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TALK WITH ME

Tuesday

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STEM

National Day Nurseries Association

*Brighter thinking for early years

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STEM

STEM refers to science, technology, engineering and maths. You may also see it referred to as STEAM, which incorporates the arts as a medium for a more holistic approach to teaching and supporting STEM learning.

STEM learning is important for our society, as we need talented people with STEM skills to provide creative solutions to global issues such as power generation and to support future productivity, growth of UK industries and the economy. People with strong STEM skills may be the inventors, engineers and scientists of the future. There are also benefits to children's life choices:

It has been recognised that science can help broaden young people's life choices and opportunities in terms of keeping their future options open, especially among low socioeconomic groups, as it can help social mobility. Beth Hawkins, Science Museum Group, 2017.

By 2030, the U.K. will have over 7 million jobs needing STEM skills (Organisation for Economic Co-operation and Development, OECD 2011). Current predictions show that unless we support and develop opportunities and career choices for STEM subjects, we may have an acute knowledge shortage for STEM roles. There is a disparity between genders taking up STEM careers. Recent research shows that just 35% of STEM students in higher education are women as reported in STEM Women (2022) with figures from UCAS and HESA. Although the gender gap is slowly improving, it is imperative that we continue to close the gap and make the STEM subjects an attractive career choice for young girls. To support this aim, early years practitioners should ensure they provide a range of stimulating STEM experiences that are accessible and inclusive to all children, and that you continue to challenge any stereotypes about gender roles and inclusion.

The concept of STEAM may be new but when the skills that are involved are explored, the links to good early years pedagogy are clear. Young children are naturally curious and STEAM concepts and inspiring experiences encourage children to actively explore and test their ideas, to be curious, to persevere and problem solve, to develop their vocabulary and communication, to become explorers, engineers, scientists and discoverers.

STEAM activities do not have to involve complicated ideas or extra resources. Children are engaging in STEAM when they:

- Explore the world around them
- Notice shapes and patterns in the environment
- Build structures with blocks (weight, balance, height, counting, problem solving)
- Explore the physics of force and motion when playing with wheeled toys
- Grow seeds and plants (the science of what plants need to grow)
- Explore the properties of materials
- Play with programmable toys or mobile phones (technology)
- Sing number rhymes (maths).

All that is needed is to provide the opportunities and environment to support children's curiosity.

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Activity 1 Balloon rockets

Balloon rockets are a great way to investigate physical forces, direction and movement. Children can explore in a fun way what happens when air is released and how far a balloon can be propelled forward. Children can test various theories by using different shaped balloons, adding weights to see if it affects distance travelled or creating inclines and bends to test out what happens.

I wonder what will happen?

Learning opportunities include:

- Make predictions
- Concentration, resilience
- Vocabulary development
- Test and refine their ideas
- Take a risk, engage in new experiences, learn by trial and error.

Resources

- Measuring equipment - standard (tape measure, rulers) & non-standard (sticks)
- Roll of string, paper straws, sticky tape (be sure that the straws slide along the string)
- Balloons of different shapes and sizes
- Paper, pen or camera to record distances travelled
- Objects to use as weights.

Balloon rockets

Activity outline

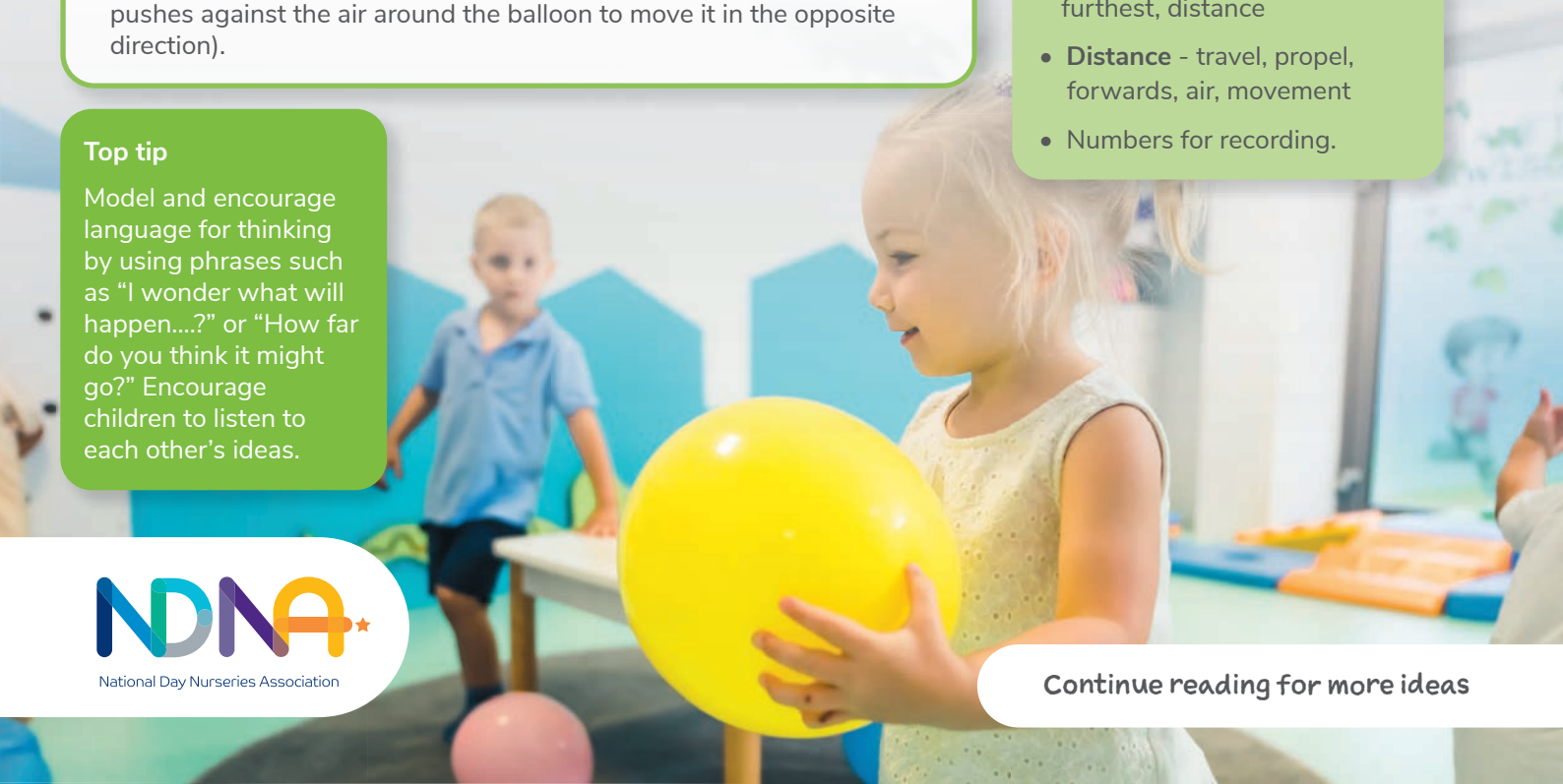
- Thread a paper straw onto a roll of string. Stick both ends of the string to separate walls, creating a washing line
- Blow up a balloon. Do not tie, but peg the end so no air escapes
- Tape the top of the balloon to the straw (so it hangs underneath the string). Pull the straw and balloon across to one end - your 'start' side
- Release the peg and see how far the air propels the balloon across the string
- Talk to children about what makes the balloon move (air rushes out and pushes against the air around the balloon to move it in the opposite direction).

Key vocabulary might include:

- **Time** - fast, faster, fastest, quickly, slow, slower, slowest, slowly
- **Measures (general)** - measure, compare, guess, estimate, results, close to, nearly, about the same as
- **Length** - far, near, close, furthest, distance
- **Distance** - travel, propel, forwards, air, movement
- Numbers for recording.

Top tip

Model and encourage language for thinking by using phrases such as "I wonder what will happen....?" or "How far do you think it might go?" Encourage children to listen to each other's ideas.



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Activity 1 Continued...

Experiment with balloons

Extension ideas

Measure distances and record results. Discuss what worked and why - what was the best way to propel the balloon the furthest distance, why some ways didn't work and what they enjoyed.

Try different experiments – part blow up the balloon, or put up a second line parallel to the first and have balloon races. Encourage each group to experiment with different ways to propel the balloon further.

Encourage children to create inclines or different shaped string lines for the balloons to travel along.

Provide small objects to act as weights to explore the difference between the distance the balloons can travel with and without weights attached.

Encourage children to take it outdoors or into other more challenging spaces.

Sustainability

Dispose of latex/rubber balloons responsibly. You can shred them and add to a compost bin.

Proper disposal of balloons prevents them from getting caught in trees, eaten by wildlife or finding their way into the sea.

Ideas for different ages

Breezy Balloons: Watching balloons can help babies to develop eye movements by visually tracking the balloon.

- Source a foil balloon (latex balloons are not recommended with babies) and tie it to an outdoor fence, tyre, plant pot, a baby's pram or baby gym
- Sit with the baby and talk about the balloon as you watch it move. Introduce vocabulary such as swish, sway, bobbing, up, down, blow, backwards and forwards. If there is no wind then gently move the balloon so the babies can track it as it moves back and forth.

Ensure the activity is supervised by an adult at all times and once the activity is over remove the balloon and any string or attachment you have used to secure the balloon in place. You could use a helium balloon left over from a celebration.

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Activity 2 Shadow box

This activity supports children's exploration of shadows and light and provides opportunities for creating a narrative and storytelling. Stories can be magical and exciting, taking children to amazing and wondrous places.

Shadow box

Activity outline

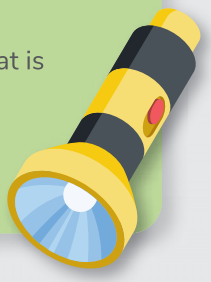
- Line the inside of a box with white paper/card
- Cut out shapes from black card or paper, e.g. cars, fairies, dinosaurs, animals etc reflecting children's interests
- Attach each shape to a paper straw
- Position a torch in front of the box to provide light. Hold the shapes in the box and observe the shadows that appear on the back of the box
- Investigate how the shadows change as the characters are moved about the box. Talk to children about how shadows are formed (a shadow is made when an object blocks light. The shadow appears on the side of the object furthest away from the light source)
- Investigate what happens to the shadows if you move the position of the torch or the characters. Ask the children if they can make a bigger, smaller or shorter shadow. Encourage them to explore and find out "What happens if...?"

Resources

- White and black paper/ card
- Torches, tape, paper straws
- Objects for exploring shadows
- Empty cardboard box.

Learning opportunities include:

- Represent their experiences in play
- Follow directions and listen to others
- Use talk to describe what is happening
- Use props to tell a story
- Develop vocabulary.

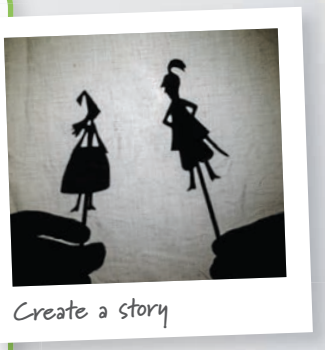


Top tip

Model being a good listener, maintaining eye contact, giving children time to formulate and share their ideas.

Key vocabulary might include:

- Long/short
- Light/dark
- Wide/thin
- Shadows
- Big/small
- Sun.



Create a story

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Activity 2 Continued...

Use your hands

Extension ideas

Make up stories together about the characters - who they are, where they are going. The adults can use their own story character to take part in the story and provide a narrative. Work collaboratively to develop and sequence the story events.

Encourage children to shine the torch light at a wall and make shadow shapes with their hands.

Take children outside in the sunshine and observe the shapes and sizes of the shadows they create, encourage them to make different shapes with their bodies and observe how this changes their shadows. Draw round them with chalk on the ground.

Set up an area with a blank wall and torches so children can explore the shadows they can create with their hands and bodies.

Ideas for different ages

Create a sensory tunnel for babies to explore using a large cardboard box. Make openings at both ends so babies can crawl through and poke holes in the roof to hang strips of ribbon. You can hang some scent bags on the end of some, e.g. lavender or mint. Add textured paper to the floor or walls, (e.g. shiny fabric or strips of textured carpet).

You could attach a long piece of material or scarf to one end so babies can crawl under it to reach the end.

Sit with children to explore the items together, introduce vocabulary for the objects and their properties.

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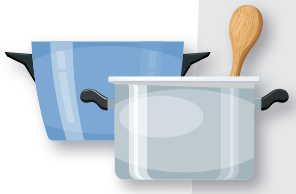
Activity 3 Sound trampoline

The sound trampoline is an exciting way for children to 'see' soundwaves and the effect they can have by raising or lowering the sounds they make. Children will be able to explore with different materials on the sound trampoline and to experiment with sound waves by testing out different distances away from the volume of sound.

Resources

- Music device, instruments, pans, spoons
- Instant coffee granules, sugar granules or uncooked rice
- Round bowl, cling film, large elastic band.



Sound trampoline

Activity outline

- Exploring sound is usually associated with our ears. In this experiment children can see the sound vibrations they make with their voice. Ask children to put their hand gently onto their neck and feel their voice as they hum. Can they feel the vibration their voice box makes?
- Cover a large bowl with cling film, making sure it is tight across the surface, then secure it with tape or a large elastic band
- Add a small amount of coffee granules into the middle of the bowl. Ask a child to move close to the bowl and say something with a loud voice. You should see the coffee granules moving and jumping on the cling film as the sound waves move them about
- Experiment with different levels of noise. Whisper and see what happens, shout out loud, try different materials or clapping your hands from different distances. Experiment with just one voice and compare this against lots of voices.

Shout loud!

Top tip

Repeat back what children say, adding an extra word to the sentence or new vocabulary to build their language skills.

Quiet whisper

Key vocabulary might include:

- Voice
- Quiet/loud
- Fast/slow
- Whisper
- Vibrate
- Sound
- Granules.

Learning opportunities include:

- Persist when challenges occur
- Work cooperatively with others
- Learn by trial and error
- Show curiosity.

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Activity 3 Continued...

Make loud and quiet noises

Ideas for different ages

Discovery Bottles: Collect some small plastic bottles to use for the activity, ensure all labels are removed and bottles are cleaned thoroughly before use.

Add different materials to each bottle for babies to explore the sounds and how the contents move. Ideas for discovery bottles include: uncooked rice or lentils or different shapes of pasta, small world figures or animals, cut up pieces of shiny paper, sand, water, coloured beads, etc. Add different quantities to create different sounds. Once filled, secure each lid tightly with strong tape to ensure there are no leaks.

Sit with children to explore the items together, introduce vocabulary for the objects and their properties.

Ensure you don't overfill the bottles and make them too heavy for babies to pick up and explore.

Extension ideas

Provide resources to explore how sound waves move by playing loud and quiet music, ask children to bang spoons against pans or play musical instruments next to the sound trampoline and examine the effects of each. Record the your results using photographs of the different experiments you try.

When outdoors ask children to be the 'coffee granules' and move slowly as you whisper and then jump high and fast as your voice gets louder to replicate results of your investigation.

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Activity 4 Ramps and inclines (babies and toddlers)

Ready, steady, go!

This activity will provide opportunities for babies and toddlers to explore the physics of force, speed and motion as they play with ramps, inclines and watch or roll large balls, cars or bean bags down an incline. Babies and toddlers can explore what happens if they gently release a ball or car and observe what happens if they push it down with lots of force. This activity supports babies' early scientific understanding and can provide lots of fun and excitement.

Ramps and inclines

Activity outline

- Create ramps with a range of gradients and different materials
- Make gentle slopes for non-mobile babies by propping card or wood up with wooden blocks or a stack of books tied with string
- Encourage babies to push their chosen objects down the ramp. Model language saying, "Ready, steady..." and "Go!" as you release the object. Provide a narrative as they roll their chosen object, e.g. "That car moved so fast" or "It rolled a long way." Use nonverbal cues to support communication for example, holding your arms far apart as you say the object travelled a long way
- For toddlers, provide a range of short and long ramps and include cardboard tubes as ramps. Let them experiment with the height of the incline
- Talk about the distance cars travel and the speed they move. Use footsteps or hands to measure how far the objects have travelled.

Resources

- Ramps (wood, stiff card, cardboard tube)
- Objects to roll down the ramps, e.g. large soft material balls, small and large wheeled vehicles.

Top tip

Talk to babies about what is happening, so they link words with actions, for example saying, "The ball is rolling down, down, down" as you release a ball down the ramp.

Learning opportunities include:

- Physical development
- Learn new vocabulary
- Enjoy the company of others
- Show curiosity, maintain focus
- Show satisfaction for what they achieve.

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Activity 4 Continued...

Ideas for different ages

Catapults: Make some homemade catapults for pre-school children to experiment with energy, force and motion.

- Secure five lollipops together at each end with an elastic band
- Secure two lollipops together at one end with an elastic band
- Slide the stack of five lollipop sticks between the two at the elastic band end
- Secure it in place tightly making a cross shape with the elastic bands
- Attach a bottle top lid with glue at the other end of the two sticks (see picture) to use as the launch pad
- When it is dry, provide objects for children to experiment with e.g. place a ping pong ball into the lid, push down on the top stick and launch your ball.

Encourage children to make predictions, analyse results and experiment with more sticks and heavier items.

All elastic bands should be removed once the activity is complete.

Key vocabulary might include:

- Roll
- Steep
- Down
- Move
- Fast/slow
- Long/short
- Ready, steady, go.

How far will the ball travel?

Extension ideas

Take babies and toddlers outdoors and release big and small balls down a slide. Talk to children about how they move, how far they travel and how fast they move. Encourage children to try and catch the balls at the bottom of the slide.

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Further resources, links and stories:

Little Scientists Leading the Way - NDNA Training

https://bit.ly/3iFrBJ5

Exploring sound

How do our shadows change?

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At NDNA, we don't just provide nursery membership, lobby government and offer training, we are dedicated to making a difference. We are a charity that believes in quality and sustainability so we put our members' businesses at the very heart of ours. We enhance, support, nurture, cherish and challenge.

Every year we run an annual Healthy Body, Happy Me campaign to encourage better health and happiness by giving nurseries FREE resources for play, learning and fun.
Get involved with our 2023 campaign and help keep your children happy and healthy.

Important: Activities with children must always be risk assessed, including for allergies or choking. Children must always have adequate supervision. Resources and materials must always be appropriate for children's age and stage of development.

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