TOMORROW'S ENGINEERS | CODE

The Code Explores… inspiring young people

Engaging young people: Key messages and top tips from EngineeringUK

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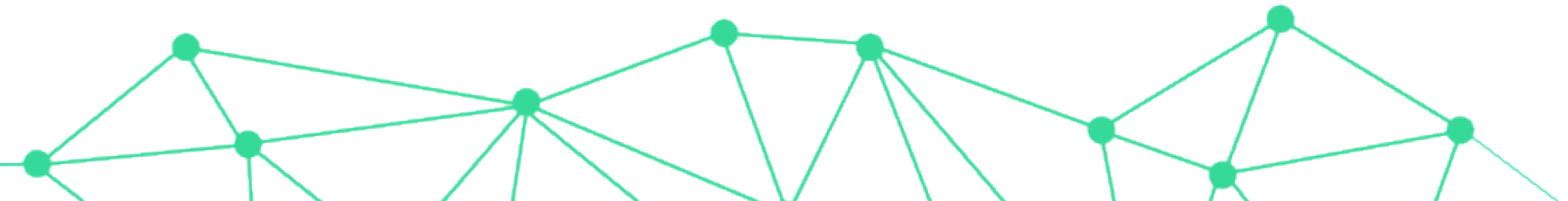
EngineeringUK
INSPIRING FUTURES TOGETHER

What we'll cover

- Key careers messaging strategies to effectively engage young people
- Activity ideas to spark interest and excitement around STEM
- Resources you can use to support your activities and inform young people's understanding of engineering and technology careers



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Key careers messaging

Key careers messaging strategies

SHOWCASE

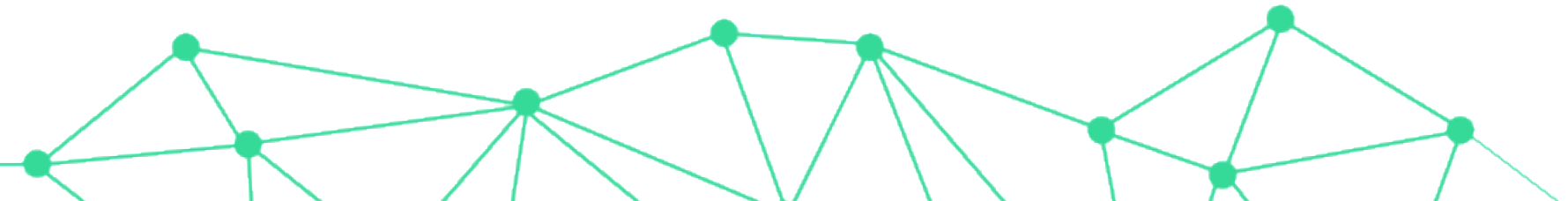
- ✓ Early careers role models
- ✓ Human story of role models
- ✓ Linking from enjoying a subject

PROVIDE

- ✓ Diverse role models
- ✓ Social impact of the role
- ✓ World of work links
- ✓ First next steps

DO

- ✓ Plain English descriptions of what they do
- ✓ Salary
- ✓ Skills links
- ✓ Linking to strengths interests and skills



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Activities that spark interest and excitement

Activity ideas- knowledge and perceptions

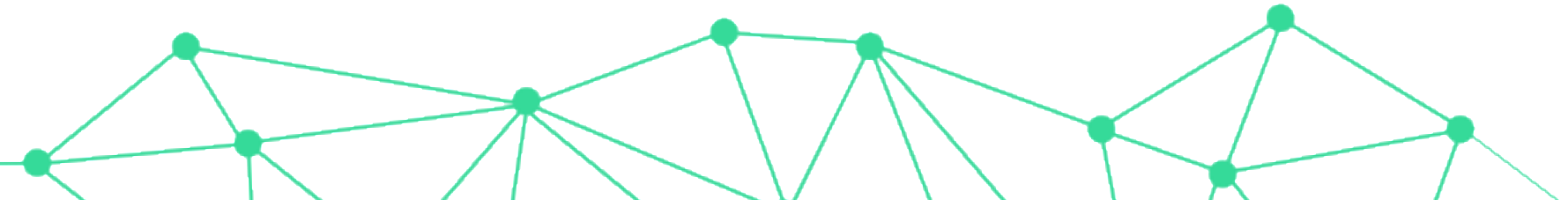
Research (The Science Education Tracker, 2023) shows that **there is knowledge and interest in STEM careers for 11-18 year olds** (77% express an interest (68% girls and 86% boys)).

However, **46% of these think they could become an engineer** in the future.

72% (76% boys and 68% girls**) and 66%** (73% boys and 59% girls**) link creativity with engineering and see how it applies to different roles**.

However, **30%** (44% boys and 16% girls) **and 25%** (38% boys and 12% girls) **think engineering is a suitable career for someone like them, and fits with who they are.**

CONFIDENCE and SELF-EFFICACY, ENJOYMENT AND REPRESENTATION ARE KEY FOR ACTIVITIES.



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Careers- knowledge and perceptions

Green careers – posters

Green careers posters

10 great reasons to become an engineer – poster

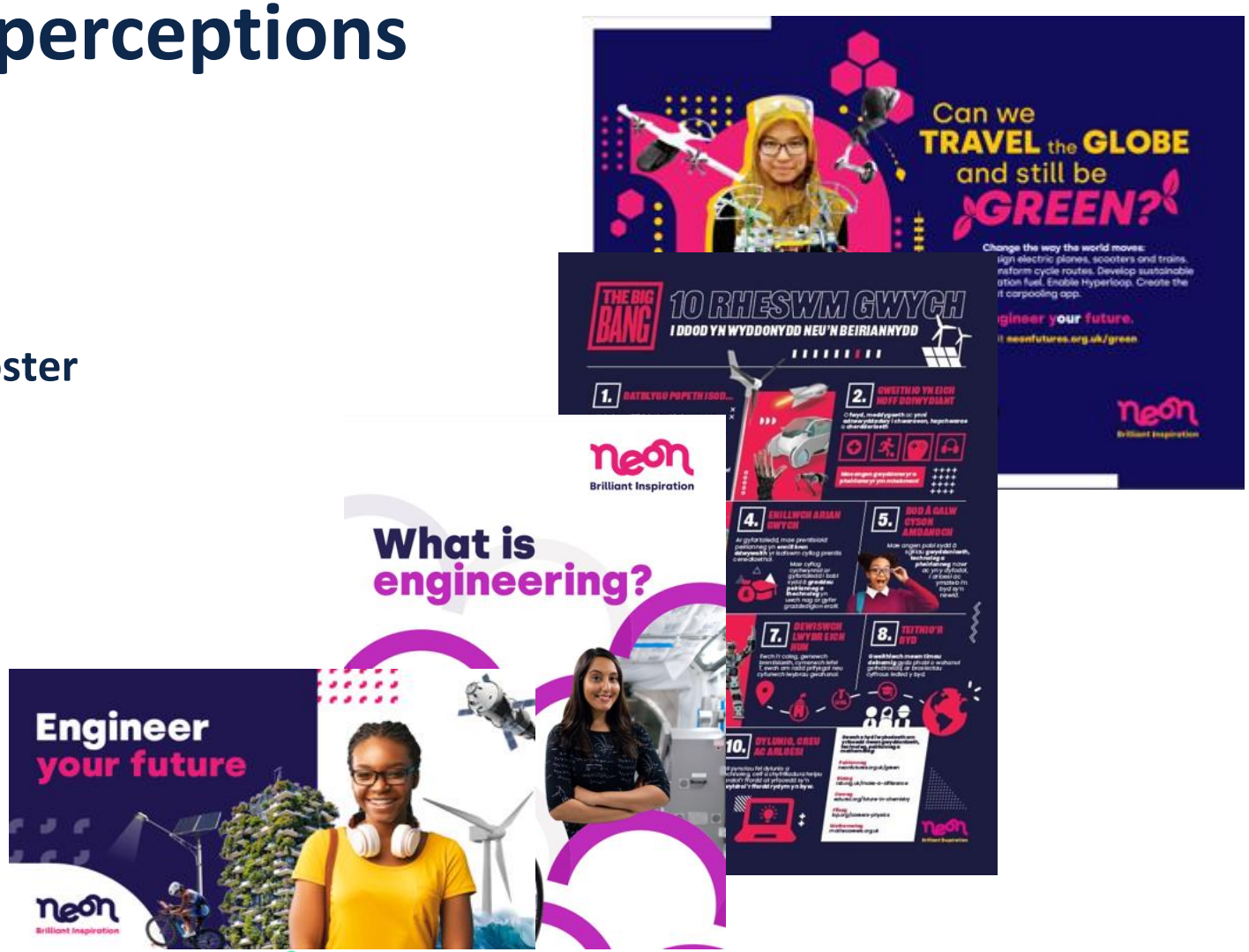
10 great reasons to become an engineer

So....what is engineering? – booklet

What is engineering?

Engineer your future – presentation

Engineer your future
Engineer your future - top tips for presenters



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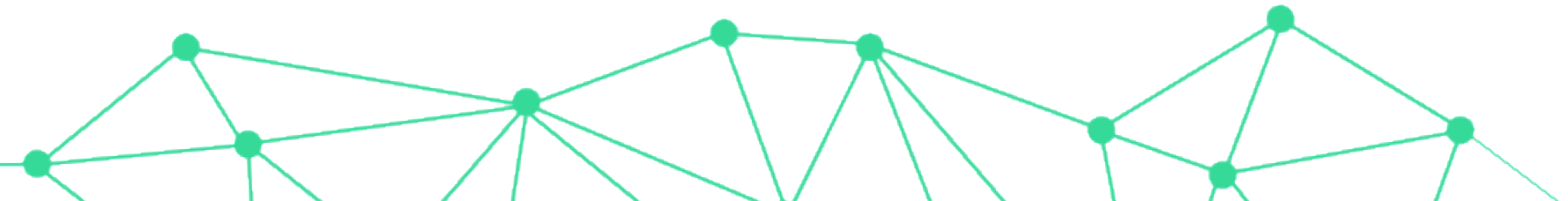
Confidence and self-efficacy

Activity ideas – confidence and self efficacy

Showing young people where this links to careers:

1. Showcase the role model, their career and the skills they use
2. Do an activity that person would do to build in purpose
3. Reflect on the skills they have practiced / developed that are similar to that role.



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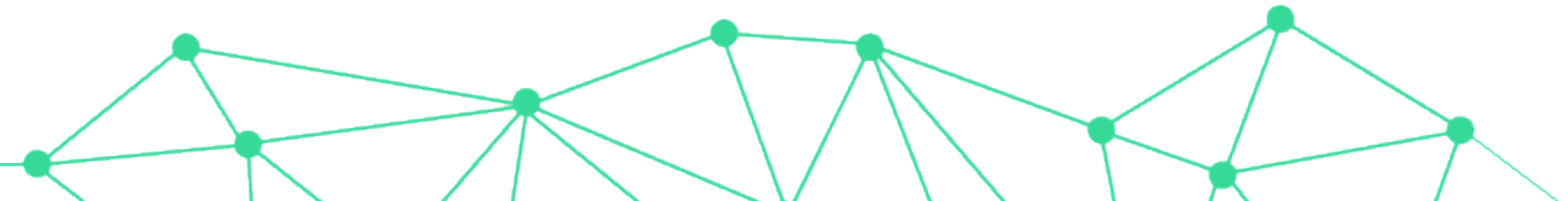
Activity ideas- confidence and self-efficacy

- Science Capital approach; build on what they know.
- Thinking, Talking, Doing Science approach: improve their attitudes and attainment.
- Problem Solving activities: helping them to understand their strengths in developing solutions.



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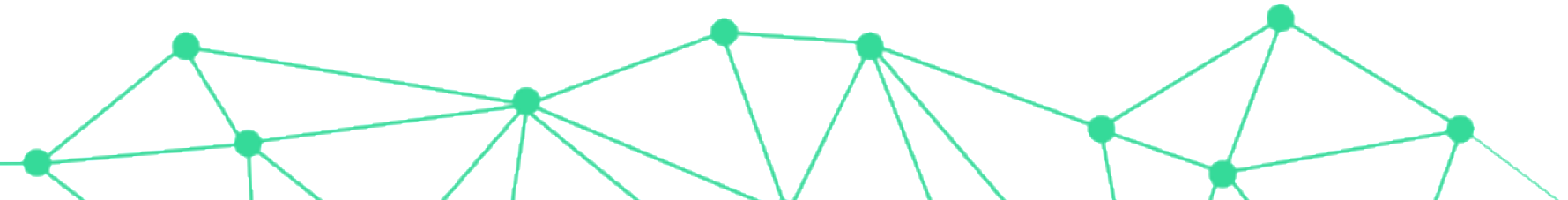
Activity ideas- confidence and self-efficacy

Examples that promote many valid ideas:

- **'Big' Question:** These help you to see what they refer to / know / reference for you to build on. These questions have more than one answer and also help you gauge their level of understanding as well as any misconceptions. They often start with 'How do we know / What is, Where does…?' Examples can be: 'What is in a plum?', 'How do we know if a product is good?' 'Where do you get your best ideas from?'. This promotes confidence in their own reference points.
- **Positive, Minus, Interesting:** This is a reframe of a debate activity, where they have to consider different points of view to a statement. You can then go into an individual vote. Examples are: 'Your school only serves vegan food.' This promotes confidence in hearing lots of ideas and that theirs has value.
- **Tinkering activities:** Providing a range of materials and a task for them to complete. They will have time to tweak, tinker and remake. 'Make something that holds the greatest weight unaided for 30 seconds.' This promotes the idea of many valid creative outcomes and that they can overcome set-backs.



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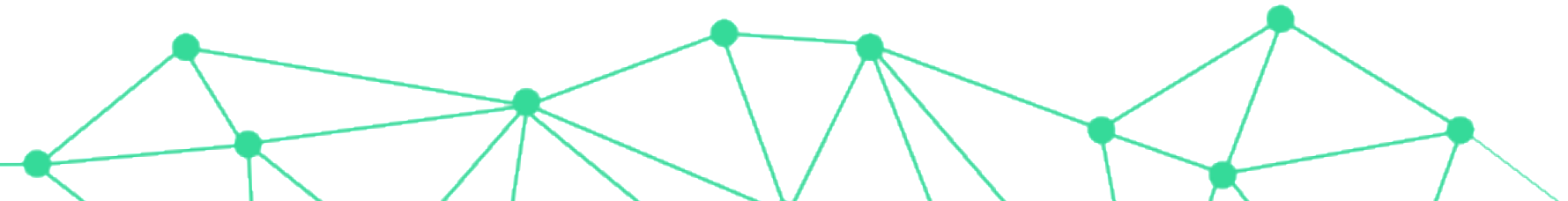
Activity ideas- confidence and self-efficacy

- Science Capital approach; positive connections with people in STEM
- Thinking, Talking, Doing Science approach: linking back to and feeding back on skills
- Diverse representation: Having early career diverse role models



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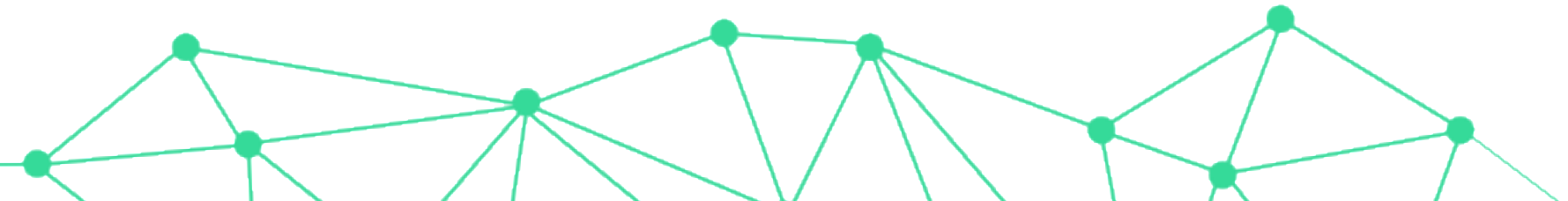
Activity ideas- confidence and self efficacy

Delivery then includes:

- No hands up when taking responses, so Think Pair Share with a range of communication styles (SEND).
- Guiding their learning through introducing key moments for reflection, skills development or questions (SEND).
- Linking up their answers so you point out the subtle differences, or where they build on each other through reflecting back.
- Showcasing and highlighting specific role models that celebrate diversity in all forms (regional, background, route in, ethnicity, disability, gender) (SEND).
- Feeding back throughout on where you see great skills, knowledge applied, or are impressed with an answer (SEND).
- You talking for a maximum of 20% of the session



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Maria Torres

Quality Engineer in Food

Wrigley Company (Plymouth)

She works in the Wrigley factory and helps to create new products. She runs trials with new ingredients, and makes sure they are safely made before being sold.

Who likes a chance to practice, test, try things out before doing it?

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PROBLEM SOLVING

CREATIVITY

Sarah Cain

Maintenance and Reliability Engineering Manager

Wrigley Company (Plymouth)

She gets to create, maintain, repair and solve problems on production lines and machines that take chewing gum from a raw material to a finished product.

Who likes working towards a goal?

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PLANNING

PROBLEM SOLVING

Food Engineers: Create the quickest, most accurate and safest way to process our food.

Who can create the most improved system?

In teams of 6. (4 Operators, 1 Quality Engineer, 1 Reliability Engineer).

- Operators build the design
- Quality Engineer observes, checks it is correct and suggest improvements
- Reliability Engineer observes, times and suggest improvements.

- RE: Turn the card over and start the timer.
- O: add one brick at a time before passing it to the next person. Pass it to the Quality Engineer when done.
- QE: check if correct and if so let the RE know.
- RE: stop the timer and record the time.
- Engineers then suggest at least one improvement for next time.
- Swap roles (3 x in total)
- At end of 3x RE works out the time difference.

PROBLEM SOLVING

TEAMWORK

CREATIVITY

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Careers- confidence and self-efficacy

Neon experiences

Brilliant engineering experiences | Neon - Brilliant inspiration

Tomorrow's Engineers Week

Tomorrow’s Engineers Week - Tomorrow's Engineers

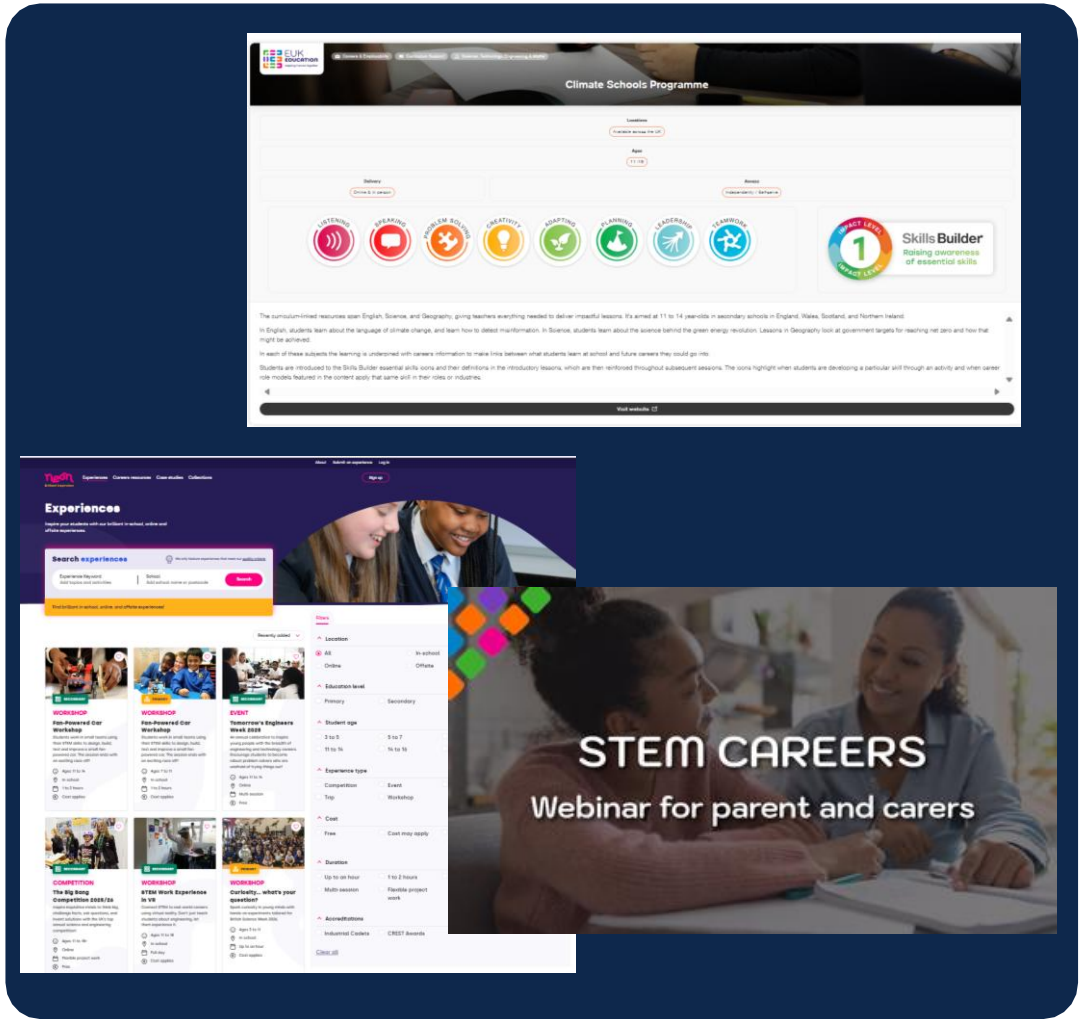
Skills Builder essential skills framework

Level 1: Climate Schools Program

Skills Builder UK

STEM Webinar for Parents and Carers

Success Stories which help Parents understand STEM Careers



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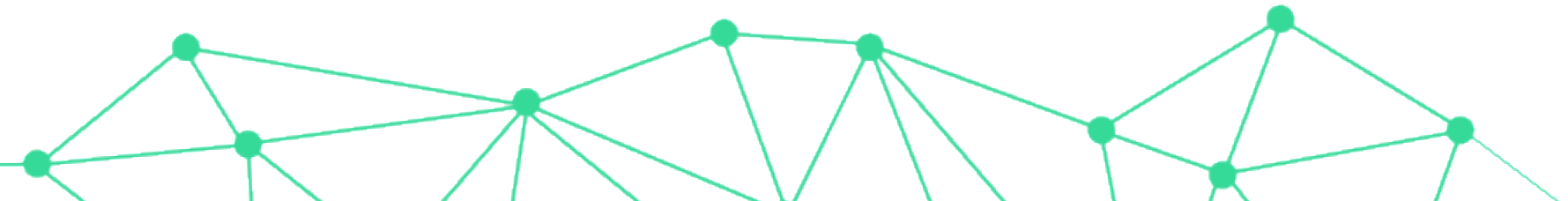
Enjoyment

Activity ideas- enjoyment

Showing young people where this links to careers:

1. Showcase modern, innovative roles in STEM
2. Do an activity that person would do framed around what young people enjoy
3. Provide actionable next steps to continue supporting their enjoyment.



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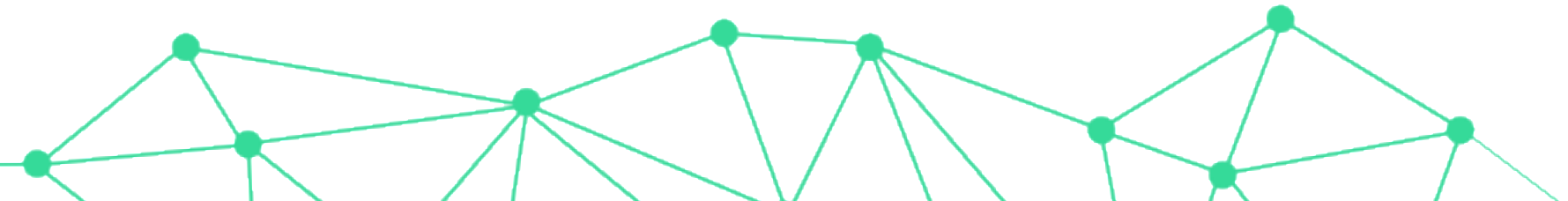
Activity ideas- enjoyment

- Science Capital approach; inclusion of all and purposeful learning
- Thinking, Talking, Doing Science approach: active participation
- Practicals: hands on approach



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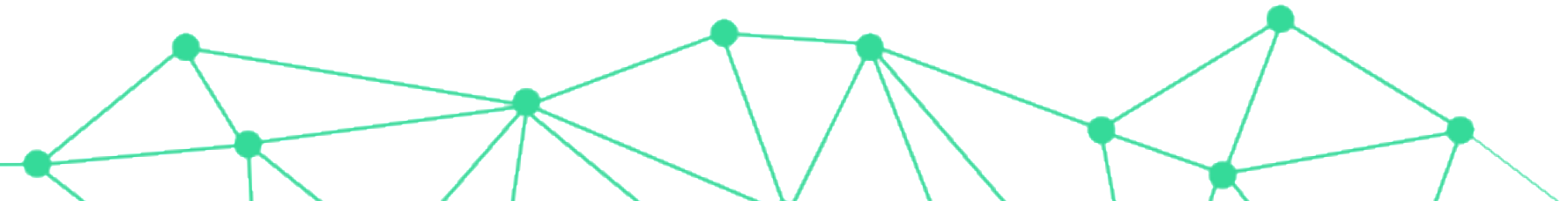
Activity ideas- enjoyment

Examples that promote enjoyment and 100% inclusion:

- **Framing:** Consider the framing of your activity to give it purpose, real world relevance and meaning to young people. Topics that young people (and particularly girls) engage with are: social impact of STEM, climate solutions, health. This helps to answer the purpose of what they are learning.
- **Matching activities:** Matching answers to build and check understanding, or a card sort with then questions or further activities afterwards. E.g. Sort these cards into the design thinking process. Now, which do you think is the stage you would spend the most time on? This brings in higher order thinking through scaffolding that everyone can then engage in.
- **Odd One Out?:** Pick any random three or four objects and set a range of questions to a group. Having them physical is more accessible and you can do it in pairs or groups and go around so everyone contributes. E.g. list eight reasons why object number 2 is the odd one out, give three reasons why objects one and four are similar. This showcases how STEM skills are relevant everywhere in seeing patterns and anomalies and young people can show their creativity and knowledge.

Activity ideas- enjoyment

- Science Capital approach; giving purpose and pace throughout
- Thinking, Talking, Doing Science approach: having a range of engagement opportunities
- Bloom's Taxonomy to build up questioning from understanding, to analysis and evaluation.



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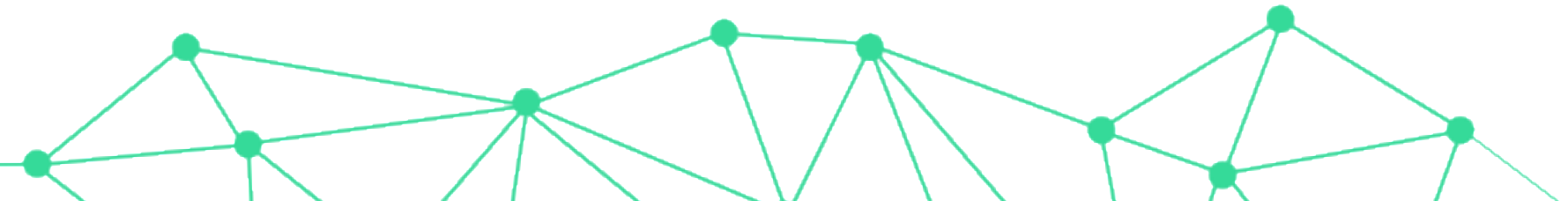
Activity ideas- enjoyment

Delivery then includes:

- Time to process answers before feeding back to the group (SEND).
- Creating a challenge / game in activities.
- Making the session have pace with clear time goals for thinking, answering etc. (SEND).
- Building up questioning and activities throughout, so that they link together in a mastery approach and all can engage at every stage (SEND).
- Students being given a choice in an activity (SEND).



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Biomimicry is …

- **When engineers are inspired by nature in their solutions, inventions and creations.**
- Engineers study plants and animals to see how they do things, how they are designed or even what they are made of. They then try to copy or recreate that into something that helps us in our lives today.

Activity: Match the animal inspiration with the engineering solution.

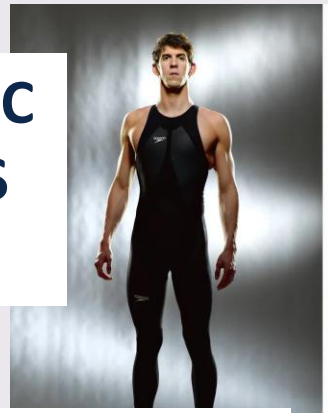
SHARK

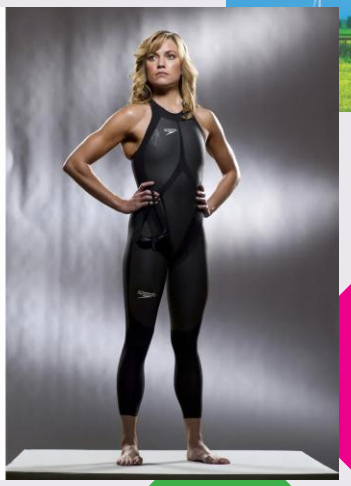
HUMPBACK WHALE

KINGFISHER

WIND TURBINE

USA OLYMPIC SWIMSUITS 2008





HIGH-SPEED TRAIN

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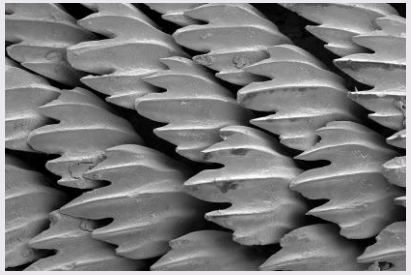
ZOOLAB

Answers: Match the animal inspiration with the engineering solution.

SHARK SCALES



USA OLYMPIC SWIMSUITS 2008 - BANNED!

HUMPBACK WHALE FIN

WIND TURBINE - BLADE

KINGFISHER BEAK

HIGH-SPEED TRAIN – FAST AND QUIET

ZOOLAB

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INSPIRED BY

- Mechanical Engineers **Jennifer Shum and Samantha Castellanos** didn't have a problem to solve. They were inspired by the cockroach and created a solution based on its properties, called the **HAM-R Robot and HAM-R Robot Junior**
- Jennifer and Samantha had to explain their idea to convince people it was a good one.
- They developed their **communication skills** in **debating and coaching.**

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ZOOLAB

THE BEST SOLUTION? WHAT ADAPTATIONS?

Biotechnology: Microsurgery

Emergency: Search and Rescue?

Nature: Pollinating Plants?

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Careers-activities

Meet the Future You quiz - activity

Meet the future you | Home

My world, my future – activities leaflet

STEM inspiration outside the classroom

The Big Bang Challenges – 7x projects

Big Bang Challenges

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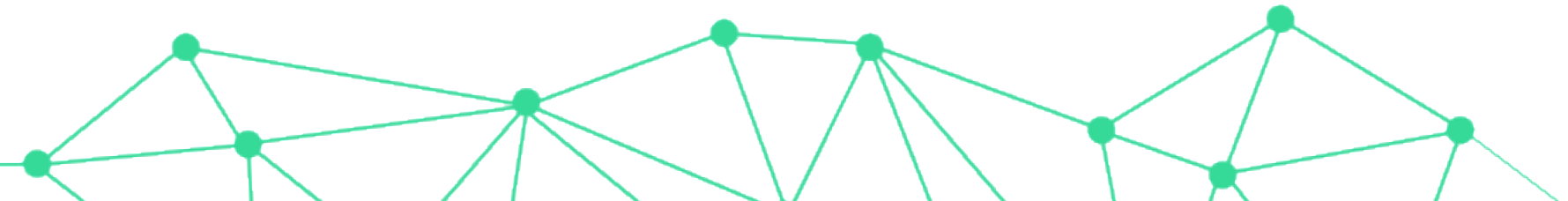
Representation

Activity ideas- representation

Showing young people where this links to careers:

1. Showcase the breadth of STEM and how it relates to everyday life.
2. Do an activity the student can relate to and represents their interests and life.
3. Celebrate diversity of people working in STEM and why more is needed.



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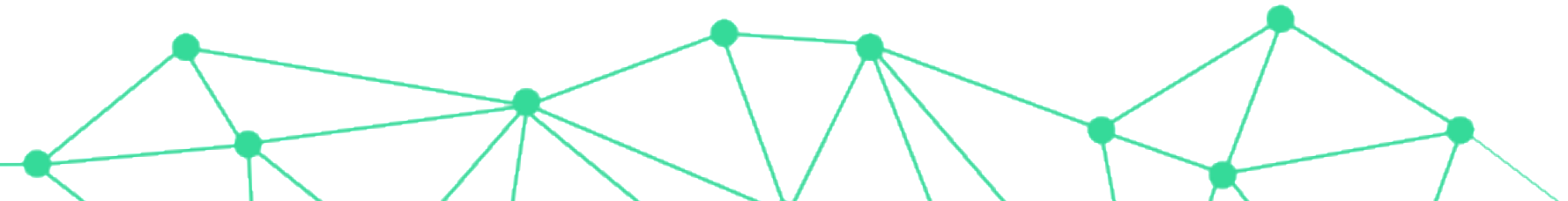
Activity ideas- representation

- Science Capital approach; building up STEM connections
- Thinking, Talking, Doing Science approach: real-world applications
- Diverse representation across STEM and role models



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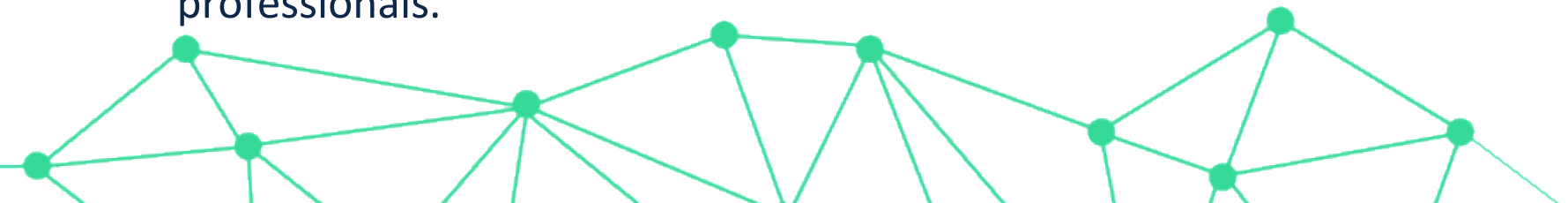
Activity ideas – representation

Examples that promote inclusion and representation:

- **Breadth of diversity in STEM:** Showcase the wide range of STEM, so that you can show it links to all hobbies, interests, topics and themes. For instance engineering in aerospace, food, medicine, culture, sports. This helps to have representation across the whole of the sector and show that there is a future whatever your interest or skill set.
- **Real world experiments with a chance for a hypothesis:** What is the best design for a paper airplane (providing three and they create the test measures to find out) and linking to aerodynamics and how this links to the real world in designing planes. What is the best food stuff to create the biggest rise in fermentation (providing three options) and relating to the real world of how that might be used for food waste. This is an inclusive way to support cause and effect and show how STEM applies to the real world.
- **Use diverse representation across role models:** This includes demographic diversity, as well as geographically (mainly UK), routes in, hobbies, interests and skills. This helps to show that STEM will suit someone like them. Some commonalities are to use real people now, and early career professionals.



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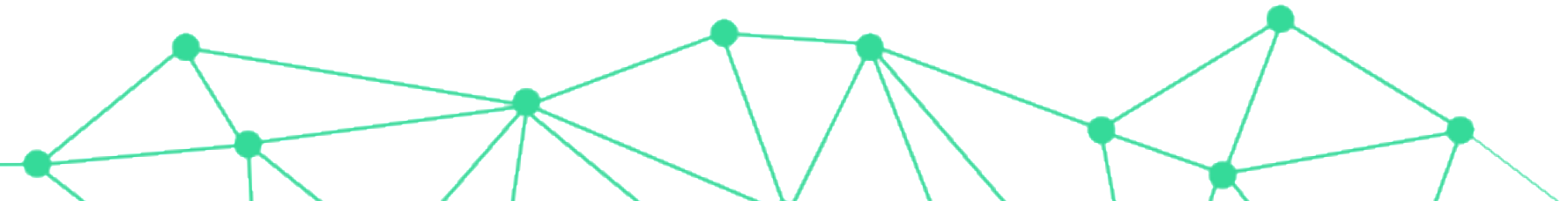
Activity ideas- representation

- Science Capital approach; next steps to continue following in your way
- Thinking, Talking, Doing Science approach: inclusion
- Gatsby Benchmarks and Equalex links.



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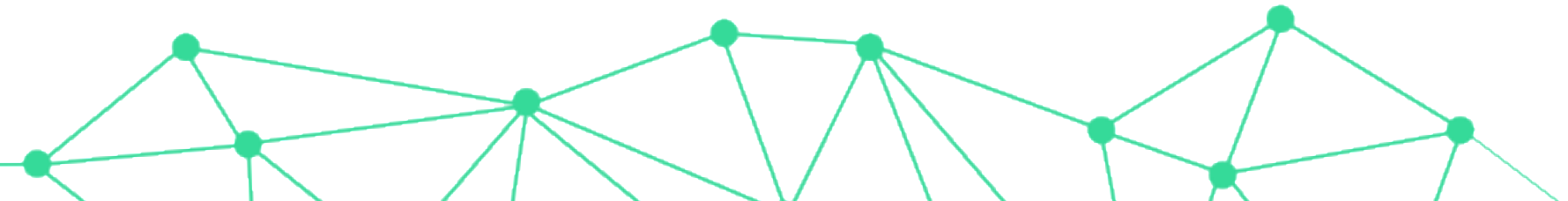
Activity ideas- representation

Delivery then includes:

- Clear instructions for any experiments, with step-by-step instructions and images to support (SEND).
- Making those links from learning in the real world to careers explicit.
- Messaging around why STEM needs diversity in solving solutions (SEND).
- Giving STEM volunteers a role and opportunity that invites them to share fun facts about themselves, as well as give feedback to students.
- Providing next steps for students to find out more in easy ways (e.g. a leaflet, website, videos, local visits) (SEND).



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Real world – Apply Computational Thinking

Applying Computational Thinking to your life …	
Preparing for a test or exam	Putting together a revision timetable to break it down by subject or type of question
Playing sports	Thinking through the rules to make sure you get the best outcome.
Cooking or Baking	Following a recipe step-by-step and understanding where you can add your own tweaks.

At work, people use computational thinking to break down a task to make it more manageable, and use precise language to communicate a task or something they need help with. People also use computational thinking to code and creating programming for computers and AI.

Glenn Ward is an Electronics Engineer who appeared on BBC'S The Apprentice. He uses computational thinking in his work as a Sound Engineer. He writes codes for computer programmes that mix digital sounds for shows like The Lion King. https://neonfutures.org.uk/case-study/electronics-engineer-glenn-ward/

Reflection

Are there other ways you use computational thinking in your life? Do you use it when you prepare for something in advance? Do you follow videos online that have step-by-step instructions or create your own?

Next steps

- Find out more about engineers who work on sustainable solutions. Examples are: Lenga Dermaut and Emma Shavick.
- Do activities to develop your engineering skills such as solving puzzles, debates, playing team sports or creative crafts.
- Join or set up a Climate Action Club at school.
- Do the Meet the Future You Quiz.
- Learn more about climate change in your lessons with our Climate Schools Programme.
- Create a solution to climate change and enter it into the Big Bang Competition.

Climate SCHOOLS PROGRAMME

Careers- representation

Who works in Engineering – Case Studies

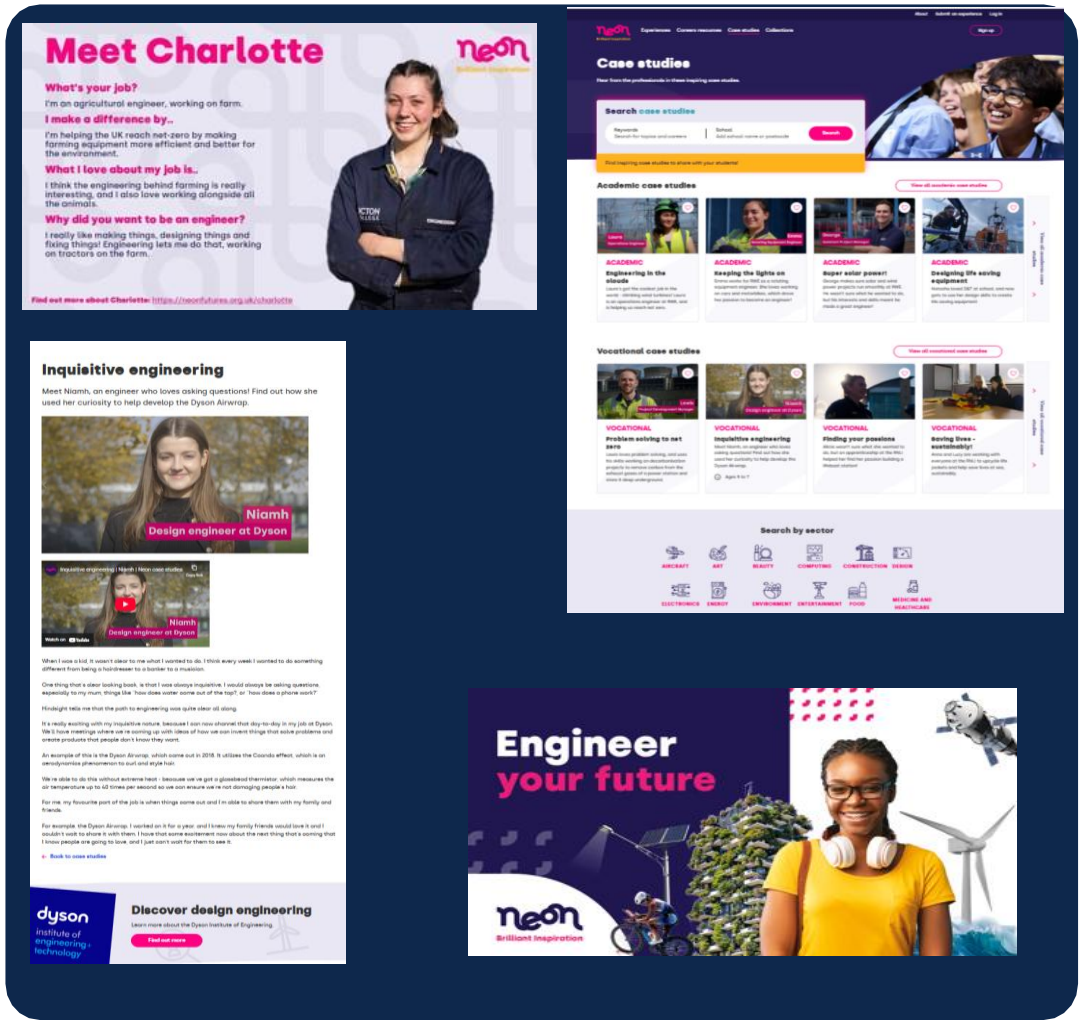
Real engineers case studies | Neon - Written case studies
Real jobs in engineering - EUK Education Video and Written case studies

Engineer your future – presentation

Engineer your future

What jobs do engineers do? - presentation

Meet real engineers presentation



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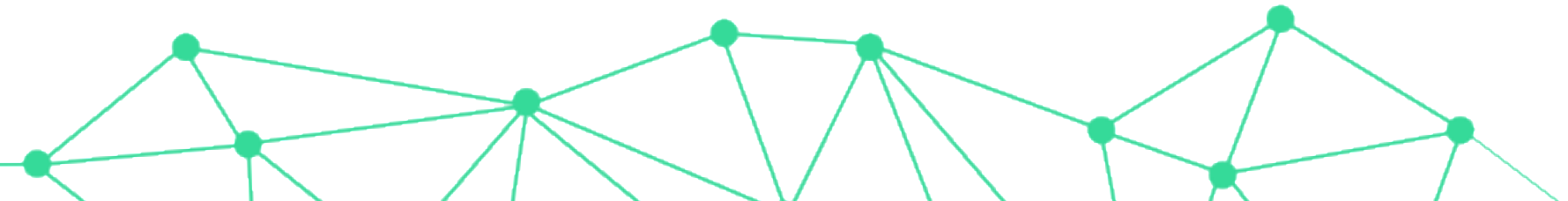
Next steps

Your next steps

Embed best practice	Make activities hands on & inclusive	Leverage & share quality resources	Champion Diversity & inclusion	Sustained engagement
• Showcase diverse role models • Use plain English • Highlight social impact	• Run practical STEM activities • Promote enjoyment & representation	• Use EUK education resources • Signpost to further exploration	• Celebrate a range of pathways • Create opportunities for reflection	• Support clubs and competitions • Keep the conversation going



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