# HAVING A BLAST WITH STEAM

STEAM Activity Guide

NYCI National Youth Council of Ireland

## National Youth Council Of Ireland

The National Youth Council of Ireland (NYCI) is the representative body for voluntary youth organisations in Ireland. We use our collective experience to act on issues that impact on young people.

This activity guide was produced as part of NYCI's STEAM in Youth Work project. This project aims to support the youth work sector to use STEAM to improve the lives of young people.

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**Author:** Katrin Wolschke



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# ABOUT THIS RESOURCE

**This guide is for youth workers and other practitioners working with young people who are interested in exploring inspiring and hands-on STEAM activities.** (STEAM stands for Science, Technology, Engineering, Art and Maths.)

The activities:

- **introduce** STEAM in a simple and fun way
- **explore** some science
- give an overview of **potential outcomes** for young people
- can be carried out with **groups** and **individuals**
- are suitable for all **age groups** from twelve years old, up.

This Activity Guide supports youth workers and practitioners to gain a **basic understanding** of the science involved and provides links and ideas about **how to find out more** so they can **inspire** young people's curiosity in STEAM. They can be **part of the learning process** by exploring STEAM together with the young people.

Youth workers and practitioners are invited to **use their youth work practice** to support young people to see the **relevance of science** to their daily lives and to enjoy and develop **positive attitudes** towards science and themselves as scientists – especially those who are from groups/backgrounds that are under-represented in science-related further and higher education and careers. Youth work settings offer a unique, **safe and fun environment** for creative exploration.

## STEAM in Youth Work...

- is **inter-disciplinary** and includes technology and art as a means of deepening engagement and learning in science, engineering and maths, and vice versa
- emphasises the **personal and social development** of young people while also providing opportunities for those with particular interests to develop STEAM knowledge, skills and competencies and a range of **twenty-first-century skills**, including digital literacy
- is **relevant** to the daily lives of young people and **captures their imaginations**
- is hands-on, supports inquiry-based and experiential learning, and design thinking processes
- is **youth-led** and based on **youth work principles** and approaches
- **inspires** youth workers and supports their **professional development**
- provides **fresh new tools** for youth workers and other educators to **engage** young people with
- features a **collaborative approach** between youth workers, STEAM practitioners, STEAM institutes and young people, which fosters mutual **trust and respect**
- supports the **progression** of young people, where there is interest, to other STEAM education and engagement opportunities
- is **inclusive** of all young people.

# Activity 1:
# **Water Bottle Rocket**

**This rocket only needs water to fly. It's easy to make and can fly up to 100 meters in the air! All you need is an empty water bottle, a cork and a bicycle pump to launch it.**

# Activity 1:
# **Water Bottle Rocket**

## What you need

- Empty plastic bottle of any size
- Bicycle pump with needle top part (or a valve)
- Wine cork that fits in the bottleneck
- Launch pad

## Where you do it

Outdoors

## What you do[1]

- Build a launch pad which is stable enough to hold the bottle straight upside down. You can use branches, bits of wood, plant pots or the handle of a garden fork, for example. You may need to try a few methods depending on your pump and the shape of your bottle.
- Fill up the bottle with water to a third or quarter of its capacity and stick the cork into the bottle.
- Stick the needle of the bike pump into the cork. You may need to make a hole through the cork with a drill or a small screwdriver beforehand. Cut the cork if it is longer than the needle and wrap tape around it in case it does not fit into the bottleneck.
- Put the bottle on the launch pad and start pumping until your rocket takes off!

## Watch out!

- Make sure you have enough space for this activity.
- Do not bend over the bottle while you are pumping and do not fire it towards or over anyone!
- The person who is pumping could get a bit wet.

### Tip!

- Because the launch happens very suddenly and the rocket flies quickly it is recommended that spectators stand away from the rocket while it is being launched.
- Film the launching of the bottle and have a look at what's going on in slow motion.

## What's going on?

What makes a rocket fly? It's actually quite simple. A rocket flies by ejecting something through an opening, and the so-called '**reaction force**' pushes the rocket body forward. In our case, it is water and air that are ejected.

You may have heard of the 17th century British scientist Sir Isaac Newton, who had an apple fall on his head. His ideas about gravity and other forces have transformed science. The water bottle rocket demonstrates his so-called **Third Law of Motion:** 'Every action has an equal but opposite reaction'. In our case, the water moves in one direction and the bottle in the opposite direction.

The **energy** to push the water out is related to the increasing **pressure** as air is pumped into the bottle. As soon as the air pressure becomes too great, the cork is pushed out. Water shoots out of the bottle opening at high speed causing the bottle to fly off. The flight slows down as soon as there is no more water in the bottle.

Look at this short video to get a better idea of how all this works: *https://www.youtube.com/watch?v=gtAbs8y5xkY*

Try to develop an understanding of the physics of the water rockets with your youth group. Show them the video linked above, identify some of the key concepts and terms, and try to use and explore them in undertaking the 'Thinking bigger' activities.

1 This activity summarizes parts of 'Bang Goes The Theory – Water Bottle Rockets' by the BBC at http://www.bbc.co.uk/bang/handson/waterbottlerockets.shtml

## Thinking bigger

- Make your water bottle rocket look like a rocket by designing and adding a cone to its head and fins to its tail! Observe what happens, e.g., do certain designs impact on the flight path?

- Change the amount of water in the bottle. Talk about the impact this has and why?

- **Projectile motion**: After your rocket is launched, it moves along a path known as the **trajectory**. It is only dependent on the initial **speed**, the launch **angle**, and the **acceleration** due to **gravity**. With this Online Simulation Tool you can explore projectile motion and test how to make your rocket fly furthest: ***https://phet.colorado.edu/en/simulations/projectile-motion***

  After that, you are ready to organise a team competition – whose rocket flies furthest? Explore and discuss how the rocket and launch can be designed to make the rocket fly further.

- Equip your rocket with a parachute for a smooth landing. Explore the best parachute design for this purpose.

- Use your youth work practice to support young people to enjoy science, to see its relevance to their daily lives, and to develop positive attitudes towards science and themselves as scientists (especially those who are from groups/backgrounds that are under-represented in science-related further and higher education and careers).

## Get more inspiration online

- Water Bottle Rocket with parachute & attached camera on YouTube: ***https://www.youtube.com/watch?v=R625vwA4jpQ***

- Homemade parachute on Instructables: ***https://www.instructables.com/Homemade-Parachute-1/***

## Potential outcomes for young people

**Working collaboratively** and using **problem-solving skills** are essential in this challenge. Young people will not only need to think about engineering the rocket itself, but also the launch needs proper consideration. They can use their imagination and be **creative**, and develop their **resilience** through trial and error. Also, the 'Thinking Bigger' activities support **inquiry-based learning** and the development of **digital skills** and competences. Last but not least, this outdoor activity is great **fun** for all age groups!

# Activity 2:
# **Bath Bombs**

**Design your own bath bombs! These fizzy, fragrant and colourful bath bombs make excellent gifts. All the ingredients are in your kitchen.**


# Activity 2:
# **Bath Bombs**

## What you need

- Bicarbonate of soda, e.g., baking soda or bread soda
- Citric acid powder or 'Cream of Tartar'
- A tablespoon of water
- Two bowls or containers
- A tablespoon
- Something to shape the bath bombs, e.g., ice-cube tray or cupcake pan

**Optional – but fun:**

- Food colouring
- Essential oils

## Where you do it

Anywhere

## What you do

The following quantities will give you two small bath bombs:

- Mix the dry ingredients in a bowl. The mixing ratio needs to be two parts of bicarbonate of soda to one part of citric acid powder, e.g., two tablespoons of bicarbonate of soda and one tablespoon of citric acid powder.
- Mix the liquid ingredients in the other bowl: one tablespoon of water, three to four drops of essential oils and three to four drops of food colouring.
- Add the powder to the liquids and mix the ingredients together. The mixture will be quite soft and crumbly. When you press it down with the spoon it sticks together.
- Shape your bath bombs. Fill the mixture into your ice-cube tray or cupcake pan and press it down firmly with your fingers.
- Leave the bath bombs to set overnight so they become harder. Ease them out of your tray and add them to your bath!

## Watch out!

- Consider any possible allergies before undertaking the experiment.
- Before using any equipment for food make sure that it's thoroughly cleaned after the experiment.

## What's going on?

When you drop the bath bomb into water it fizzes and eventually disappears. The **acid** (citric acid) and **alkali** (bicarbonate of soda) react with each other when they are added to water. They make a **gas**, carbon dioxide, which leads to the fizzing. This is a good example of a **chemical reaction**. A chemical reaction is a process in which one or more **substances** (reactants) are converted to one or more different substances (products). In this case, it's an **irreversible** chemical reaction which means you can't change them back into bicarbonate of soda and citric acid powder.

Watch this short video to get a better idea of how all this works: *https://www.youtube.com/watch?v=-qseSbSHy_M*

Try to develop an understanding of the chemistry of the bath bombs with your youth group. Show them the video linked above, identify some of the key concepts and terms, and try to use and explore them in undertaking the 'Thinking bigger' activities.

## Tip!

- You can add some corn-starch to make your bath bombs more solid.
- If you use cooking oil instead of water, you can shape the bath bombs with your hands. However, they will need several days until they are dry.
- Be prepared that working with the ingredients can get a bit messy. We suggest wearing old clothes or wearing an apron when doing this experiment.

## Thinking bigger

- What happens when you vary the ratios of the ingredients used?
- For really colourful bath bombs, prepare several mixtures with different colours and combine them by layering them up in your ice-cube tray.
- Mix different food colours to create new colours. If you have red, yellow and blue you can create all the colours you wish!
- Look for alternative ways to add fragrance to your bath bombs. What about adding fragrant herbs or petals? What else might make your bath bombs smell nice?
- Ask young people to describe what is happening when they drop a bath bomb in water. Encourage them to use key words and phrases like chemical reaction, reactants, products, acid, alkali and irreversible reaction.
- Ask young people to list other chemical reactions they are familiar with and to identify the reactants and products in these reactions.
- Research other chemical reactions you can do using kitchen ingredients and try them out with your youth group.
- Use your youth work practice to support young people to enjoy science, to see its relevance to their daily lives, and to develop positive attitudes towards science and themselves as scientists (especially those who are from groups/backgrounds that are under-represented in science-related further and higher education and careers).

## Get more inspiration online

- How to create bath bombs on YouTube: *https://www.youtube.com/watch?v=-qseSbSHy_M*
- Royal Society Of Chemistry – Making Bath Bombs: *https://www.youtube.com/watch?v=wieE0wSVXOQ*

## Potential outcomes for young people

The science of bath bombs is closely connected to our everyday lives. This provides a good opportunity for making it **relevant to the lives** of young people. Bath bombs can be created both individually and in small teams, which supports **peer-learning** and **problem-solving skills**. Young people can use their **creativity** and think about additional ingredients that could be used. Often, a meditative atmosphere develops through this activity which supports **mental wellbeing** and **resilience**. Support young people's **innovation** and **entrepreneurship** by challenging their ideas how to take this activity further – a great opportunity for a **youth-led** project.

# Activity 3:
# Soap Bubble Challenge

**Learn how to create really big and strong bubbles. Find ideas for fun soap bubble team challenges, soap bubble artwork and for exploring the physics of soap films.**


# Activity 3:
# **Soap Bubble Challenge**

## What you need

- Water
- Washing-up liquid
- Sugar or glycerine (available in pharmacies)
- Garden wire or a wire coat hanger
- Shallow tray

**Optional:**

- Yarn

## Where you do it

Preferably outdoors

## What you do

**The bubble solution:**

- Mix about 50 ml of washing-up liquid and a tablespoon of glycerine with 1 litre of water.

**Building the hoop:**

- Bend the wire into a hoop – you decide on the size! The bigger the hoop the bigger the bubbles.
- Where the circle closes, form a handle using the rest of the wire.
- Optionally, you can wrap some yarn tightly around the rim of the hoop. This way, the bubble solution will be absorbed by the yarn which will increase the chance of creating bubbles.

**Creating bubbles:**

- Pour the bubble solution into your tray and immerse your hoop in it. Make sure the whole hoop is under water.
- Start raising one side of the hoop slowly out of the solution until it is vertical. There should be a film of the solution extending across the hoop.
- Lift the hoop and swing it through the air to make a bubble. Finally, twist the hoop to seal the bubble off at the end.

## Watch out!

Consider any possible allergies before undertaking the experiment.

## What's going on?

The bubble solution gets stuck in the hoop and forms a thin film that you can carefully blow up like a balloon. With pure water and with a very small hoop, it might be possible to stretch out the water to create a film. However, this film would burst immediately if you tried to blow it up. This is due to a property of water called **surface tension** – the water **molecules** cling to each other and cannot move very far apart. The washing-up liquid reduces this surface tension so that the water molecules cling together more loosely, and the soapy water film becomes elastic. Adding sugar or glycerine makes the solution even thicker and the bubbles get stronger.

**Why is the soap bubble a sphere?**

A soap bubble floating in the air, which has no contact with other objects, has the shape of a **sphere**. A soap film always forms the smallest possible surface area for the volume of air it contains – a sphere.

Look at this short video to get a better idea of how all this works: *https://www.youtube.com/watch?v=8mQXFPyGw4M*

Try to develop an understanding of the physics of soap bubbles with your youth group. Show them the video linked above, identify some of the key concepts and terms, and try to use and explore them in undertaking the 'Thinking bigger' activities.

### Tip!

- Some bubble experts use wallpaper paste to create really big, strong bubbles!
- If you want to start smaller, you can use a simple straw to blow bubbles first. You can enlarge the straw opening by cutting a piece off at an angle, or by splitting the bottom end of the straw into four parts and bending them outwards. Another good way for creating medium-sized bubbles is to turn a pipe-cleaner into a hoop.

## Thinking bigger

**Do a soap bubble challenge:**

- Who can make the biggest or longest lasting bubble?
- Design and make new types of bubble making devices using household objects and bubble making solutions – which works best and why?
- Blow a soap bubble with a straw on the table and try to blow up more soap bubbles inside the first one. Who can blow the most bubbles into one? And how does it work? Look at this Bubble Challenge: ***https://www.scienceworld.ca/resource/bubbles/***

**Soap bubble artwork:**

- Photography: Take pictures of your soap bubbles. Experiment with different focusses and explore the colours of your bubbles.
- Colourful paper art: Add food colouring or water colour paint to your solution and blow up bubbles on paper. When the bubbles burst, they leave some colourful artwork on the paper. This way, you can create lovely gift cards, bookmarks or gift tags. Get inspiration with Bubble Painting on tinkerlab.com: ***https://tinkerlab.com/bubble-paint-recipe/***

**Exploration:**

- Explore geometry with soap films: Build three-dimensional geometric frames with drinking straws or pipe cleaners to create geometric art with soap films. Find out more about creating geometric art with the Exploratorium: ***https://www.exploratorium.edu/snacks/soap-bubble-shapes***
- Worth having a look at the Irish invention of the Weaire–Phelan bubble structure as well! 'The physics of foam, Irish-style, has made its way into the spectacular Water Cube, national swimming centre for the 2008 Beijing Olympics.'[2] You could, e.g., build them out of paper: ***https://www.cutoutfoldup.com/214-weaire-phelan-structure.php***
- Explore the colours of your bubbles. Observe the behaviour and colourful appearance of different wavelengths of light. Find out more with the Exploratorium: ***https://www.exploratorium.edu/snacks/soap-film-on-can***

Use your youth work practice to support young people to enjoy science, to see its relevance to their daily lives, and to develop positive attitudes towards science and themselves as scientists (especially those who are from groups/backgrounds that are under-represented in science-related further and higher education and careers).

## Potential outcomes for young people

To create really big and long-lasting soap bubbles, a lot of **problem-solving skills** are needed, as well as **patience**. This could potentially cause frustration, and some young people may want to focus on doing smaller soap bubbles or would prefer to be **creative** and make some artwork. The 'Thinking bigger' activities give scope for those whose **curiosity** has been sparked to dig deeper, **explore the science** of soap bubbles and use their learning to take the activities to the next step. Working in teams supports **communication** and **interpersonal skills**.

2 https://www.irishtimes.com/news/chinese-snap-up-irish-design-for-olympics-1.1310178

# Activity 4:
# **Seed Bombs**

**Brighten up your world with a seed explosion! Learn about how seeds germinate, how flowers grow and how to do urban gardening projects. Find out about the world of pollinators and their importance for our environment.**


# Activity 4:
# **Seed Bombs**

## What you need

- Mixed seeds of native or non-invasive flowers and/or herbs
- Compost
- Clay soil, clay powder or modelling clay
- Water
- Mixing container

## Where you do it

Preferably outdoors

## What you do

The mixing ratio is five parts compost, one part clay soil and one part flower seeds.

- In a big container, mix together the compost with the flower seeds.
- Add the clay and give it a good stir. If you are using modelling clay, knead the mass thoroughly with your hands.
- Slowly mix in some water until everything sticks together.
- With your hands, roll the mixture into small, firm balls. A size of about four centimetres in diameter is ideal for seed bombs.
- Leave the seed bombs in a sunny spot or indoors to dry.
- 'Plant' your seed bombs by simply throwing them at bare parts of your garden or property, or look out for other feasible spots. Plants don't need much to grow so be creative with finding the right spots that need brightening!
- Now you need some patience to see what pops up and explore the stages of a plant transforming from seed to fading.

## Watch out!

Use unplanted spots for your guerrilla gardening to avoid annoying fellow gardeners.

## What's going on?[3]

What do plants actually need to grow? Plants need soil, water, air, light and warmth. However, the growing conditions differ from plant to plant.

**Light and warmth:**

Perhaps you have noticed that sunflowers always turn their flowers towards the sun. Or that many herbs and shrubs grow at the edge of the forest – but usually not in the middle where it is quite dark. Moss, however, feels very much at home in the middle of the forest. Without enough warmth a plant seed cannot **germinate**. In unfavourable temperatures, even the growth of older plants is restricted. There are, however, a few exceptions. Certain plants can germinate and grow even at very low temperatures.

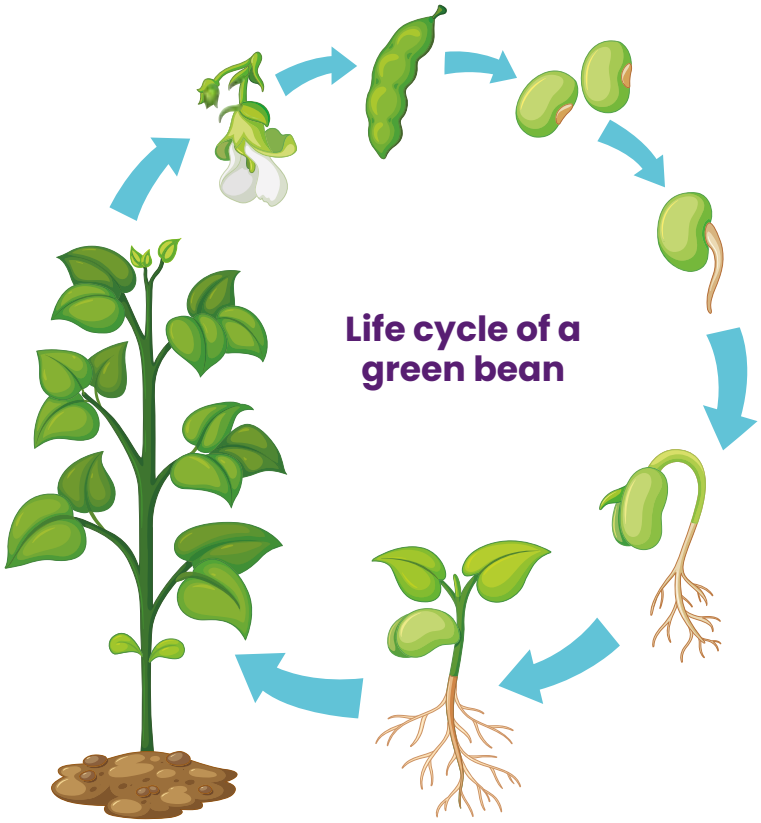
**Air:**

Plants also need air from which they take **carbon dioxide**. Ever heard of **photosynthesis**? In short, through photosynthesis plants use carbon dioxide, water and sunlight to produce **oxygen** (which we use to breathe) and **food** (i.e., the sugar molecule, glucose). Photosynthesis is another example of a **chemical reaction**.

**Water and soil:**

Finally, a plant needs **water** and **nutrients** (which they get from the soil). Water is absorbed through the root hairs, which are found on the **roots**, and then passed on to all the other parts of the plant. The water also carries nutrients from the soil into the plant. Solid nutrients dissolve in the water before it is absorbed through the roots and passed on to other parts of the plant. Plants can even grow without soil! In **hydroponics**, all the nutrients the plant needs are dissolved in the water and soil is not used!

3 This section was inspired by https://www.sofatutor.com




Watch this short video to get a better idea of how all this works:
*https://www.youtube.com/watch?v=FBPwKrgm2Bk*

Try to develop an understanding of the science of the life cycle of plants with your youth group. Show them the video linked above, identify some of the key concepts and terms and try to use and explore them in undertaking the 'Thinking bigger' activities.

## Tip!

- Contact your local library for seeds. Some libraries have Seed Arks for 'borrowing' seeds. Also, libraries might know of other urban gardening projects in the community that you could get in touch with for seeds or for other kinds of collaboration.
- Your seed bombs didn't work? Do some research to learn how to prepare the soil and try again!

## Thinking bigger

- Get in touch with your community to find out about public spaces in your town that you could use for your own urban gardening project.
- Start a plant diary and explore the anatomy of plants. You can also use pressed plants to design your own gift cards.
- Undertake an art project to showcase what you learned about gardening and your local environment.
- Explore online apps for identifying plants. There is a huge range of free tools available, like Pl@ntNet or SmartPlant™.
- Field study: Do an urban walking tour in your town to explore the local flora and fauna. Document what you see.
- Build your own bug mansion to give a multitude of creepy crawlies a home. All you need is out there in the nature! Get some inspiration to build bug hotels or a really big bug mansion of pallets here:

*https://www.craftionary.net/diy-bug-hotels-material-instructions-to-attract-bugs/*

*https://www.wildlifetrusts.org/actions/how-build-bug-mansion*

- Build a bee observatory to observe the life of the bees around your place and help them find a good place to lay their eggs: *https://www.instructables.com/Bee-Observatory/*

- Use your youth work practice to support young people to enjoy science, to see its relevance to their daily lives, and to develop positive attitudes towards science and themselves as scientists (especially those who are from groups/backgrounds that are under-represented in science-related further and higher education and careers)

## Get more inspiration online

- Ideas Hub on Pollinators.ie: *https://pollinators.ie/ideas-hub/*

- GrowItYourself.ie support people to grow some of their own food at home, at work, at school and in the community: *https://giy.ie/*

- Learning Zone of the Irish Bee Conversation Project: *https://www.ibcp.ie/learning-zone/*

- Guerrilla Gardening in Ireland and worldwide: *http://trinitynews.ie/2020/05/planting-the-future-guerrilla-gardening-in-ireland/*

  *http://www.guerrillagardening.org/*

  *https://en.wikipedia.org/wiki/Guerrilla_gardening*

- Ted Talk about Urban Community Gardening: *https://www.ted.com/talks/ron_finley_a_guerrilla_gardener_in_south_central_la?language=en*

## Potential outcomes for young people

Topics and projects related to climate change can sometimes be daunting. Being outdoors and exploring life on the doorstep is a great way to help young people **interact with their environment** in a different way and to develop **resilience**. A **youth-led** approach and **real-world context** helps them to build an understanding of this important issue that society is facing and to **take ownership** of it, and **stimulates follow-up activities** they would like to do on topics of their concern. The chance to contribute to solutions as **active citizens** improves their **self-confidence** and **perception of their own abilities**. Larger projects in particular are ideal for **working in teams** where peers can **learn from each other**.

# Activity 5:
# Cascading Mobile Sculpture

**Mobiles are beautiful, balanced, kinetic sculptures that respond to environmental factors such as wind. Design your own cantilevered, cascading mobile sculpture and explore the magic of the balance of objects and your own body.**

# Activity 5:
# Cascading Mobile Sculpture

## What you need

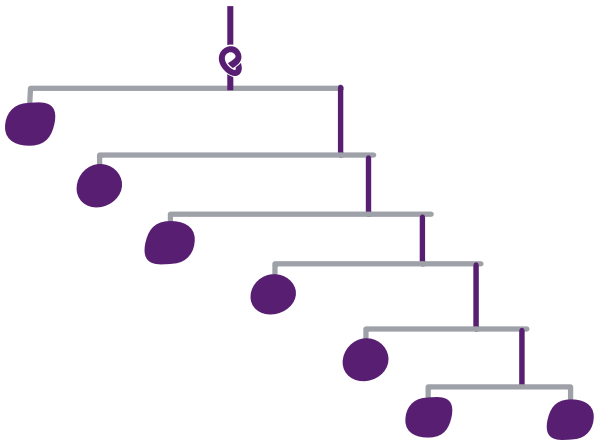
- A handful of light objects. You can simply craft your objects from cardboard, paper (origami), foam or anything you wish. Alternatively, you can 'upcycle' natural or household objects by using e.g. sea shells, feathers, small toys, buttons, old CDs and much more.
- A handful of sticks or strong wire
- Thread or light wire
- Craft glue

## Where you do it

Anywhere

## What you do[4]

There are no limits to the variety of mobiles that can be made! In this example, we will be using the following model:



- Prepare your sticks in different lengths. Lay the sticks on a table, with the longest at the top and then descending in length as in the above image.
- Fix your light objects to the left end of each stick and a string at the right end. The way of fixing the objects and string will vary depending on the mass of the object you are using. Attach two objects of similar sizes to the bottom stick, one on the right and one on the left, as in the above photo. A thread is not needed here.
- Tie an additional string close to the middle of the top stick and turn it into a hook.
- With the string, connect the lowest stick to the one above, as in the above image. Make a double knot (but don't tie it too tightly). Make sure consecutive sticks are far enough apart so that the objects don't hit each other when the mobile is hung up and moving. Repeat this step for all sticks.
- When all the sticks are tied you will need to balance them out. Hang the mobile so that it can float in the air or ask someone to hold it for you. Starting at the bottom, begin adjusting the sticks so that the objects and the mobile begin to balance out (this is called finding the balance point). Slide the string on the lowest stick so the stick is entirely balanced. Repeat this step for the second lowest stick and so on until you have reached the top stick.
- Glue the knots and, when they are dry, trim off the ends of the strings.

## What's going on?

**Balance:**

When balancing out the sticks you are looking for the **centre of gravity**. With a simple and straight stick, this is exactly in the middle. As we have attached objects of different **masses** to the sticks of our mobile, the centre of gravity is unlikely to be in the middle of the stick. Even adding a very light object causes the centre of gravity to shift. The centre of gravity is the point where the mass of the body is concentrated.

4 This activity is a summary of Art Edu Guru's video 'Engineering the Calder Cascade' at https://www.artedguru.com/home/engineering-the-calder-cascade

**Energy of motion:**

Due to the architecture of this cascading mobile sculpture with its free-floating sticks (called **cantilevers**), even the smallest movement of air can cause a dramatic effect. All moving objects have energy of motion, also called **kinetic energy**. As the objects are floating in the air the **gravitational pull** of the earth also influences the movements of the mobile, and so do environmental factors like wind or someone pushing one of the objects on the mobile.

Look at these short videos to get a better idea of how all this works:
*Centre of Gravity: https://www.youtube.com/watch?v=rcIZhW5oEHo*

*Force and Motion: https://www.youtube.com/watch?v=vixDAtgarrw&t=367s*

Try to develop an understanding of the physics of mobile sculptures with your youth group. Show them the videos linked above, identify some of the key concepts and terms, and try to use and explore them in undertaking the 'Thinking bigger' activities.

### Tip!

You can find the centre of gravity simply with your fingers: Place the stick on your index fingers with the fingers at each end of the stick. Slowly slide your fingers together, keeping the stick balanced, until they meet. The fingers will meet under the centre of gravity of the stick.

## Thinking bigger

- Design your own cascading mobile sculpture by trying out different models, arrangements, objects, and sizes. Do the elements always need to be connected at their centre of gravity?
- Explore the balance of your body by picking up a sweet from the floor without bending your knees or moving your feet while standing with your back against a wall: *https://www.scientificamerican.com/article/balancing-challenges/*

  You could even try slacklining, a fun outdoor balance activity for all age groups: *https://www.instructables.com/howto/slacklining/*
- With this Online Simulation Tool you can explore how the balancing act of a see-saw works in practice: *https://phet.colorado.edu/en/simulations/balancing-act*
- As an art project, ask your youth group to work together to make a giant themed mobile structure. Ask the youth group to work in pairs to create the objects that will hang from the sculpture based on an issue of importance to the group (e.g. how the pandemic was for me). Then the group should work together to create the sculpture.
- Include mini electrical circuits within your giant mobile sculpture to add a new area of science learning. For inspiration and instructions of electrical circuits see 'Activity 1 – Paper Circuits' of NYCI's 'Activity pack for STEAM activities, sessions and projects' which you can download at *https://www.youth.ie/documents/activity-pack-for-steam-activities-sessions-and-projects/*
- Use your youth work practice to support young people to enjoy science, to see its relevance to their daily lives, and to develop positive attitudes towards science and themselves as scientists (especially those who are from groups/backgrounds that are under-represented in science-related further and higher education and careers).

## Get more inspiration online

- Video Instruction – Engineering the Calder Cascade: *https://www.artedguru.com/home/engineering-the-calder-cascade*
- Mobile Building on YouTube: *https://www.youtube.com/watch?v=b5GTUM-Q2g0*
- Designing Balancing Sculptures with the Exploratorium: *https://www.exploratorium.edu/tinkering/projects/balancing-sculptures*
- Experiments around the Centre of Gravity with the Exploratorium: *https://www.exploratorium.edu/snacks/center-gravity*
- More experiments around Balance on Exploratorium.com: *https://www.exploratorium.edu/search/balance*

## Potential outcomes for young people

Using their **imagination** and being **creative** is a big part of the Cascading Mobile Sculpture activity. Young people who don't consider themselves to be creative can focus on the **engineering** side of the activity. This way, building the mobiles in **teams**, supports not only everyone working in a **role they feel comfortable** with, but also **peer-learning**. Young people who are struggling with fine motor function could **decide** to build bigger mobiles instead.

# Health and Safety

**Every youth organisation should have a health and safety policy, a first aid kit and a youth worker trained in first aid. When introducing STEAM in a youth work setting, health and safety policies and procedures should be reviewed. As with any new activity, a risk assessment is needed with necessary precautions taken when new STEAM activities are introduced. Minor injuries are sometimes part of the STEAM process and it is important to be prepared.**

YOUR
NOTES
AND IDEAS

**National Youth Council of Ireland**
3 Montague Street
Dublin 2
Ireland
Email: info@nyci.ie
Tel: +353 (0)1 478 4122

**www.youth.ie**

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