



STEPS

Engineers Week
Feb 29 - Mar 6 2020



ENGINEERS WEEK 2020

ACTIVITY PACK

FEBURARY 29 - MARCH 06



An Roinn Oideachais
agus Scileanna
Department of
Education and Skills

ARUP



Energy for
generations



STEPS ENGINEERS WEEK

The Engineers Ireland STEPS Programme is a non-profit outreach programme that promotes interest and awareness in engineering as a future career to school students through a portfolio of projects. Engineers Week promotes engineering and the importance of the profession to children in Ireland this February 29 -March 06.

WHAT'S IN THE PACK

| | |
|--------------|--|
| Page 3 | Water crisis challenge: instructions (read me and discuss) |
| Page 4 | Engineer a plane challenge: instructions (read me and discuss) |
| Page 5 | Engineer a plane challenge: body (print me and design the plane) |
| Page 6 | Straw rocket challenge |
| Page 7 | Stable structures: instructions (read me and discuss) |
| Page 8 | Engineer a cardboard chair challenge: instructions (read me and discuss) |
| Page 9 | Engineers journal: worksheet (print me and ask students to work through) |
| Page 10 -16 | Types of engineering: colouring sheets (print me) |
| Page 17 | Certificate of participation: (print me) |
| Page 18 -21 | Engineering case studies: showcase these Irish engineers as role models to your group of students (print me and display) |
| Page 22 | Photo consent form (Ensure consent if you are taking images and sending them into Engineers Ireland for marketing purposes) |
| Page 23 - 24 | Evaluation form (print me and return to Engineers Ireland) |
| Page 25 | Event registration (follow the link and register your activities) |
| Page 26 | Engineers Week documentaries (follow the link to register) |
| Page 27 | The Curiosity Box (follow the link to purchase) |

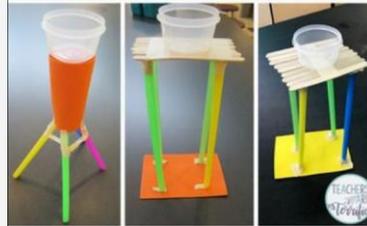
WATER CRISIS CHALLENGE: INSTRUCTIONS



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The Engineer's Week water crisis challenge is an activity you can carry out with a group of students. Print instructions, worksheet and distribute. Encourage students to read the activity concept and work through the worksheet following the design process of Ask, Imagine, Plan, Create, Improve.



Materials

| | | |
|-----------------|----------|---------------------|
| Popsicle Sticks | Cups | Tape & elastic band |
| Newspaper | Scissors | Water/ weight |

TOP TIP - like real engineers, prototypes must be economical and sustainable, using as little materials as possible and designs should hold the weight of water.

Activity Content

A small village in Sub Saharan Africa has no access to running water. How do the villagers drink a glass of water when they are thirsty? How do they shower? How do they clean their clothes? Currently a high percentage of village women and children must walk 15 km to a well and fill up old cartons with water. Why is this a problem? (Discuss)

The Task

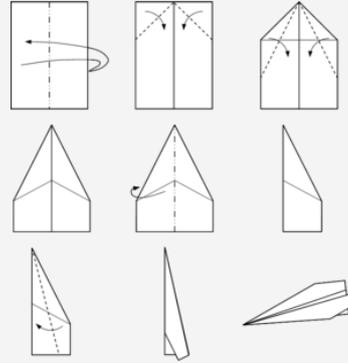
The Irish Government has assigned your teams a task to create a water tower that can hold water, which will free up the villagers time, increase standard of living and children can go to school!

ENGINEER A PLANE: INSTRUCTIONS

ENGINEER A PLANE

What you will need:

- An A4 sheet of paper
- Measuring tape



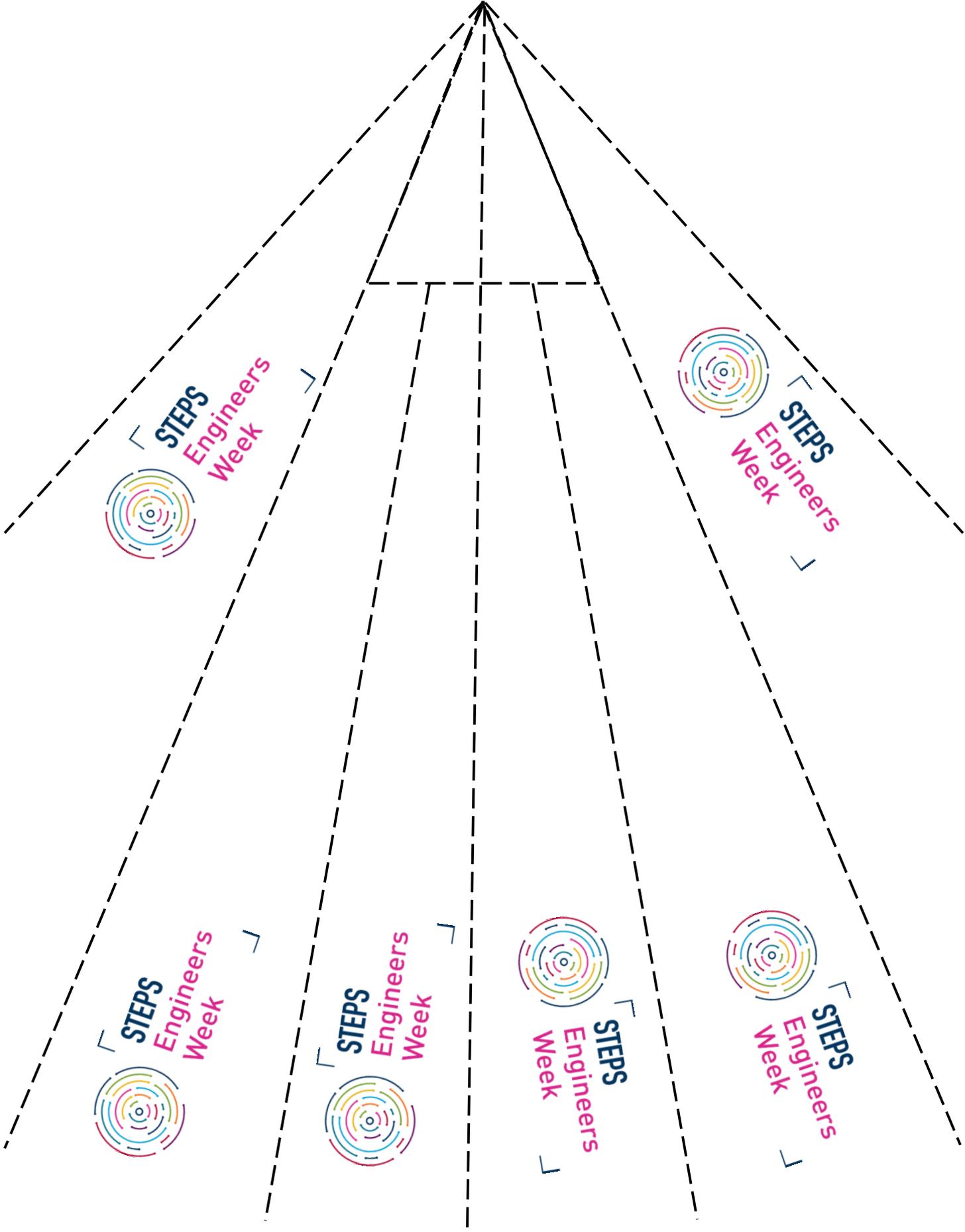
How can you do this:

There can be planes of various shapes made by folding the paper in different ways. Try and design a few shapes and see which flies the furthest. If you are having trouble, there are plenty of videos and instruction on the internet to help you.

It's a balancing act! As with real airplanes there are 4 main forces, called aerodynamic forces, that enable a paper plane to stay in the air:

| Force | Description |
|---------------------------|---|
| Thrust | when you throw the plan forward |
| Lift | is a force that acts on the wings and helps the plane to move up. Big wings increase lift |
| Gravity | is the force that pulls the plane down. The right materials can create a lighter aircraft that stays up longer. |
| Drag (caused by the tail) | is the opposite of thrust and it makes the plane slow down |

ENGINEER A PLANE





**Straw Rockets
Engineering
Challenge**



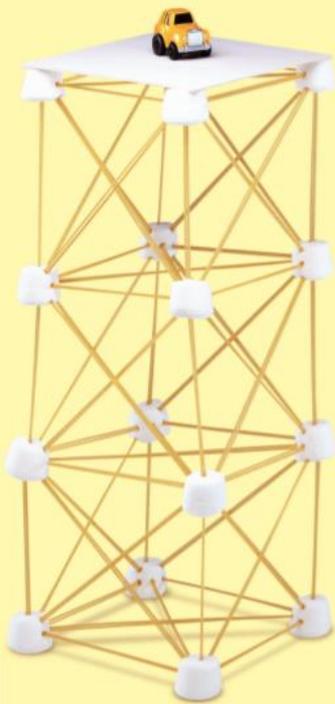
Watch the video tutorial:
<https://www.wikihow.com/Make-a-Paper-Rocket>





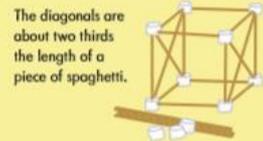
Stable structures

Find out which shapes make the strongest structures.



- You will need:**
- marshmallows
 - spaghetti
 - card

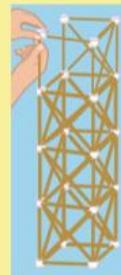
Tower challenge



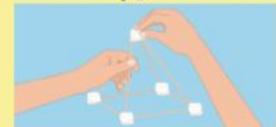
1. Use marshmallows and half lengths of uncooked spaghetti to build a cube like this. Does it feel stable?

2. Snap other pieces of spaghetti to make diagonals across each side of the cube. Does it feel more stable now?

3. Build the tallest tower you can from marshmallows and spaghetti. Put some card on top and see what weight it will support.



Make a pyramid



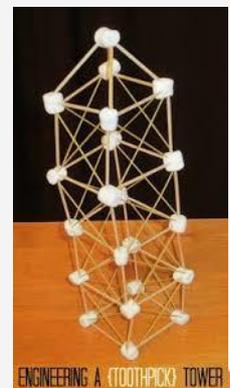
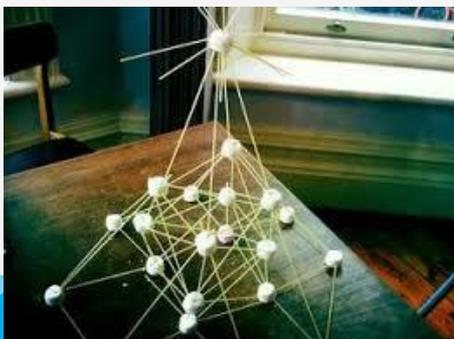
1. Make a square using half lengths of spaghetti and marshmallows. Add four half lengths to make a pyramid.



2. Add more spaghetti to extend your pyramid building like this. How stable does this shape feel?

What's going on?

Cubes and pyramids make stable structures. Cubes make strong building blocks if they have reinforced diagonals. Pyramids make good structures because they contain triangles, which are one of the strongest shapes.



Reference: USBORNE Publishing. As seen in activity booklet Think like an engineer. Find out more information: <http://bit.ly/2YcPvNv>

CARDBOARD CHAIR: INSTRUCTIONS



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CARDBOARD CHAIR

ENGINEERING
CHALLENGE **08**

Designed by Andy,
Design engineer at Dyson

The brief

Construct a chair that you can sit on using only cardboard. No glue, tape or other fixing materials allowed.

The method

1. Write down or sketch some ideas as to how you will construct the chair.
2. When you are planning, think about using cones, interlocking sheets, spirals, tubes – or even using strips of card like sewing thread.
3. Use the materials to create a chair made from cardboard.
4. If your first design doesn't work, evaluate what went wrong and try again.

Top tip

Think about structure.

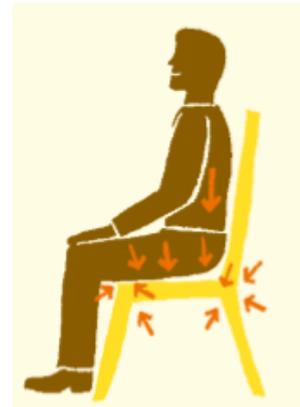
Materials

Cardboard

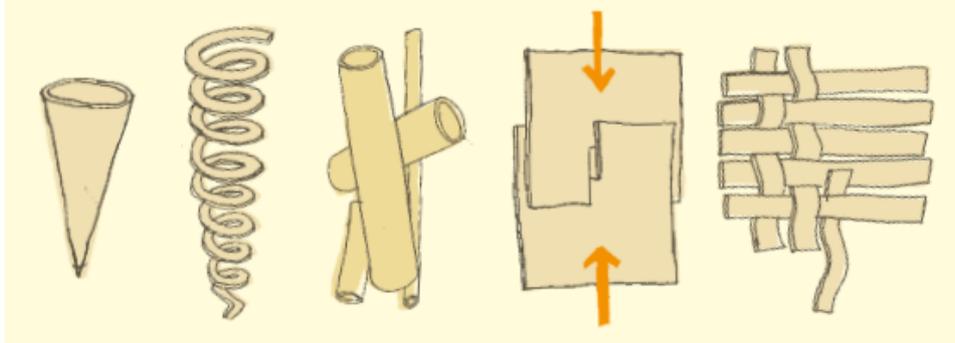
Cutting equipment
(with adult supervision)

Rulers

Pencils



Examples of different structures:



ENGINEERS JOURNAL: WORKSHEET



Step 1: Plan and design

Today my problem is?

What problem do I have to solve?

What questions do I have about my problem?

What are some solutions?

What materials do I need?

Step 2: Draw a detailed diagram

A large grid of small squares, intended for drawing a detailed diagram.

Step 3 & 4: Build it! Test it!

Step 5: Reflect

What changes can be made to the idea?

How can I make it better?

Step 6: Present your solution

HERE ARE SOME EXAMPLES OF THE DIFFERENT TYPES OF ENGINEERS

| | | | |
|---|---|---|---|
|  | <p>Chemical Engineers develop ways to make products on a large scale.</p> <p>Examples: Processed food (like chocolate), medicines, detergents, shampoo, make up.</p> <p>Famous Example: Hair dye</p> |  | <p>Mechanical Engineers design things that have moving parts</p> <p>Examples: Airplanes, cars, electric cars, rollercoasters, robots, turbines</p> <p>Famous Example: Apollo 11: landed on the Moon</p> |
|  | <p>Biomedical Engineers develop technologies and equipment to help save lives and improve health</p> <p>Examples: X-Ray machines, MRI, artificial knee, artificial tissue, pacemaker</p> <p>Famous Example: Blade runner</p> |  | <p>Software engineers design apps and programs that we use on our computers and phones.</p> <p>Examples: Apps like Instagram, programs like Microsoft Word, videogames</p> <p>Famous Example: Facebook</p> |
|  | <p>Electronic Engineers design ways to make use of electricity on the small scale on tiny circuit boards</p> <p>Examples: Mobile phones, PC's, stereos, play stations</p> <p>Famous Example: iPhone</p> |  | <p>Civil engineers design lots of ways to make our life easier and safer.</p> <p>Examples: Roads, buildings, dams, water treatment, wind turbines, pipelines,</p> <p>Famous Example: Empire State Building</p> |

CHEMICAL & PROCESS ENGINEERING



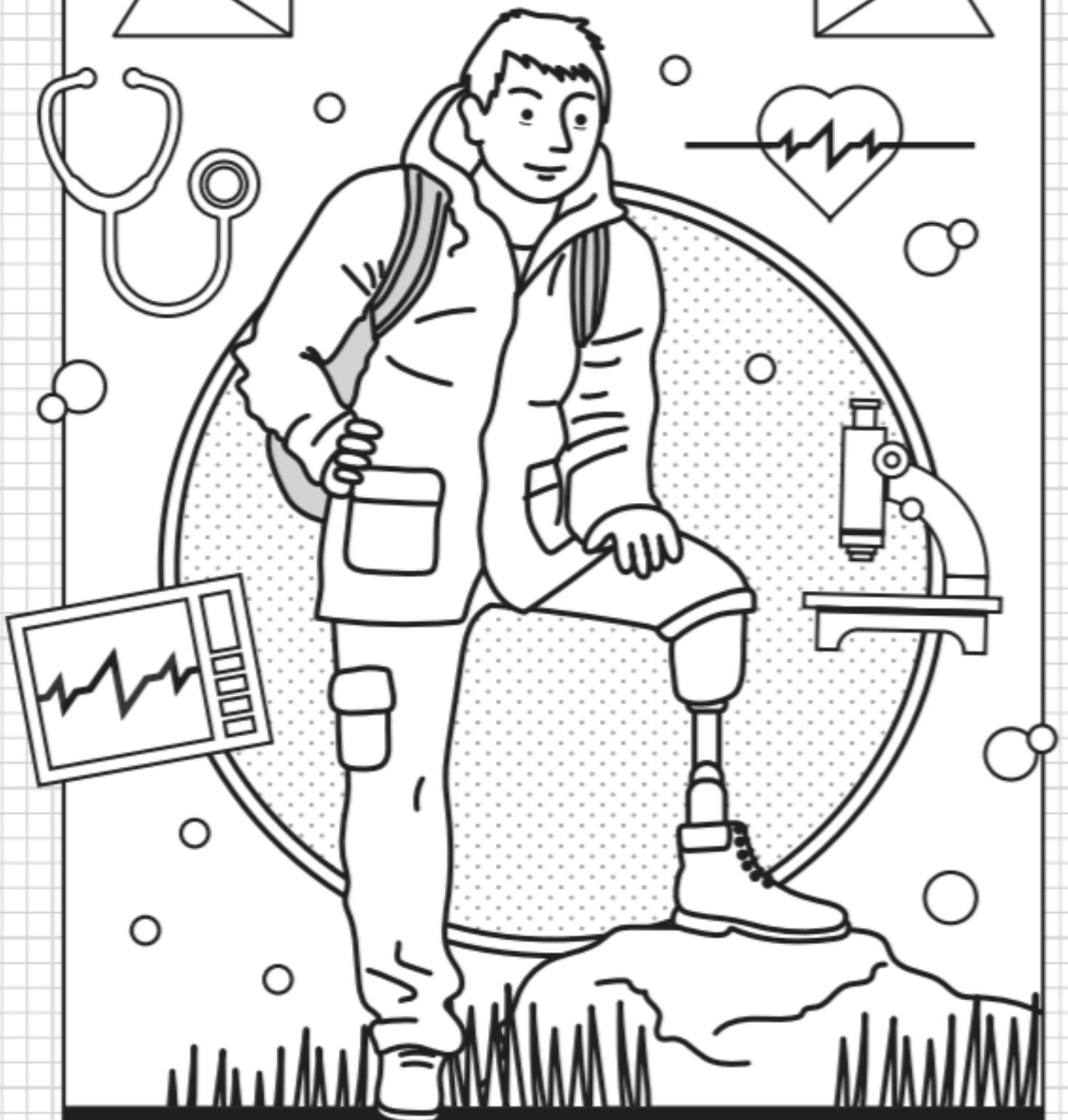
Chemical engineers develop the industrial processes used to make everyday products such as food, drink, drugs, cosmetics, plastics and electronics.

CIVIL ENGINEERING



Civil, structural and environmental engineers design and construct the buildings and infrastructure that are essential to our modern society.

BIOMEDICAL ENGINEERING



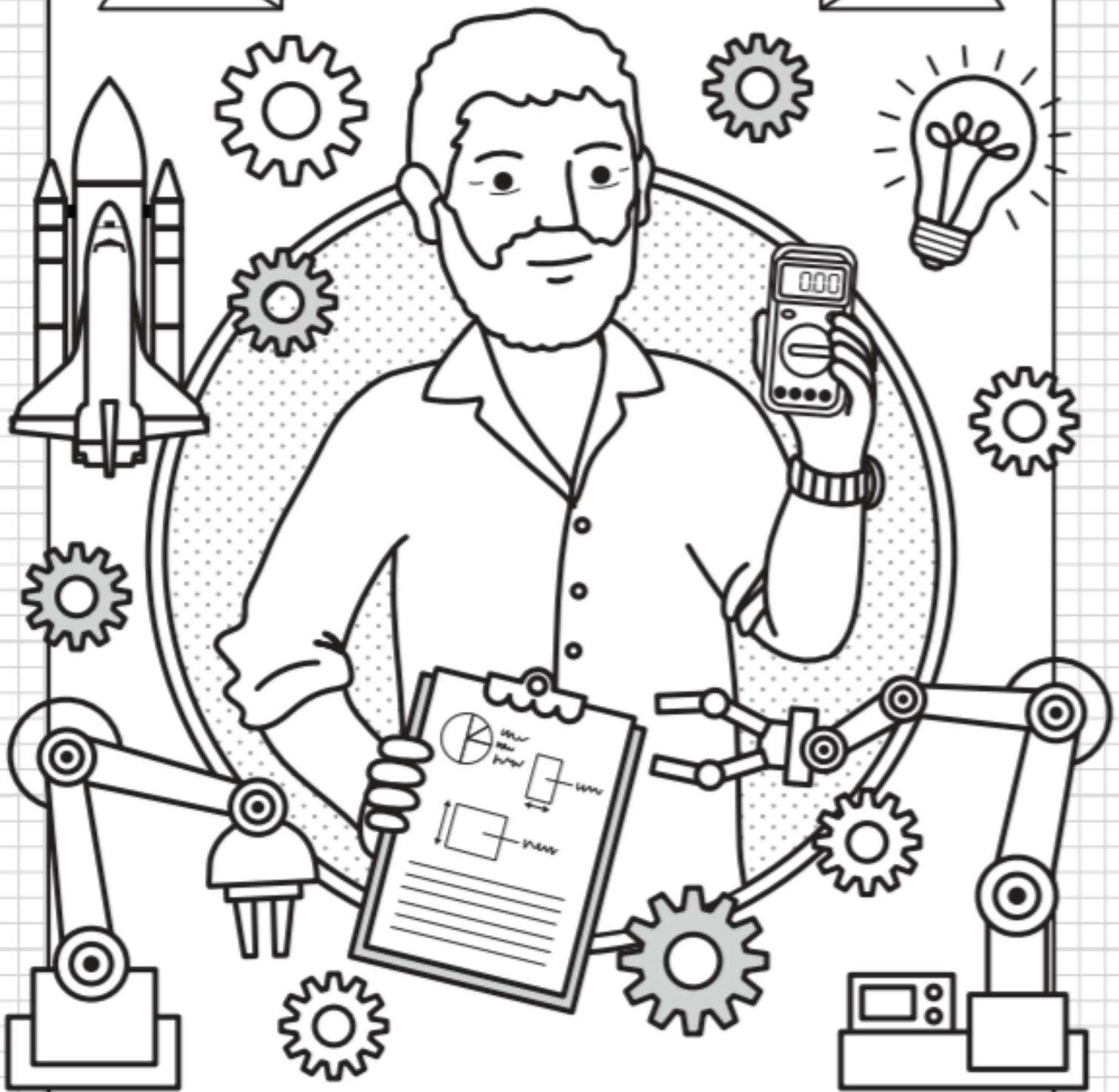
Biomedical engineers develop technologies and equipment to help save people's lives and improve their health.

COMPUTER & SOFTWARE ENGINEERING



Computer and software engineers design and develop hardware, software and information systems for computers and mobile devices.

MECHANICAL ENGINEERING

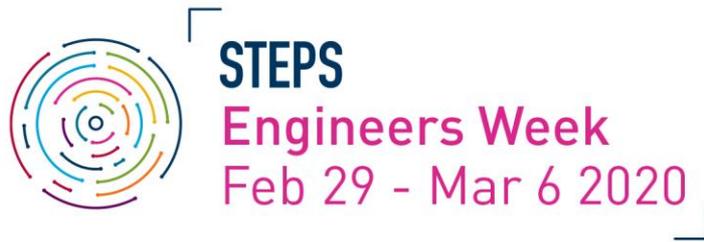


**Mechanical engineers use their
problem-solving skills to design machines
and technologies to improve our world.**

ELECTRONIC ENGINEERING



Electronic engineers design and develop the electrical and electronic equipment that we use every day, from mobile phones to microwaves.



It is hereby certified that

Name:

**Is now an Engineers Week
Superhero!**

Caroline Spillane, Director General

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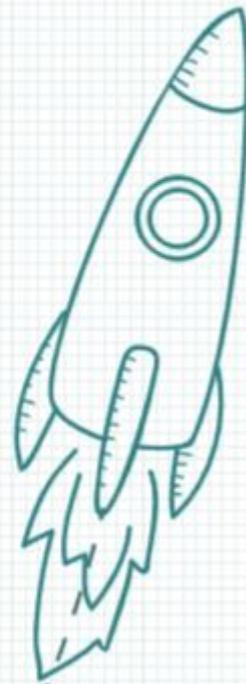
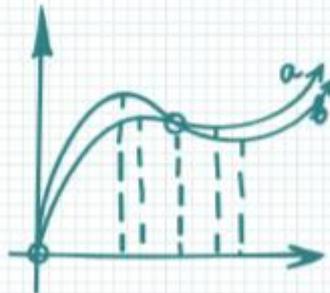


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ENGINEERING CASE STUDIES



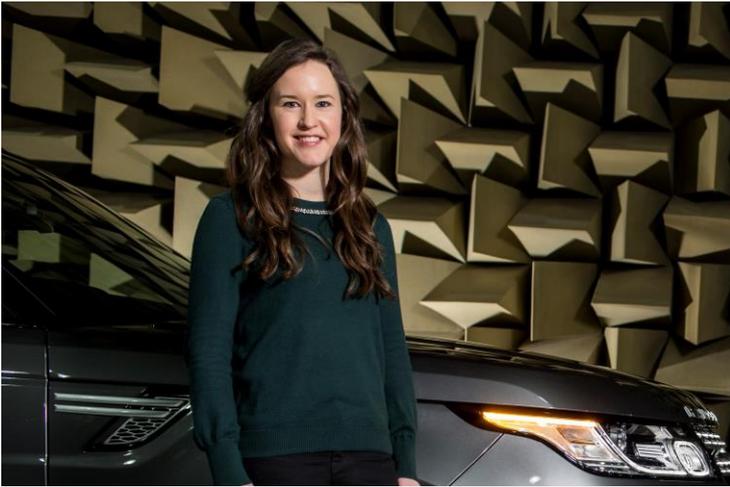
FIONNGHUALA O'REILLY



Miss Universe Ireland 2019 and NASA Datanaut

Fionnghuala O'Reilly, Miss Universe Ireland and NASA Datanaut added the title of Engineers Week 2020 Ambassador to her list of credentials. The systems engineer and George Washington University graduate commented: "As an Engineers Week Ambassador and role model, I want to empower and support young women to explore the limitless opportunities a career in engineering offers. As a woman of colour working in the technology industry, I look forward to collaborating with Engineers Ireland's STEPS programme as Ambassador for Engineers Week 2020 to help tackle outdated attitudes and stereotypes towards underrepresented communities and to showcase that engineering is an all-inclusive profession."

ORLAGH MURPHY



Engineering Quality Transformation Manager at Jaguar Land Rover

Growing up, engineering wasn't even on my radar, but I loved Maths, Physics and music. I couldn't decide what to be. It wasn't until the discovery of an engineering course at UCC that was a third maths, a third physics and a third music that I had that eureka moment of 'that's what I want to do with my life' – and I've never looked back. Engineering is so diverse and varied, and I'm thrilled to support Engineers Week. I really enjoy solving problems, and I like the fact that my job is constantly evolving with new technology.

Engineers must adapt and use cutting-edge technology, so your role is always changing and developing. I can't imagine a career doing anything else!

TOM PARSONS



Tom Parsons, Chartered Engineer working in civil engineering at Jacobs.

The skills developed on the sports field have been vital to building a successful career in engineering” The Mayo senior football says: “For 30 to 40 hours of my week, I am a professional athlete focused on training, recovery, diet, video analysis, workshops amongst other things; then, for the other half of the week, I am a professional engineer. All those attributes that are critical in sport, such as resilience, effective communications, flexibility, time-management and of course passion, are equally vital to becoming an effective and dynamic engineer. Like athletes, engineers have unique abilities to push boundaries and overcome great challenges, and so I’m delighted to support Engineers Week - and I urge schools the country to support what is now a vital annual event in the engineering calendar.”

PHOTO CONSENT FORM

| | |
|---------------------------------|--|
| Child's Name | |
| Parent/ Guardian's Name | |
| Parent/ Guardian's Email | |
| Parent/ Guardian's Phone Number | |
| Relationship to Child | |

To whom it may concern,

We're celebrating STEPS Engineers Week, at this event we will be taking photographs of individuals and groups, audio and video clips ("images") to use in promotional materials, social media pages, and on our website.

Please tick to indicate that you are giving permission for the use of your child's image.

Signed: _____

Date: _____



EVALUATION FORM

What type of event have you attended today?

What is the date of the event you have attended?

Where did you attend the event?

(Please tell us the name of the school or place where the event was held.)

Which school are you (please circle)?

Primary

Secondary

Which class/year are you in at school (please circle)?

1st

2nd

3rd

4th

5th

6th

7th

Which of these best describes you?

Female Male prefer not to say

How much did you enjoy today?

😊 a lot 😐 some 😞 not at all

How interested are you in becoming an engineer?

😊 a lot 😐 some 😞 not at all



EVALUATION FORM

Did today's event make you want to find out more about engineering?

😊 yes 😞 no 😐 don't know

If you were an engineer, what would you like to design, make or build?

(Tick as many as you wish.)

- Aeroplanes / helicopters / rockets Medicine / cosmetics
 Buildings Computers / apps / video games
 New technologies for the home Cars / engines / roller coasters
 Wind turbines X-ray machines / mechanical hand
 Phones / tablets Food
 Other: _____

Do you have any comments about your experience today?

Completed surveys can be returned to:

STEPS, Engineers Ireland, 22 Clyde Road, Ballsbridge, Dublin 4 before 16th of March 2020.

You can complete these surveys online via: <http://bit.ly/2pTbUCV>

EVENT REGISTRATION

To be an official Engineers Week partner please register your activities by January 20th via engineersweek.ie



All participating organisations are required to comply with your child protection obligations, including any obligations arising under the Children First Act 2015 and Children First Guidance 2017.

STEPS Engineers Week should be appropriately acknowledged at events and use of the official hashtag #EngineersWeek #STEPS. We advise organisations to take advantage of resources developed including media kit, logos, website banner, activity ideas all downloadable via engineersweek.ie

Contact us on: steps@engineersireland.ie

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DOCUMENTARIES



Inventing Tomorrow | Hidden Figures | Dream Big | John Phillip Holland: Submarine Inventor.

Register and STEPS will send you streaming information, plot, audience, and running information including any pairing educational resources that tie in with each documentary. This information will be sent in February ahead of Engineers Week.

Register by January 31st via: bit.ly/2kXaR2j

THE CURIOSITY BOX

Give the gift learning during Engineers Week. Engineers Ireland STEPS have teamed up with The Curiosity Box to bring you two very special STEM IN A DAY boxes. These boxes enable a teacher and 30 students (7 -11 years old) to engage with engineering through hands on activities, worksheets and lesson plans.

STEM
Day
in a Box



Electric Artwork €105 + postage

Fully Charged Battery Box €150 + postage

These boxes are perfect for:

- Organisations who would like to donate Engineers Week activities to classrooms in the community
- Teachers who would like to purchase a comprehensive, ready to execute hands on engineering lesson
- Organisations/Engineers who would like to bring present the boxes to schools as part of their Engineers Week visits.

The boxes can be purchased via The Curiosity Box and you will be directed to their separate website [via https://stemday.co.uk/steps/](https://stemday.co.uk/steps/)