Autumn 2021 Schools Digital Project: Evaluation Report by Dr Irene Wise and Sarah Punshon

"truly fantastic!" *Teacher*

"a refreshing, exciting way of communicating some of the thrill and excitement of STEM challenges to some VERY young children… a real pleasure to be part of and I'd love to do it again."
STEM Ambassador

Institution of MECHANICAL ENGINEERS

IET The Institution of Engineering and Technology

BIG IMAGINATIONS

Engineering | Lancaster University

STEM AMBASSADOR HUB

STEM Ambassador Hub Lancashire and Cumbria

Overview

- **604 audience members** experienced our live Zoom interactive show, *Curious Investigators* (see trailer). Of these, 542 were Reception, Year 1 and Year 2 school pupils in the Morecambe Bay area: **14 different schools**

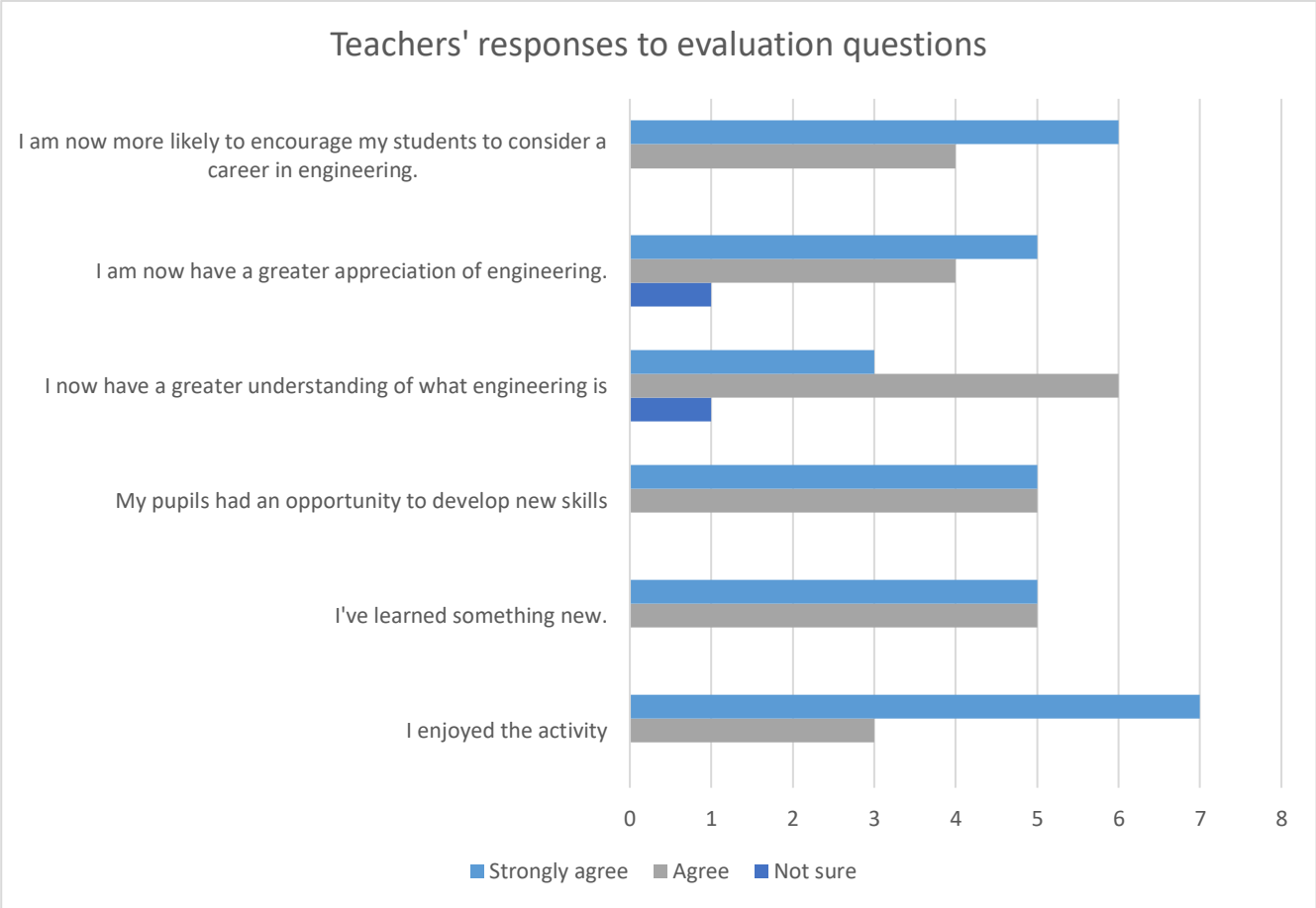
- **300 children** and 32 teachers & teaching assistants (11 schools) also took part in **a live Q&A with STEM Ambassadors**, hosted by "Investigator Toni". Ambassadors bravely and brilliantly answered questions including "do you work with potions?", "can girls be engineers?", and "why is the sky blue?": take a look here.

- **42 STEM professionals attended training** in communicating with young audiences, and **13 STEM Ambassadors** were supported to prepare and deliver three minute "This is Me" presentations, followed by live Q&As.

- **We changed children's aspirations**: before the show and Q&A, 66% of children answered "no" when asked "would you like to be an engineer when you are older?"; afterwards, this dropped to less than 5%. 96% answered either "yes" or "maybe" – with girls even more likely to say yes than boys (50% of girls vs 38% of boys).

Teacher experience:

10 teachers filled in and returned our evaluation forms. 100% of responders agreed or strongly agreed that they had benefited from the experience in terms of their understanding about engineering and the opportunity it provided to their pupils.



"It was a great session and the best we've attended/been involved in! As soon as it finished the children asked if we'd be doing another one."

"Pitched really well – we loved investigator Toni! Really good for the children to see different engineering roles too!"

"A truly fantastic workshop!"

"The activity is very appropriate to the age range. The central character 'Investigator Toni' captures the students imaginations very effectively and they really 'buy in' to the problem that needs solving." *Teacher comment*.

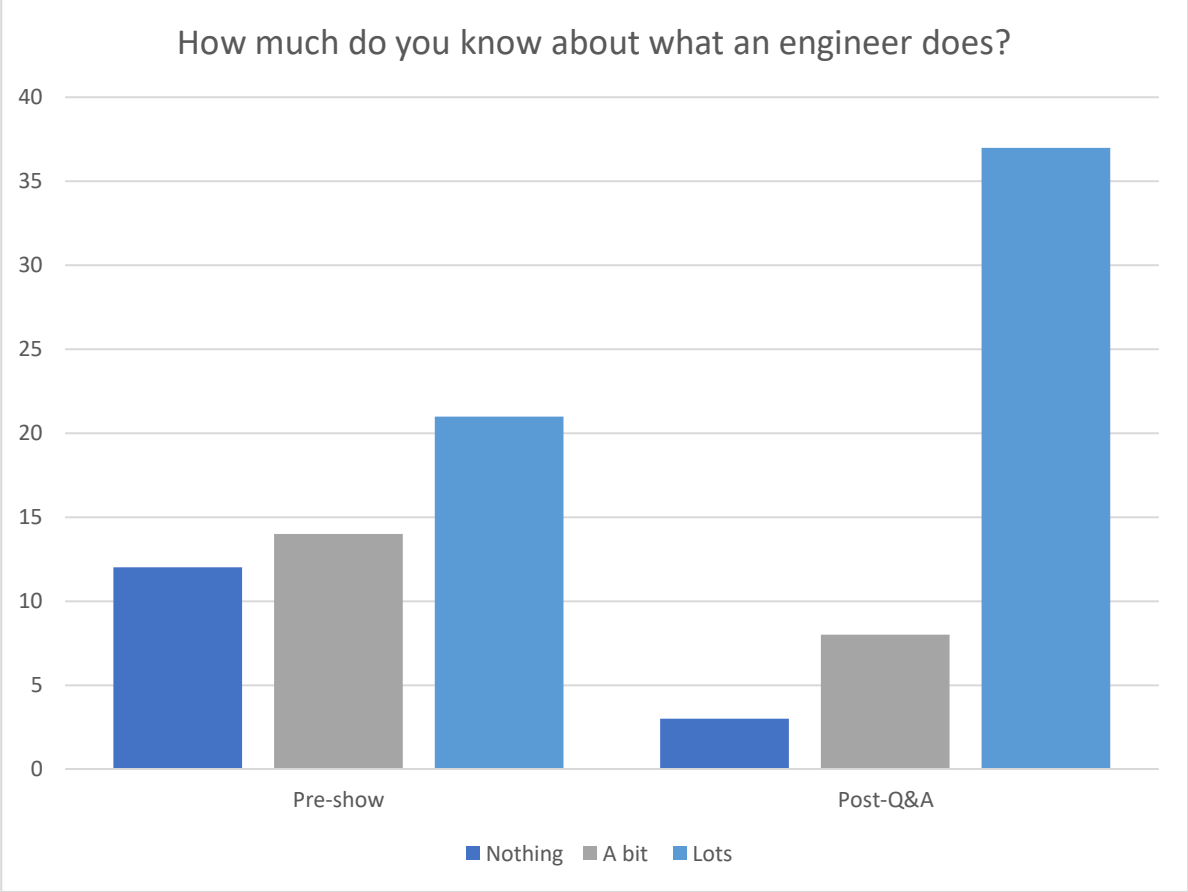
The only criticism teachers offered was that they wished they had known more about how inspired the children would be:

"they were so keen to keep designing and building – wish I'd have booked an earlier slot, i.e. not Friday afternoon!"

Impact on Children

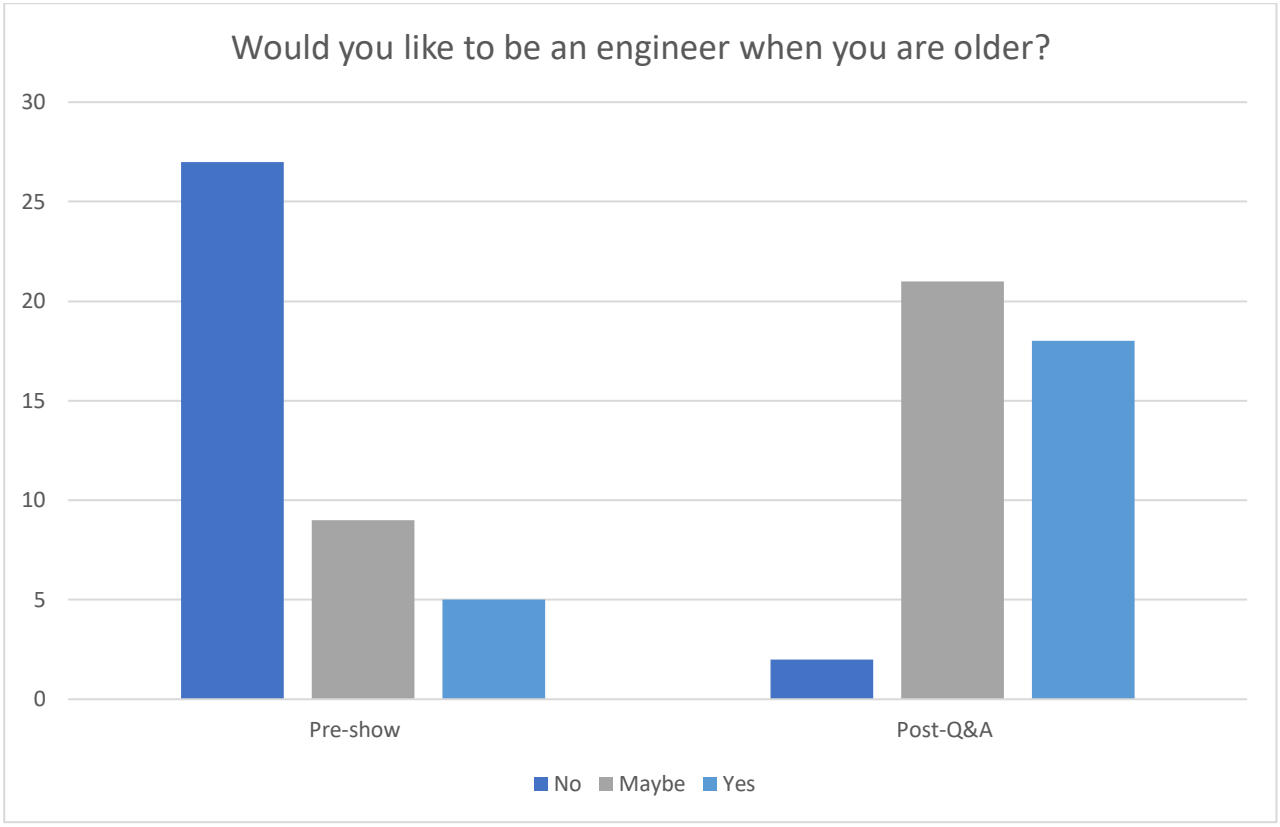
How much do you know about what an engineer does?

49 Reception, Year 1, and Year 2 children from two different schools were asked pre-show and post-Q&A, “how much do you know about what an engineer does?”. With their eyes covered, children were asked to hold up a fist for “nothing”, one finger for “a bit”, and all five fingers for “lots”. Teachers tallied the responses. Children were considerably more confident that they knew what engineers get up to after participation than before:

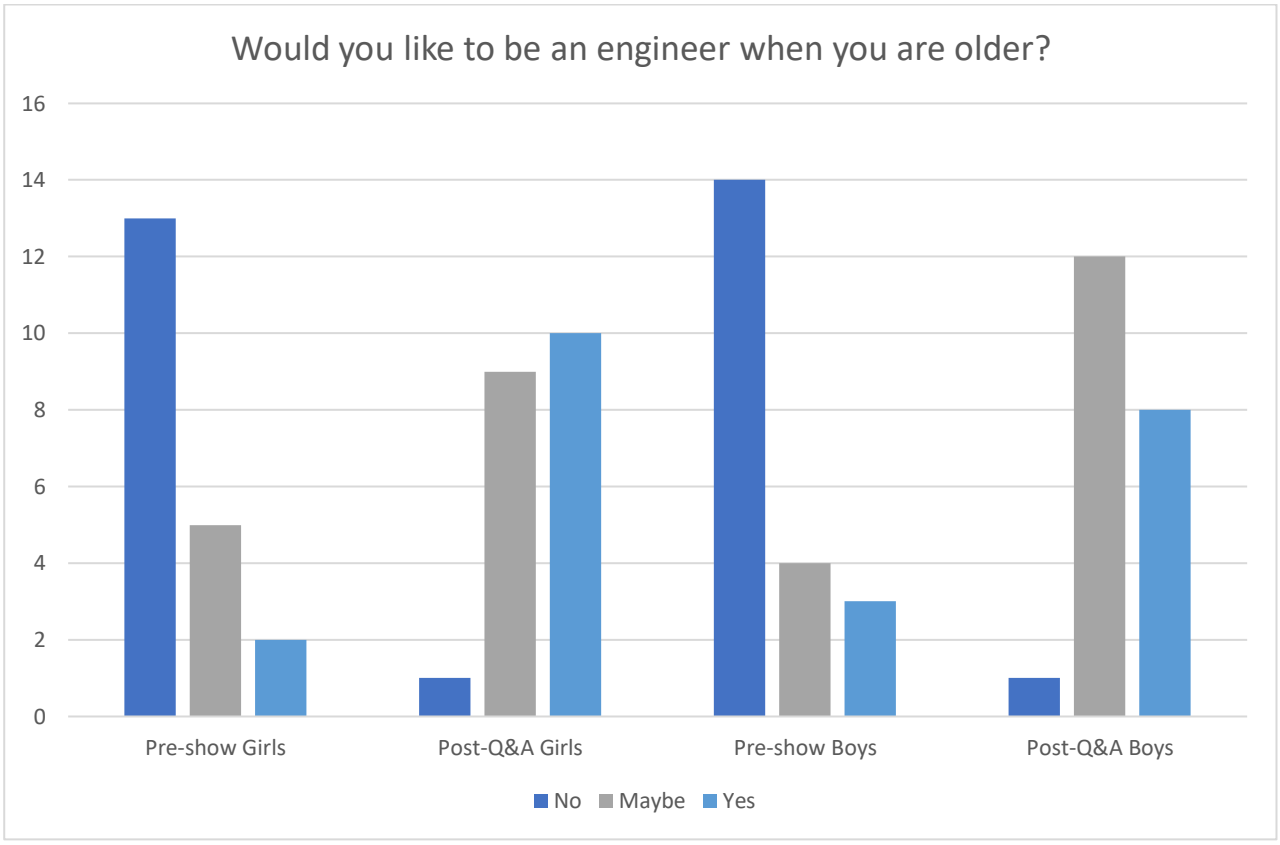


Would you like to be an engineer when you are older?

41 Year 1 and 2 children from two different schools were asked pre-show and post-Q&A whether they would like to become an engineer when they are older. With their eyes covered, children were asked to hold up a fist for “no”, one finger for “maybe”, and all five fingers for “yes”. There was a considerable shift in aspiration after participation, from 66% saying “no” beforehand to less than 5% afterwards.

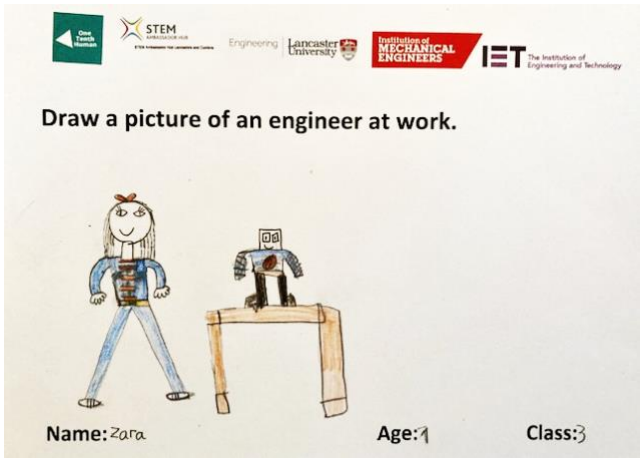


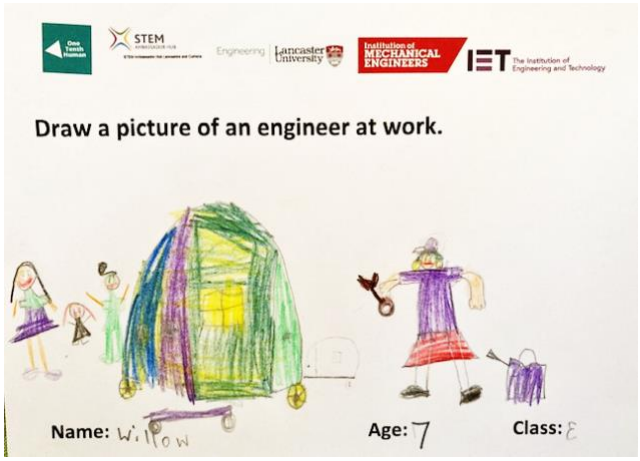
We were able to break this data down by gender, revealing that a larger proportion of girls said “yes” at the end (50% compared to 38% of boys). Both schools had panels featuring both male and female engineers, but “Investigator Toni”, their role model and host throughout, is female – possibly this was influential. However both the effect and sample size are small.



Identifying as Engineers

We received over 200 drawings back from participating schools. Many show people with typically feminine characteristics such as bows and skirts.

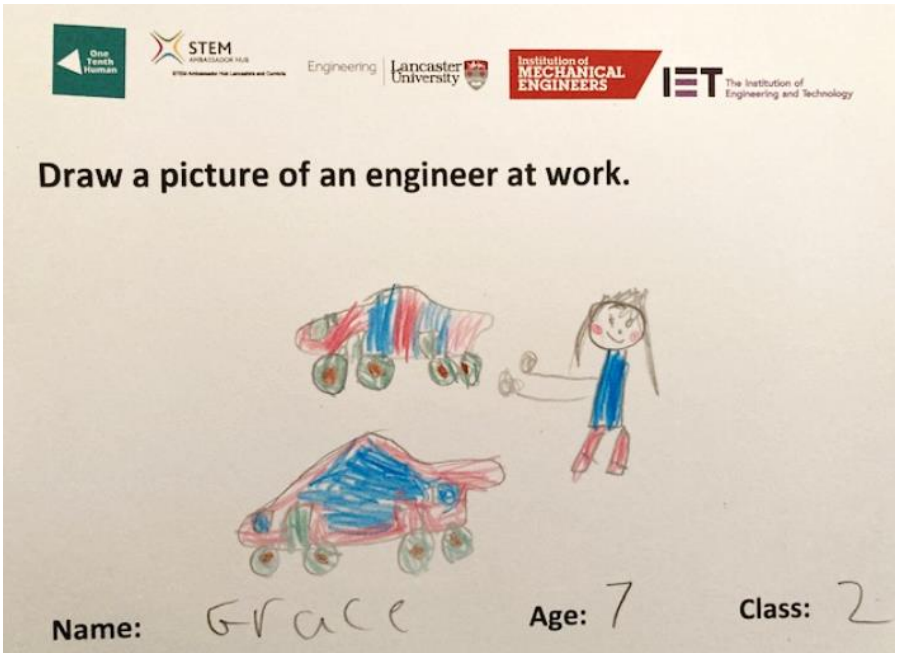




Many drawings had no written comments, so interpretation is required, but from those that did add comments, it's clear many children were identifying as engineers. In one rural class of only seven children, for example, three out of seven drew themselves:

Oliver 5y: *He is building a tunnel. He had an idea of a tunnel so people can back out if they fall in a ditch.*
Henry 4y: *It's me making a bike.*
Reuben 5y: *I drawed me, I'm an engineer.*
Thomas 5y: *I invented a lightning tracker. An engineer designs and builds things.*
Harry 7y: *An engineer fixes things like tractors. They make things.*
Jessica 4y: *I am an engineer. Just pretending.*

It is likely that many of our images are of children "in role" in this way:

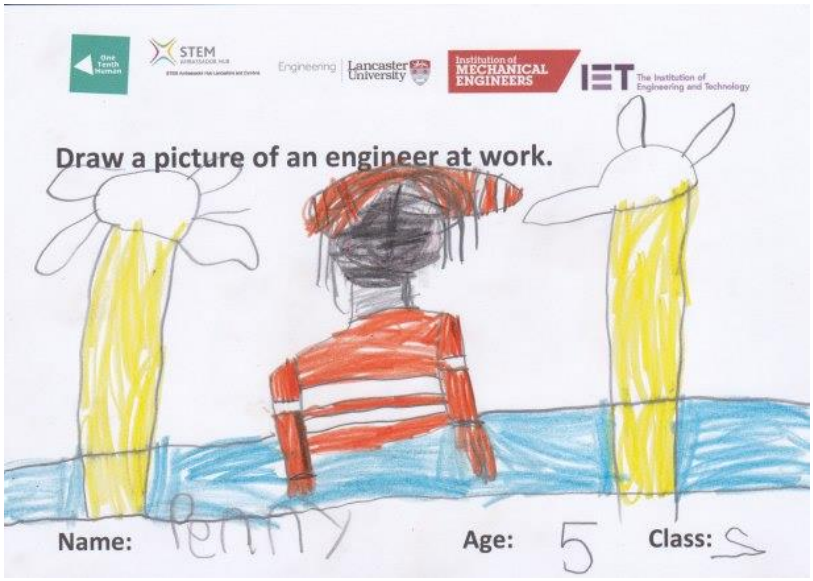


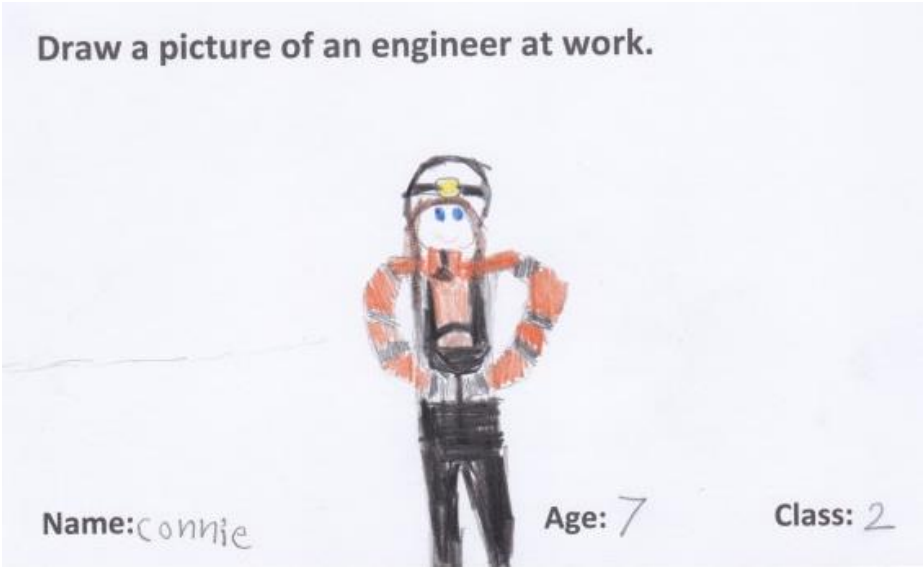
Relevance

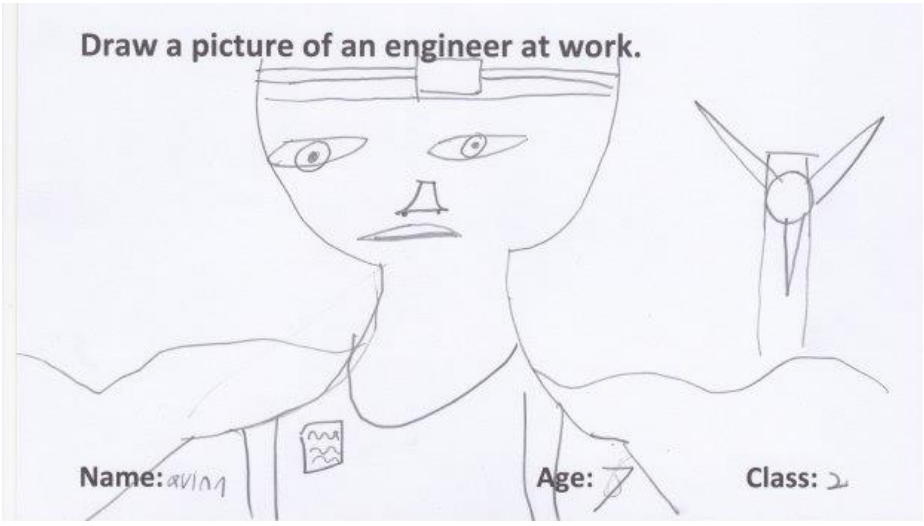
Many images were clearly related to the specifics of panel presentations – pictures of planes came from presentations featuring our BAE Systems volunteer, of buildings when children had met a construction planner, etc.

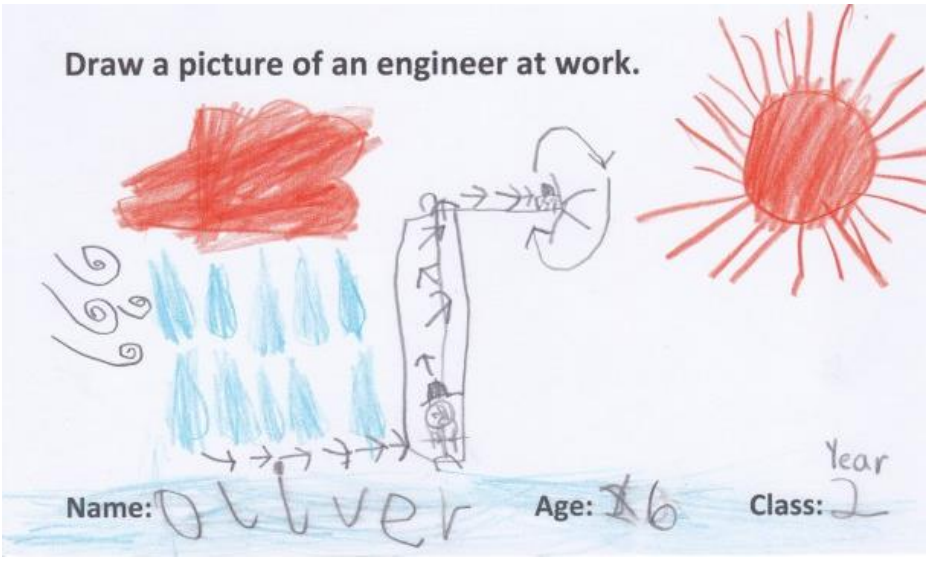
One particularly impactful presentation was that of a female wind turbine technician, with a Lancashire accent, whose work clearly resonated with these Lancastrian and Cumbrian children. Some had recently experienced a black-out, and Leah was asked many questions about electricity, wind and solar power. Her presentation included this slide:

These images, and her work, clearly stuck in the chidren's minds, with about half the class images featuring Leah, wind turbines, or electricity:




Draw a picture of an engineer at work.
Name: Connie
Age: 7
Class: 2


Draw a picture of an engineer at work.
Name: Avian
Age: 7
Class: 2


Draw a picture of an engineer at work.
Name: Oliver
Age: 6
Class: Year 2

Resilience

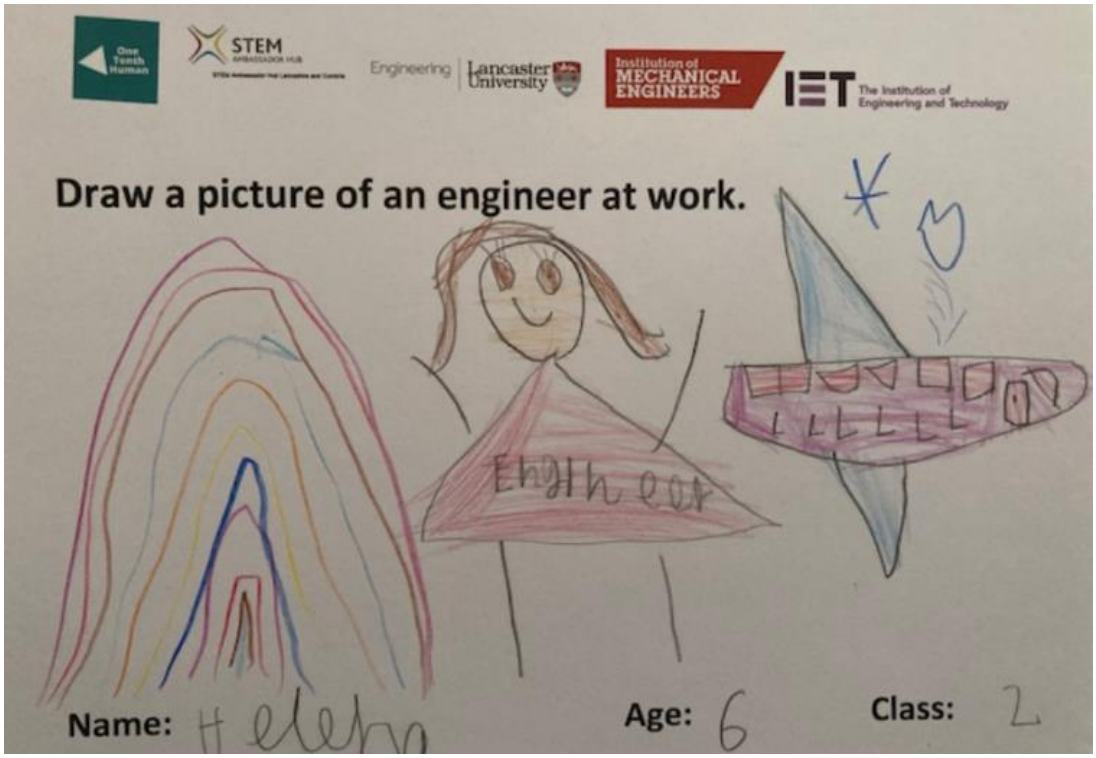
A major theme of both the show and the Q&A was how to cope when things go wrong. “Toni” asked each Ambassador if they ever got stuck or made mistakes, and what they did when that happened. We invited children to tell Investigator Toni what they do when they get stuck. We received 33 written answers. 19 said they would try again and/or never give up; six that they would ask for help; four referred specifically to taking a deep breath or staying calm. Four said they would think how to improve their design, or investigate further. These are core engineering thinking skills.

“If I get stuck work together and solve the problem. If I were an engineer I would invent sushi maker.” Lilly

“When I get stuck I take a deep breathe and start again. If I were an engineer I would invent a teleporter.” Adeek

“If I get stuck, I will take it apart and make it again. If I were an engineer I would make a rubbish collector.” Mikail

“If I get stuck I will rub it out and start again and be calm. If I were an engineer I would invent a motor bike that when you press a button there is an arm that gives you a drink.” Hazel



“These sessions were really well put together and you could see the curiosity, excitement, and interest of the young pupils clearly. We need to focus on skills from an early age, as this is what engineers and scientists of the future will need. Resilience, problem solving, curiosity and asking ‘why’ was embedded in these high quality sessions.”

Helen Heggie, Director, STEM First.