet and the things it holds work - and that goes right to the heart of STEAM learning.



If you have found these lesson ideas useful, you might also be interested in some of our other STEAM centred lesson ideas and articles, including [Fun Outdoor Science Lessons for KS1](#) and [The Benefits of Performing Arts in Schools](#).

If you would like to find out how we can help you to improve your school or nursery playground to support STEAM learning, please do not hesitate to [Contact Us Here](#). We'd love to hear from you.