EXPLORING ENGINEERING (PRIMARY: AGE 7-9 YRS) ROLE MODEL SUPPORT SHEET

(ALSO SEE VIDEO TUTORIAL AND SLIDE DECK TO ACCOMPANY THE SESSION. CAN RUN ACTIVITIES AND EXPERIMENTS WITHOUT SLIDES IF PREFERRED)

Welcome to this fun STEM workshop, called Exploring Engineering!

We are going to practice being curious, creative and courageous as you all become mini-engineers and do 2 different experiments to explore how we apply the amazing science you learn in school to real STEM jobs and real problem-solving in our world. Plus you'll learn a cool engineering magic trick you can take home to show your family and friends!

Ice-breaker resources per group:

- 20 x (28mm) paperclips (Amey)
- 1 x A4 paper (Amey)
- 6 - 10 books (Teacher)
- 15 cm ruler (Teacher)

Main activity resources per child:

- Colouring pencils (Teacher)
- Scissors (Teacher)
- Glue stick (Teacher)
- A4 printed template (Amey)
- Pea-sized blob Blu Tack (Amey)
- 2 x (28mm) paperclips (Amey)

Risks to manage

- Safeguarding - Have DBS/PVG (notify teacher in advance if not), don't take photos (ask teacher to take)
- Resources / tools - Care using scissors (injury) and working with paper (paper cuts)

Key Steps & Guide Agenda - also see presentation notes **(Total 60 mins)**

1. (5 mins) Hook & Introduction - What is STEM? Intro to STEM, Amey and role model (slides 1 – 3)
2. (10 mins) Ice-breaker activity - Groups of 4: two bridge designs. How can we engineer a bridge to be strong and stable? Highlight balancing forces and shapes in design. (slide 4)
3. (10 mins) 3 key Forces learning points, then Amey bridge video (notice Girder bridge like they made from paper) - Discuss different interesting bridges - what do they notice about them, what do they think makes them strong & stable? (slides 5 – 7)
4. (20 mins) Main activity - Let children create their Beaver's Bridge and try to balance it, then show them how to lower CoG and balance. Have fun with where you can balance it! (slide 8)
5. (5 mins) Sumary qus and final message: we need more young people like all of you to be our future engineers - our STEM superheroes of the future! (slide 9 - 10)
6. (10 mins) Q&A & Wrap Up – (optional slide 11) & give out certificates and remind to take home their Balancing Beaver to show their families to explain how they've been Engineering Explorers!

Key STEM Messages & Extra Info for Role Model (also see completion certificate)

- Engineers are like creative problem-solvers who use science, maths, imagination and teamwork to build things that help people. They turn cool ideas into real life inventions.
- Gravity is the invisible force that pulls objects down towards Earth (this gives objects weight).
- Gravity is a non-contact force because it acts without touching (also like magnetism)
- Contact Forces need objects to touch before they can act. For example - air resistance and friction.
- For an object to stay still – the forces acting on it need to be balanced.
- An object will move if its forces are unbalanced.
- Bridges don't just hold heavy cars; they have to fight the wind! Engineers design bridges to be strong and stable in high winds and even resist forces from things like earthquakes.
- We made different designs of bridges from the same piece of paper. Flat paper is weak, but if you fold the edges up you make a girder which is a stronger shape because it is stiffer & resists bending.
- In engineering, we test things to failure to learn! We design things on the computer to test it safely and also make models and prototypes (like you did) to test designs before we build the real thing!
- Every object has a "magic spot" called the Centre of Gravity (C of G) or Centre of Mass where all its forces are balanced!
- Low C of G makes things more steady. Just like our Balancing Beaver Bridge - we made it balance by having the same weight on each side, and adding weight to the bottom to lower the C of G - so we could balance it more easily - even on our noses!

Extra interesting info

- The triangle is a strong shape in engineering. Connected triangles are even stronger - this is called a Truss and is often used in bridges.
- Engineers use forces to understand how strong to make a bridge - they calculate two weights: the "Dead Load" (the bridge itself) and the "Live Load" (the extra forces acting on it like cars and people moving on it).