

SCIENCE SPARKs

Science for Early Years



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At Science Sparks we know how hard it can be to integrate science in the classroom, which is why this e-book is full of inexpensive, simple yet creative irresistible learning opportunities for Reception age children.

When someone says let's do a science experiment, what's the first thing that springs to mind? Do you think of specialist equipment, laboratories and following a long list of instructions or watching someone else demonstrate something that's been done hundreds of times before?

Science for children shouldn't be constricted to watching other people, it should allow children to explore themselves, asking questions and learning through their own curiosity using simple materials easily found around the home or classroom. Imagine a tray of coloured, glittery ice, warm water and a pipette, just those simple materials provide the opportunity to learn about melting, freezing, temperature, team work, problem solving and so much more.

Science doesn't need to be complicated and perfectly planned. Open-ended challenges are a fantastic way for a child to learn through their own natural curiosity and innate problem solving skills to investigate, observe and question, learning through their own mistakes and successes.

The activities in this book are primarily designed for Early Years Foundation Stage, but can be extended for much older children. Each idea has been carefully planned to improve logic, problem solving and investigative skills whilst being visually appealing.

Top Tips for Science in the Classroom

Don't try to set up the perfect experiment, encourage correct experimental design but allow some flexibility. It's impossible to control every variable in the classroom or home.

Don't worry if it doesn't work or things go wrong, use the opportunity to talk about why it might not have worked and what you can do to improve it for next time.

Take a hands on approach, children learn much more if they can take part in activity themselves rather than watch someone else.

Repeat the same concepts with different activities. Reinforce a child's knowledge on a particular topic by allowing them to explore it in different ways, for example you could do a magnet treasure hunt, followed by a magnet maze and then a sensory bottle.

Let the children lead, listen to questions they ask and adapt the activity to answer their questions.

Take your time, allow plenty of time and space for children to explore for themselves and learn by trial and error.

*Thank you to Eagle Class, 2014-15
whose boundless enthusiasm and
imagination inspired this collection
of activities.*

Painting on Ice

Ice painting costs almost nothing and one thick sheet of ice can keep several children busy for hours. This activity is great for learning about changes of state as the ice melts as the children paint.

Did you know ice feels sticky because it freezes the moisture in your fingers?

Materials

Baking Tray
Water based paints
Kitchen roll
Paper
Water
Paintbrush



Method

- Freeze water in a baking tray so you have a sheet of ice.
- Paint on the surface of the ice.
- Place paper on top and press down gently, rubbing all over.
- Leave your paper to dry.
- Wipe the remaining paint off the ice and paint again.
- Decorate your ice paint picture.



Discussion points

How does this ice feel to start with? Is it sticky?

Is it easier to paint on once the ice starts to melt? How does it feel when using the paintbrush?

Can you experiment with different types of paper? Does normal paper absorb more paint than tracing paper?

Expressive Arts and Design → Exploring and using media and materials
Expressive Arts and Design → Being imaginative

Snow Volcano

Theme – Winter/Ice

A snow volcano is a great way to show children a simple chemical reaction, without the hassle of making an indoor one. The contrast between the white snow and the red lava is also great to see.

Materials

Baking soda (bicarbonate of soda)
Washing up liquid
Red food colouring
30 ml vinegar
Jar or plastic bottle



Method

- Add about 30 ml of water, a few drops of red food colouring and a heaped tablespoon of baking soda to the jar or bottle.
- Build your snow volcano up around the jar.
- Pour in about 30ml of vinegar and a dollop of washing up liquid.
- Watch the eruption!!!

Why does this happen?

Vinegar (an acid) and bicarbonate of soda (an alkali) react together to neutralise each other. This reaction releases carbon dioxide, a gas which is the bubbles you see, these bubbles make the washing up liquid bubble up to give the reaction shown above.

Top Tip

Have some extra materials ready for a second eruption

Ice Fishing

Theme – Winter/Ice

The aim of the activity is to discover whether ice melts faster in hot or cold water. It's a brilliant activity for introducing changes of state to young children.

Make this activity look appealing by freezing string into ice and attaching to sticks as 'fishing rods'.

Materials

Sticks
Plastic fish
Water
String
Trays
Timer



Method

- Freeze plastic fish and pieces of string in an ice cube tray.
- Label 3 tubs of water hot, warm and cold and fill with the corresponding water.
- Let the children feel the water in each tub and ask them to choose which they think will melt the ice first.
- Ask the children to hold the their fishing rods in the water and observe the changes that occur over time.
- How long does it take for the fish to be free?

Discussion points

How does this ice feel to start with? Is it sticky?

How could you speed up the ice melting?

Early learning goal – the world

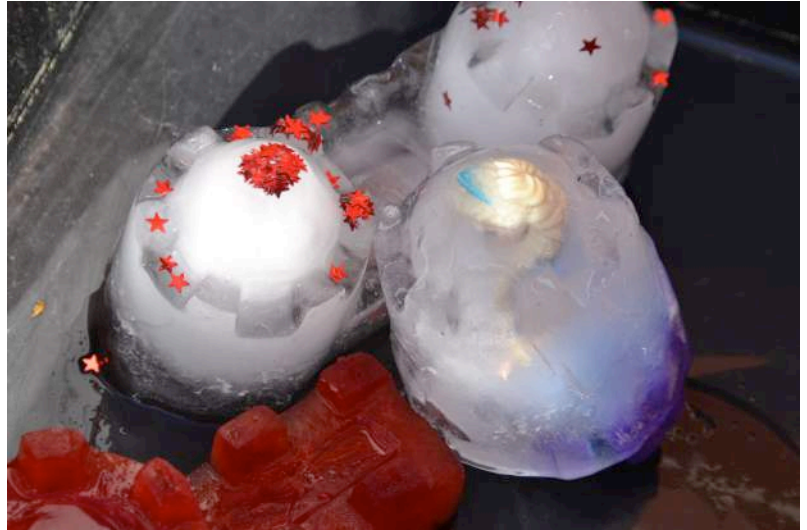
Expressive Arts and Design → Exploring and using media and materials

Ice Excavations

Freeze characters into ice shapes and let children try to rescue them. You could even use salt to experiment speeding up the melting process.

Materials

Water
Different shaped containers
Toy characters
Warm water
Cold Water
Salt
Pipettes



Method

- Freeze characters into chunks of ice.
- Let children discover how to melt the ice fastest by dropping warm water and cold water onto the ice with a pipette.

Discussion points

How does this ice feel to start with? Is it sticky?

Other ideas

How about making some ice decorations and leaving them in different areas of your outside area to see where they melt the fastest, do you have a sunny spot?

Top Tip – freeze a huge piece of ice and see how long it takes to melt.



Spin Art Painting

Spin art is an easy and almost mess free art activity, as the paint is neatly contained in the spinner. You could experiment using different types of paper to see how the patterns differ.

Materials

Paint
Salad Spinner
Paper or coffee filters



Method

- Place the paper or coffee filter into the spinner.
- Drip paint onto the paper.
- Spin the salad spinner.
- Admire your creation.

Discussion points

Does the paint slide around shiny paper more than matte paper?

What happens if you spin the spinner very fast? Is the pattern different to if you spin slowly?

Top Tip
Try some colour mixing..

Investigating Fingerprints

Theme – People who Help Us

This super simple activity is perfect for Police themed role play.

Fingerprints are tiny ridges and patterns on the tip of the finger.

Materials

Paper

Washable Ink pad



Method

Ask each person to press their finger carefully on the ink pad, from the last joint to the end of the finger.

Remember to note whose print it is.

Compare the fingerprints. What can you see?

Discussion points

Look for lines, creases and circles? Do any family members have similar fingerprints?

Extension tasks

Make a tally chart of eye and hair colour for people in them same family? Are they the same or different?

How to keep teeth healthy

Theme – People Who Help Us

This fun activity is all about how to teeth and how to keep them healthy. First we talked about how important it is to brush our teeth everyday and then chatted about foods that are good for our teeth and foods that aren't.

Sugary, sticky food is not good for our teeth as it sticks to the surface, bacteria then break down the sugar to make acid which can damage our teeth.

Materials

Eggs

Jars

Water

Tea/Coffee

Fizzy flavoured drink

Vinegar

Toothpaste



Method

- Pour the same amount of fizzy drink, vinegar, water and tea or coffee into your jars.
- Add a whole raw egg still in it's shell to each, cover an extra egg with toothpaste and also place in tea/coffee.
- Leave for approximately three days.
- Remove the eggs.
- Rinse the egg kept in vinegar and rub gently until the shell comes away.

Discussion points

You should see staining on the eggs from the tea and coffee and less staining where the egg was covered in toothpaste.

Tea is rich in tannins which stain teeth if they're not cleaned properly while cola and fizzy drinks are acidic as well as containing staining products.

Vinegar (which is acidic) dissolves the calcium carbonate in the shell, leaving just the membrane intact.

Top Tip
Can you bounce the vinegar egg?

Physical Development → Health and self-care

Make a Stethoscope

Theme – People who Help Us

This super simple stethoscope is a great way to learn where the heart is, practice counting and working together.

Did you know you can make a Stethoscope with just kitchen roll, gaffer tape and a funnel.

Materials

Kitchen roll tube

Gaffer tape

Small funnel



Method

- First try using just the kitchen roll tube. Place on the chest and see if you can hear the heart beating.
- Next tape the funnel into one end of the kitchen roll. Place on the chest again, does the heart sound clearer?

Discussion Points

Stethoscopes used by doctors consist of a chest piece, rubber tubes and earpieces. The chest piece consists of a diaphragm and bell which amplify the sound of the heart beating so the doctor can hear it.

Extension Tasks

Make predictions as to what will happen to the heart rate if a person jumps around first.

Trying counting the number of beats before and after some exercise and record the data on a chart.

How could you make the stethoscope better? What if you used a hose with a funnel at each end? Or different sized funnels? Which do you think would work the best?

Learn about bones

Theme – People Who Help Us

This is a lovely hands on role play activity great for learning about bones and how to keep them healthy.

Did you know the Human skeleton is made up of more than 200 bones?

Materials

Doll
Modrock
Water
X-rays
Plain bandage



Method

- Discuss why we have bones, and what our body would be like without them.
- Talk about foods that are good for bone health and foods that are not.
- Discuss X-Rays and how they help us see inside our body.
- Use the modrock to carefully bandage the arms and legs of dolls.

This activity must be supervised

Check the instructions on the mod roc, but usually you cut the mod roc into small sections, dip quickly in water and then place over a plain bandage on a dolls limb.

Useful Information

The skeleton has three main functions:

- It supports the body.
- It protects organs, for example the ribcage protect the lungs and heart and the skull protects the brain.
- It helps the body move, along with muscles.

Can you bend your fingers and feel the finger joins with your other hand?

Muscles help our bones move. If you bend your arm and clench your fist, can you see the shape of the muscle in your upper arm?

Physical Development - Health and self-care

What's inside your body

Theme – People Who Help Us

Children draw around each other on large sheets of paper and then draw and label body parts.

Materials

Large sheet of paper

Felt tip pens



Method

- Children work in small teams to draw around each other.
- Draw different body parts
- Label body parts.

Top Tip
Use sticky labels to name body parts

Extension Tasks

Cut out organ shapes and stick them onto the drawing.

Make 3D organs using play dough.



Physical Development → Health and self-care → ELG

How Waterproof is it?

Theme – Pirates

This is an easy waterproofing experiment, which this can be changed to fit any theme. How about using sparkly princess bags or a superhero survival kit bag?

Materials

Coins
Washable Paint -optional, but helps the children to see if the coins are wet
Plastic bags
Cloth bags
Paper bags
Water
Spray bottles



Method

- Let the children feel each bag and ask if they know what material it's made from.
- Ask the children to predict which bag will be the most waterproof and how they will know.
- Seal the bags with an elastic band.
- Spray the bags 5 times with the water sprayer.
- Observe any changes.

Discussion points

How does the water look on the surface of the waterproof bags compared to the paper?

What happens to the paper bag?

Can you see the colour running off the coins.

Top Tip
Paint the coins with washable paint so you can easily see if they get wet.

Make a Magnet Maze

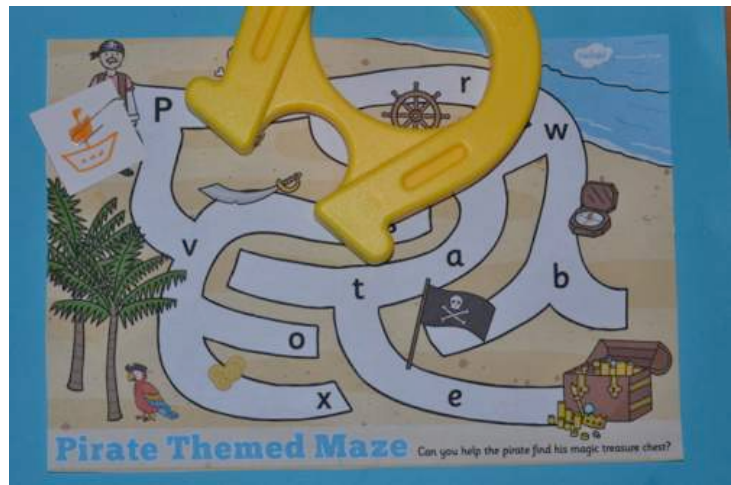
Theme – Pirates, but easily adapted for Superhero and Fairy Tales

This is a fun way to learn about magnetism, and just needs a paperclip, paper and large magnet.

How many magnetic items can you find around the classroom?

Materials

Thick cardboard
Selection of magnetic and non
Magnetic objects
A Magnet
Metal Paperclip
Cardboard
Pirate maze FREE from Twinkl



Method

- Draw a pirate ship on a small piece of cardboard and attach a metal paperclip. Place the magnet on the underside of the maze and use it to guide the ship around the maze.
- If you didn't want to use the Twinkl maze you could always draw your own.

Discussion points

Magnets attract some metals and can be different strengths.

Magnets have two poles, we call them the north pole and south pole. Opposite poles attract each other and the same poles repel.

Extension Tasks

Can you make a giant maze? Does thinner paper work better than thicker?

Expressive Arts and Design → Exploring and using media and materials

How waterproof is it?

Theme - Pirates

This is another low cost activity brilliant for introducing how materials have different properties. You can adapt this easily to fit any theme. This example uses pirate ships.

How many different types of paper can you test?

Materials

Paper with a picture on it.
Materials such as kitchen roll, plastic, bubble wrap, greaseproof paper, tissue paper cut into squares.
Water
Glue
Squeezy water bottle.



Method

- Draw a pirate ship.
- Feel the different types of material and predict which will be the most waterproof and why.
- Place the squares of material over the picture using glue.
- Spray water over the picture and observe any changes to the paper.

Discussion points

Does it make a difference if you use more than one layer of the materials that were less good at repelling the water?

Can you try using a 3D pirate ship? Try using egg boxes or paper boats.



Magnet sensory bottles

This is a lovely, hands-on way to introduce magnetism to young children and can be themed to fit your topic.

Remember – not all metals are attracted to magnets, but iron and steel (steel is mostly iron) are

Materials

Water
Pirate 'treasure'
Coloured rice/pasta
Bottle with lid
Small magnetic and non
objects
A magnet



Method

Rice/Pasta Bottle

- Carefully pour your coloured rice and pasta into the bottle, add the small objects and give a good shake.
- Use the magnet to move the magnetic objects around the bottle. How many can you find?

Water Sensory bottle

- Fill your plastic bottle with water and drop your magnetic objects in.
- Use the magnet wand to drag magnetic objects around the bottle.

Discussion points

Does a plastic bottle work better than a glass bottle?

Do you have any coins that aren't magnetic?

Can you try with different strength magnets?

Making and racing boats

This is a really fun activity for starting to learn about properties of materials and the effect of gradient on speed. You can split the experiment into two parts, first test different materials to see which work best as a boat and then race the boats down different inclines.

How many different types of boats can you make?

Materials

Paper
Optional pirate decorations
Corks
Elastic bands
Skewers
Black cardboard
Wooden lolly sticks
Washing up sponges
Plasticine
Glue



Method

- Construct your boats using different materials.
- Some ideas are lolly stick rafts, sponge boats, paper boats and cork boats
- Test your boats to see if they float.
- Race them down half pipes.
- Observe the difference in speed if the gradient is greater or if water is run down behind the boat.

Discussion points

How can you measure which boats are the fastest?

Extension Ideas

Use a straw to blow the boats across a calm surface of water, what happens when you blow gently and then with more force?

Does the boat move faster if you blow the air close to the boat or far away?

Can you use the straw to create waves across the water?

Little Red Riding Hood Map Reading

Theme: Fairy Tales

Create a map of the forest and use props to help Little Red Riding hood get to Grandma's before the wolf.

Skills: logic, map reading, problem solving

Materials
Card
Doll
Wolf
Story Props
Pens



Method

- Use a large piece of card to design your forest. Add obstacles such as streams, ponds, trees etc to the shortest route through the forest.
- Mark a long route through for the wolf.
- Choose several items that may/may not help Little Red Riding Hood get over the obstacles, the children can select which item they think will work the best, for example, boat, basket, stepping stones to cross the river.

Extension Ideas

How could you slow the wolf down? Block his way with logs? Break the bridge across the river?

Expressive Arts and Design → Exploring and using media and materials

Make a Teddy Zip Wire

Set up a zip wire in the trees, test different harness materials and change the gradient to see how it affects the speed.

Materials
String
Pipe Cleaners
Straws
Soft Toy
Timer



Method

- Set up your zip wire
- Attach a soft toy to the wire and time how long it takes to reach the bottom.

Variables to change

Type of zip wire
Incline of zip wire
Weight of teddy
Type of harness

If you change one variable don't forget to keep the others constant.

This is a great experiment for starting to learn about correct experimental design.

Extension ideas – for older children consider the effect of friction

Top Tip

Set up several zip wires in one area with different inclines.

Treasure Maps

Use coffee to paint treasure maps then draw maps, or follow a trail on a map.

Use easily identifiable markers on your map.

Materials
Paper
Coffee
Water
Felt Tip Pens
Paintbrushes



Method

- Make up a strong coffee solution and leave to cool.
- Paint the paper with the coffee solution and leave to dry.
- Draw a map, looking carefully for recognisable markers.
- Can a friend follow your map?

Extension Ideas

Can you try making treasure map paper with different concentrations of coffee? Does it make the paper different colours?

Top Tip
Can you write a secret message using lemon or lime juice.

Three Little Pig Houses

Theme: Fairy Tales

This is a brilliant activity for learning about stability of structures and properties of materials. You can use whatever materials you have handy for the houses and could easily adapt this for any theme.

Materials
Sticks
Straws
Marshmallows
LEGO
Squeezy bottle or fan
Sugar cubes



Method

- Set up several areas for house building with different materials for example, sugar, cube houses, sticks, straws, LEGO, marshmallows and straws
- Discuss how best to test the strength of your house, can you simulate wind using a squeeze bottle or fan?

Extension Ideas

- Discuss how you could stick the sugar cubes together, could you use icing sugar as 'cement'.
- Could you find out if the houses are waterproof?
- What happens if you spray the sugar cube house with water?

Expressive Arts and Design → Exploring and using media and materials

Filter Paper Pictures

Use filter papers to try a mini chromatography experiment. Watch the felt tip pen colours separate when you add water to the filter paper.

Use easily identifiable markers on your map.

Materials
Filter paper
Water
Felt Tip Pens – not washable
Pipettes



Method

Draw some dots on your filter paper using felt tips pens.

Use the pipette to drop water onto the dots.

What happens to the pen?

Discussion Points

When water touches the ink it dissolves and spreads out, separating the ink so you can see the different colours that make up the felt tip pen ink.

Extension Ideas

What happens if you use a permanent marker?

Top Tip
Can you turn your colourful filter paper into a butterfly?