Curious Investigators Autumn 2024 Evaluation Report

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Context

Curious Investigators is an interactive performance aimed at children age 5 to 7 years old (Key Stage 1), although also suitable for younger and older children. The show was commissioned from children's theatre company One Tenth Human (OTH) in 2022 by Big Imaginations (a Northern network for theatre for young audiences). It has toured nationally several times.

This report relates specifically to the Autumn 2024 five week tour, subsidised by Arts Council England, the Westminster Foundation, and the Fort Vale Foundation, with support from In Good Company and the House network.

The Autumn 2024 tour reached 2,319 audience members across 41 shows: 1073 audience members at schools in Lancashire, Cumbria and Corby (averaging 37% Pupil Premium rate, well above the national average); and 1246 at venues nationwide. 56% of venues were in "Levelling Up for Culture" locations (local authorities identified by DCMS as priorities for additional arts and culture investment and activity).

Nine schools received a hands-on engineering workshop delivered either by the OTH Artistic Director or Lancaster University Engineering Outreach Officer Dr Irene Wise; the remaining eight schools received resources and training so teachers could deliver this session themselves.

All 17 schools were given the opportunity to take part in a live Zoom Q&A after the show with at least two professional engineers, hosted by the OTH Artistic Director: eight took up this offer (188 Key Stage 1 children).

Audience Feedback Summary

Children, parents, and teachers were overwhelmingly positive about *Curious Investigators*.

169 parents and 15 teachers filled in paper surveys on the day of performances and fed back positively that the show was highly absorbing and held children's attention, felt relevant to children, and helped them to understand something new about the world: scoring well above 80% on average on all these criteria. Parents and teachers also learnt something new and had a greater appreciation of what engineering is – with teachers scoring significantly higher on these questions (above 70% average compared to above 60% for parents), indicating presumably the impact of the more in-depth schools programme. See Appendix 3 for detail.

100% of teachers said they would recommend *Curious Investigators* to another school and 96% of parents said it had met their expectations or was better than they expected.

Parents highlighted that it was an "Interactive show. Topical in terms of recycling and engineering. Good duration", "Kids very much loved the format. Interaction was absorbing. Audience suggestions were excellent and clearly helped engage the children" and "It was amazing. It made me want to investigate and learn more about science and engineering. My son's favourite bit was when they scanned their bottoms".

Teachers fed back, "The children were able to ask and answer questions, to problem solve. Our younger children were able to follow and engage as much as our elder. They were fascinated" and "Children were extremely engaged – EVERY SINGLE child. It was inclusive for all". Teachers' and parents' comments often referred specifically to STEM (Science, Technology, Engineering and Mathematics): for example, one parent highlighted, "The visual comedy and strong STEM element", and one teacher fed back, "The show has left us with lots of things we could explore and links well to maths / science / design tech in school. Thank you!"

Suggestions for improvements included feedback from a small number of parents about noise levels, noticing some children covered their ears and suggesting making ear defenders available for children and adults sensitive to loud noises. There were a small number of suggestions for improvements from teachers, including: "A pre-talk about engineering and what it is. Also, that they will be needed during the show to help solve problems"; "communicate to teaching staff how best to organise children's responses if shouting out, hands up, etc."; "It would have been good if the actors could deliver the workshop after the performance".

When asked if there was anything notable about the way the children or an individual child participated in any element of the programme, teachers responded with comments such as, "It gave the children lots of opportunities to think outside the box" and "They really engaged with the problem-solving element of the activities after and because of how much they had enjoyed the show, were keen to be *real engineers*".

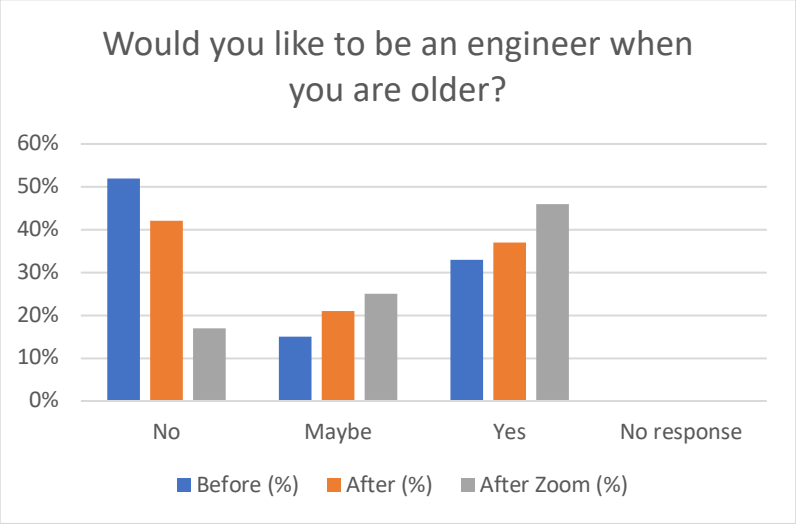
Teachers strongly agreed that bringing the project to these particular schools gave the children opportunities to access activities they would otherwise not have access to (89% average score).

95% of children agreed that they had fun doing the activities and 74% agreed that they could do things now that they couldn't do before.

Impact on children's knowledge and aspirations

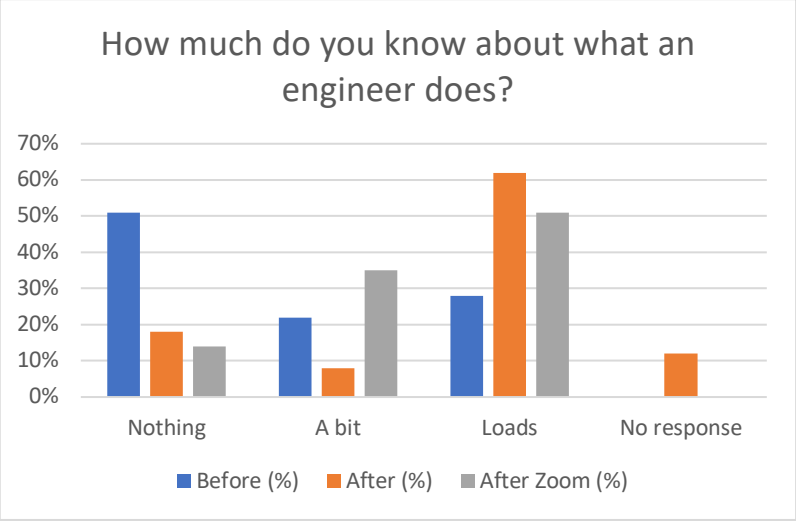
Children were asked to indicate by raising their hands before and after the project inputs to show how their ideas had changed.

According to this data, **13% more children wanted to be an engineer after the programme of activities** (33% before the show and 46% after show, workshop and Zoom Q&A):



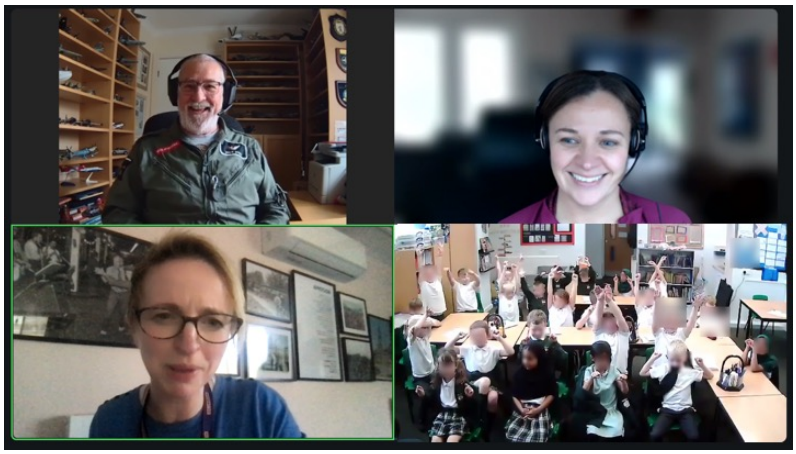
Focus groups indicated an even bigger shift: just 1 out of 16 children said they would consider being an engineer when they are older when asked before the project, but 7 out of 16 children answered positively after the project (3 saying "yes" and 4 "maybe").

The project also significantly increased children's knowledge about what engineers do – although interestingly fewer children were confident they knew "loads" after the Zoom Q&A than after the show plus workshop – perhaps indicating that the Zoom Q&A widened their understanding of what they didn't know. Teachers definitely felt the programme had an impact here, scoring an average of 87% agreement when asked if the programme had increased children's understanding of engineering.



Impact on stereotypes

By design, *Curious Investigators* features two female characters, one Black, one White; and Zoom Q&As always featured at least one woman and one man, in order to counter prevailing stereotypes of who can and cannot be an engineer or scientist.

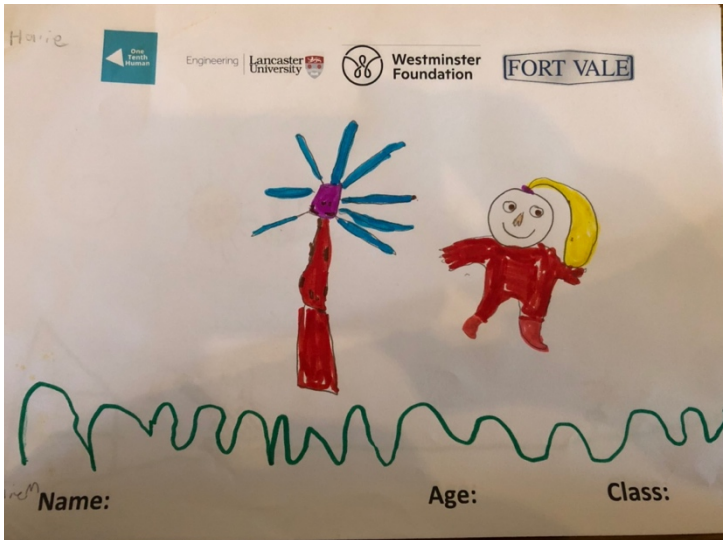


Children's stereotypical views about the work of scientists (make potions) and engineers (fix cars) are ingrained and difficult to change. However, following inputs from the *Curious Investigators* project, children's ideas had developed, and they had begun to incorporate a broader view into their schema.

For example, when asked if she had learnt anything new about the sort of work that scientists do, one child said, "Well, sometimes they don't do potions, they make other things as well". You can see the same incorporation of stereotype and developing understanding in response to a question about why a child wanted to be an engineer when older: "Because they're fun and you get to investigate things, like you get to go under them and fix them and create them".

When asked to draw a scientist or engineer at work before the project began, all the children chose to draw a scientist. 12 out of 16 scientists drawn were male (the 4 female scientists were all drawn by girls).

After the project input, children could recall additional details about the work of engineers, evidencing their new learning on this subject. For example, that they "make new materials" or "test playgrounds to see if they're safe" – specific elements of the engineers' presentations.



When asked to "draw an engineer at work" after the project, 21 out of 26 children were able to draw an image that recognisably showed they had some understanding of what engineering involves, including specific elements from the engineers' presentations they had seen (eg wind turbines, water, construction). 11 drawings contained clear indicators of femininity (eg long hair, skirts): 42%, compared to only 25% of the scientists drawn before the project began.

Impact on children's resilience and self-confidence

12 out of 16 children in focus groups already saw themselves as a 'sciencey' person at the first sessions, and spoke enthusiastically about the science they enjoyed learning about, for example, one child said, "I just like everything about science" and another said, "I like about science that you get to learn some new stuff and also you discover stuff like how your brain works or what it can do". Children described reading science books and watching TV as well as the experiments they did at school and at home, such as, growing crystals. 4 girls said they weren't 'sciencey' and gave reasons such as, "because I like drawing and things like that" and "because it might explode". Focus group participants were selected by teachers at each school, and it is possible that despite being asked for a diverse group, teachers sent their keenest students.

To find out more about children's resilience, I asked them what they would do if they didn't know how to do something and if they would try again if they made a mistake. During all the focus groups, children agreed that it was OK to make mistakes, one child quoting a common phrase, "Everyone makes mistakes in life. Nobody is perfect". Children were noticeably more vocal and enthusiastic at the second focus group, all saying "yes" simultaneously when asked if it was OK to make a mistake.

Responses to the question about what they would do if they didn't know something often referred to asking for help from an adult. After the project input, however, children gave more responses referring to self-reliance, for example, "I would try to figure it out on my own" and "I know that if I just give up, that it won't happen, so I will keep on trying".

Legacy

Eight teachers responded to a second survey sent via email in January 2025, more than two months after our programme had visited their school.
As with the previous teachers' survey, responses were very positive, with very little change on previous scores (see Appendix 3).

Teachers were asked whether the children had spoken about the show, the characters, or any other element of the programme in the weeks since: six said "yes", two "no". The characters in the show featured in three teachers' responses, eg: "The children were extremely engaged and were heard to be discussing reasons why the characters had behaved in the way they did, during playtime".

However the real engineers were also memorable, featuring in two responses, eg: "Yes, Class Two (Years three and four) discussed the roles of the engineers and how exciting that seemed."

One teacher commented that "It has made them want to explore and create for a purpose."

Appendix 1: Data Collection Details

Data collection took place in three different formats:

1. Online surveys distributed in December 2024 and completed by 169 parents and 15 teachers. Additional survey completed by 8 teachers in January 2025.
2. Immediate feedback from children before and after sessions by asking them to raise their hand.
3. In-depth focus group conversations with 16 children in two case study schools – School A and School B.

During September and November 2024 feedback was collected from Year 2 children via four school visits and conversations with focus groups (see Appendix 3 and 4). In preparation for the first visit, which was prior to any input from the Curious Investigators, children were asked to 'draw a scientists or engineer at work' (see Appendix 5). During the visit, I spoke to children informally in groups of four (two girls and two boys) – a total of 16 children (8 boys and 8 girls) – the children were chosen by their teachers. I asked the children to tell me about their drawings (and on the second visit if they had anything further to add or say about their drawings) + the following questions:

1. Tell me about what you've drawn?
2. If you didn't know how to do something, what would you do?
3. If you went wrong or made a mistake, would you try again?
4. Do you like doing easy things at school, where you know how to do it straight away, or do you like trying more difficult things, where you have to work out what to do?
5. Are you a science-y person?
6. How much do you know about what an engineer does?
7. Would you like to be an engineer when you are older?

Details of focus group visits:

School A and School B are both primary schools in the North West of England.

- 25th September 2024 school visit School A. Transcript of two focus groups with year 2 children, eight children in total.
- 27th September 2024 school visit School B. Transcript of one focus group with year 2 children, eight children in total.
- 1st November 2024 school visit School A. Transcript of two focus groups with year 2 children, eight children in total.
- 1st November 2024 school visit School B. Transcript of two focus groups with year 2 children, eight children in total.

Additional drawing task:

In January 2025, the whole Year 2 class at School A were asked to "draw an engineer at work": 26 drawings received and analysed.

Appendix 2: Data Analysis

I identified four themes in the data, using both inductive and deductive coding, these are discussed below and highlighted in the transcripts (see Appendices).

Stereotypical views about scientists (make potions) and engineers (fix cars)

Scientists

Children demonstrated stereotypical views of scientists, most children drew images of scientists as male, often wearing a white coat, holding test tubes, and making potions (See Appendix 3). This is consistent with a significant body of research on young people's views about scientists (Archer and DeWitt, 2016).

When asked to draw a scientist or engineer at work, all the children chose to draw a scientist.

12 out of 16 scientists drawn were male (the 4 female scientists were all drawn by girls).

Year 2 children drew and spoke about how scientists "make potions". One girl described what the scientist she had drawn was doing, "She's making some potions. She's thinking that this one will explode like that."

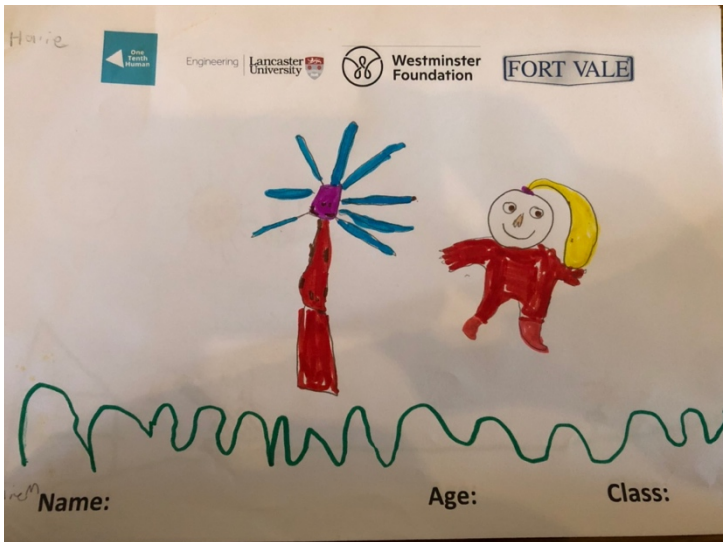
Engineers

Children initially said that engineers "fix cars" or "fix stuff". When asked during the first visit: *Do you want to be an engineer when you are older?* 1 child said "maybe", and 15 children asked said "no". In the second visit, 3 children said "yes", giving reasons such as, "to test things [to see] if they're safe" and 4 children said "maybe", giving reasons such as "Because they're fun and you get to investigate things, like you get to go under them and fix them and create them", 8 children said "no" they did not want to be an engineer and stated that they had already decided what they wanted to do when they grow up, for example, a footballer, librarian, farmer and scientist. During the second visit, one child, who said she might like to be an engineer gave a reason that implies she still held a rather stereotypical view of what engineers do, "You can fix stuff and if there isn't a lot of cars to do, so you can relax a bit, so you're full of energy and you can get steam on your face".

In the second visit, I asked children if their ideas had changed and children reiterated their ideas about scientists making potions, but this time with more nuance. For example, one girl said, "Well sometimes they don't do potions, they make other things." A boy asked, "How do the potions work in science? Because if they make an explosion, how do they make it, do they just get baking soda? So, they don't use like actual potions".

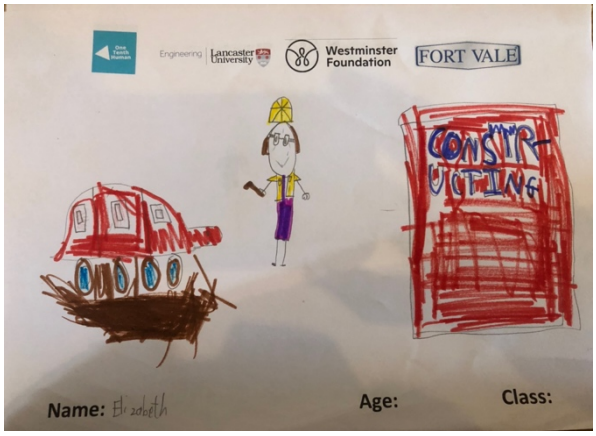
In the second visit, some children provided more detail about what engineers do, for example, "make materials that people haven't made before, like make different engines", "build stuff" and "design and test playgrounds to see if they're safe".

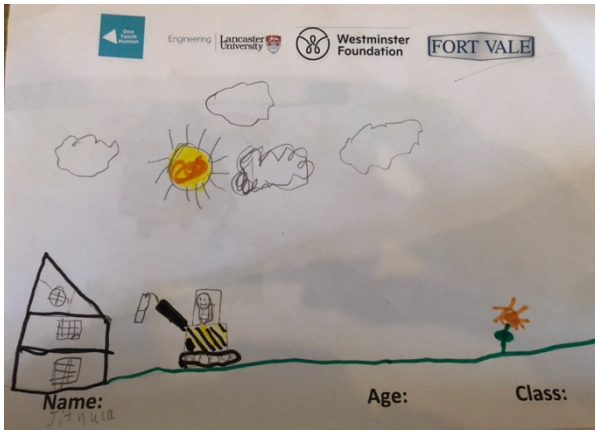
This shift was even clearer when children were specifically asked to “draw an engineer at work”.



21 out of 26 children in a year 2 class were able to draw an image that recognisably showed they had some understanding of what engineering involves, including many specific elements from the engineers’ presentations they had seen in the Zoom Q&A (eg wind turbines, water, construction).

11 contained clear indicators of femininity (eg long hair, skirts): 42%, compared to 25% of scientists drawn before the project began.





Eight drawings featured cars, two featured submarines and one, a person making potions, showing the resilience of stereotypes.

Positive emotions/attitudes about being ‘sciencey’

Many children expressed positive attitudes to science during the visits, for example, one child said “I just like everything about science” and another said, “Science is kind of my jam”, and when asked why, he talked about making robots and that scientists “build machines”. Another child eagerly explained that “I like about science that you get to learn some new stuff and also you discover stuff like how your brain works or what it can do”.

Gender featured strongly in this with most boys saying “yes” they saw themselves as sciencey – one boy responding “Yes, yes, Yes!” and most girls saying “no”. One girl explained that she wasn’t sciencey, “because I like drawing and things like that”, another girl said she wasn’t sciencey because she likes writing and two girls said they didn’t like science because it could be dangerous/might explode.

Some children talked enthusiastically about science books they had read, for example, “I've got the perfect book for you. So, it says All about science. So, it's like how you run and it's like how life works and it's how animals get extinct, and it shows you and it's like how fire works, how a tornado comes”. Two children talked about having “some science sets at home” and growing

crystals. These are examples of science capital (Nag Chowdhuri, 2021) – where parents are facilitating/encouraging their children's interest in science.

Evidence of resilience/determination (to work something out for themselves or do something difficult)

All the children said they were prepared to try again if they made a mistake. One child saying, "Everyone makes mistakes in life. Nobody is perfect" (no doubt echoing what he had heard adults say) .

Children were noticeably more vocal and enthusiastic at the second focus group, all saying "yes" simultaneously when asked if it was OK to make a mistake.

Responses to the question about what they would do if they didn't know something often referred to asking for help from an adult. Many children said they would "ask an adult" (e.g. parent/teacher), whilst others said they could "think of your own idea" and "put it on the design, so then you can make the design again". After the project input, however, children gave more responses referring to self-reliance, for example, "I would try to figure it out on my own" and "I know that if I just give up, that it won't happen, so I will keep on trying".

12 out of 16 children said they would choose to do something difficult rather than something easy, giving the reason that they would get bored if they did something easy and they liked a challenge, for example, "You can challenge yourself by doing the hard thing, and if you can't do it, just keep on trying" and "I like it when it's hard because then I could learn new things and I get more brain power". Those children that chose something easy said that it would "be faster" and "because I don't need to do a lot of hard stuff, because some stuff is tricky for some of us". These proportions did not change between focus groups.

References

Archer, L. and DeWitt, J. (2016) *Understanding Young People's Science Aspirations: How students form ideas about 'becoming a scientist'*. Routledge.
Nag Chowdhuri, M., King, H. & Archer, L. (2021) *The Primary Science Capital Teaching Approach: Teacher Handbook*. London: University College London

Appendix 3 Survey responses

On-the-day paper surveys (total received: 169 family, 15 teachers)

Ethnicity of children in the group:	
Asian / Asian British	9.38%
Black / Black British	3.13%
Mixed heritage	9.38%
White / White British	73.44%
Other	3.13%
Prefer not to say	1.56%

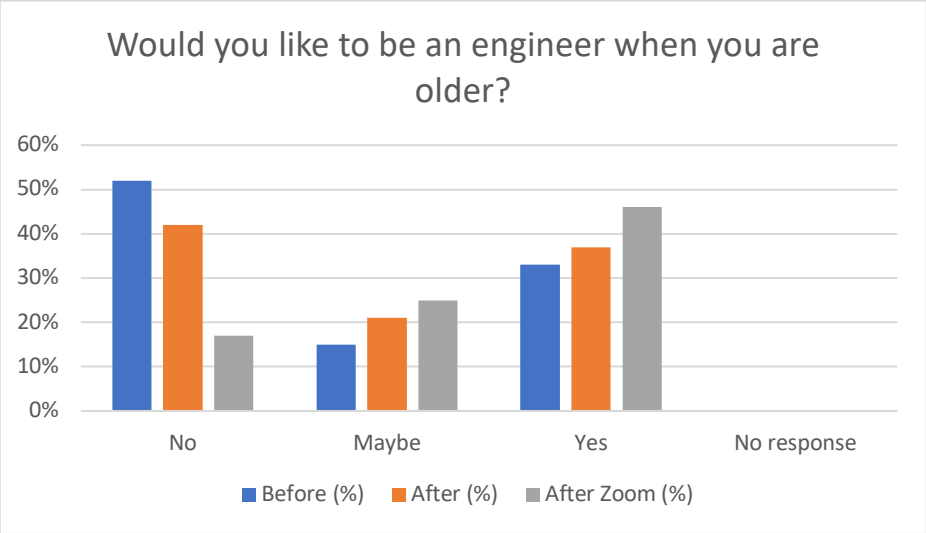
Question	Average score: Families	Average score: Teachers
It was absorbing and held their attention	84	95
It felt relevant to the children	84	93
It helped them to understand something new about the world	81	87
It's important that it's happening here, in this venue	79	n/a
It opened their eyes to new possibilities	n/a	91
We would come to something like this again	87	n/a
We would take part in something like this again	n/a	96
I personally learned something new	61	75
I now have a greater appreciation of engineering	67	77

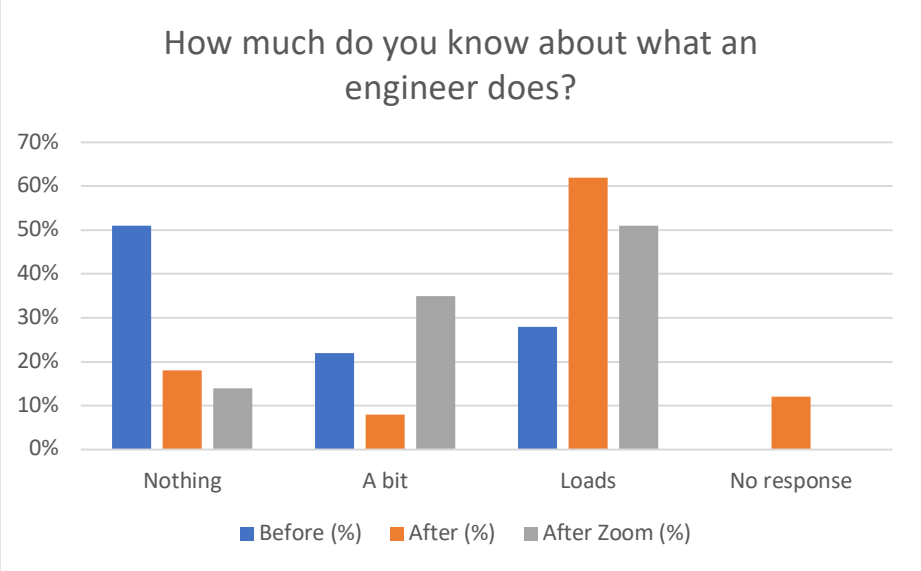
Q16. Did the show match your expectations?		
Yes	48.25%	55
No	0.00%	0
It was better than we expected	48.25%	55
It was worse than we expected	1.75%	2
Other (please specify)	1.75%	2

Follow-up January 2025 teachers' online survey:

Question	Average
It felt relevant to the children	**93**
It helped them to understand something new about the world	**90**
It opened their minds to new possibilities	**87**
It gave the children opportunities to access activities they would otherwise not have access to	**93**
We would take part in something like this again	**100**
The children now have a greater appreciation of what engineering is and what engineers do	**87**
How likely is it that you would recommend One Tenth Human to someone like you?	**98**

Appendix 4 School tallies raw data





Can you do things now that you couldn't before?				
	No	Maybe	Yes	No response
After workshop	8	10	50	
After (%)	12%	15%	74%	

How much fun did you have today?			
	None	A bit	Loads
raw	2	3	91
%	2%	3%	95%

Appendix 5 Transcripts of focus groups at School A

School A Group 1 focus group 25.9.24 Child A and C are boys and Child B and D are girls (this is an extract of the full transcript).

Key

= stereotypical views about scientists (make potions) and engineers (fix cars)

XXX = more nuanced ideas about what scientists/engineers do

XXX = positive emotions/attitudes about being 'sciencey'

= evidence of resilience/determination (to work something out for themselves or do something difficult)

Zoe: So, the first thing I'm going to ask you to do is to just tell me what you've drawn and then after we've finished talking, I'll take a photo of what you've drawn as well. Do you want to go first? Tell me what you've drawn. Let's have a look.

Child A: I've drawn a scientist.

Zoe: Yes, so you've drawn a scientist. And what's he doing, or is it he or a she?

Child A: He.

Zoe: Yeah, what's he doing?

Child A: He's creating a potion.

Zoe: Creating a potion, and is that the kind of thing that scientists do?

Child: Sometimes.

Zoe: Sometimes. Is there anything else they do?

Child A: Well basically, sometimes a bunch of the time, they also do tests. And also I think, I don't know if this is true or not but I believe that scientists are trying to, so you know when like a stick insect loses a leg or an axolotl, and it can grow it back.

Zoe: I do yeah.

Child A: Well, I think they're trying to make it work so that humans can do that as well. So, to change humans DNA, so they can do it.

Zoe: Yeah great, thank you very much, thank you, how about you what have you drawn, is that a scientist or an engineer?

Child B: A scientist.

Zoe: And is it a boy or a girl?

Child B: A boy.

Zoe: And what is he doing?

Child B: He's making a potion.

Zoe: And what's he making a potion of do you think, what did you have in mind. What sort of potion is he making? Is it going to do anything?

Child B: I don't know.

Zoe: No. What else do scientists do then?

Child B: Make stuff.

Zoe: Yeah, like what?

Child B: flowers and potions.

Zoe: That's great, thank you. Ok, how about you, what's your picture of, is that a scientist or an engineer?

Child C: A scientist.

Zoe: And is that a boy or a girl?

Child C: A boy.

Zoe: And what's he doing?

Child C: He's making a potion.

Zoe: And what's he making a potion of?

Child C: So, if you drink it you will explode.

Zoe: Oh gosh. It's a very dangerous potion, isn't it? Wow, so you better not drink it.

Child A: Wait, wait, so is it meant to look like a healing potion but is it like a prank one? Like, a really bad one, so for anyone you really don't like.
Zoe: Yeah, would you give it to someone you don't like, or would you tell people to be careful?
Child C: I'll put a prank on a robber.
Zoe: Oh right.
Child C: I'd tell them it's nice.
Zoe: To trick them, wow. Let's try the last one then, so is this an engineer or a scientist?
Child D: Scientist.
Zoe: And is your scientist a boy or a girl?
Child D: A girl.
Child A: The only girl.
Zoe: And what's she doing?
Child D: So that potion, if you shake it, it will glow, and that potion, if you take it outside, when you take the lid off fireworks will come out. And that is a super egg, if you crack it, if there's a chick inside, then when it touches someone, it turns into a chick.
Zoe: Great and is that what scientists do, they make those sorts of things?
Child D: Yes, and that's a bubble thing and she's standing in front of everybody telling them what they are.
Zoe: Yes, telling them what they are, great thank you very much. Is there anything else that scientists do?
Child A: Yes, I think so. I think they used the DNA. They used the fossils of dinosaurs, so they put the bones of dinosaurs together and DNA and stuff.
Zoe: Right thanks very much, great. Now, how much do you know about engineers then, because nobody drew an engineer, do you know anything about engineers?
Child B: They fix cars.
Zoe: Do you know anything about engineers?
Child C: There they have a job.
Zoe: Do you know anything about engineers.
Child D: They fix lots of cars and put tyres on cars.
Zoe: Yes, fantastic. Do you know anything about engineers?
Child A: Engineers do a lot of work. So like they also make new stuff, so they invent new things, like toys and stuff for kids.
Zoe: Great, anything else?
Child D: So, they get lots of smoke in those places, because when they're fixing the cars there's smoke comes out of it because the oil is mixed together, and it makes the smoke.
Zoe: Yeah, very good, you know a lot about cars and engineering. Right now. Would you like to be an engineer when you are older?
All children: No.
Zoe: No, nobody wants to be an engineer when they're older, because…?
Child B: I don't know.
Child D: There's lots of steam and smoke and noise.
Child C: Because my dream is to become a professional footballer.
Child A: My dream is to become a footballer or a policeman.
Zoe: Great, thank you everyone, you've given some great answers. Now talking about science and thinking about you in your everyday life. Are you a sciencey kind of person? Are you the kind of person who's interested in science, so yes or no?
Child A: Yes, yes, Yes!
Child B: No, not really.
Child C: Yes, I like science.
Child D: No
Zoe: Ok, so two yes and two no. So, why not?

Child B: I don't know.
Zoe: Not sure, ok, so why not?
Child D: Because it might explode.
Zoe: OK, so it could be dangerous. Any why yes?
Child C: Because they could be really fun, so some potions could be good, like potions that make fireworks could be really fun.
Zoe: Great so the explosions might be fun because they might be fireworks.
Child A: I think it would be quite a cool job but also, I think my other two dream jobs are a bit better.
Zoe: Yes, but not for your job, just your normal everyday life, whether you like science?
Child A: Oh yes, I do like science.
Zoe: So, you don't have to do it for a job. So look at me, I work at university and I really like science, so you can do both, it doesn't have to be your job.
Child A: So, they've reintroduced a type of spider and they live in like swamps and stuff don't they.
Zoe: Yes, so you know a lot of this background stuff, where are you getting it from?
Child A: Oh, my mum and dad are telling me and also, I learn it off Google.
Zoe: Thank you very much right, so now we've got one more question, OK. It's quite a long question. So follow me. If you didn't know how to do something. What would you do? And if you did it wrong and made a mistake, would you try again. Go ahead.
Child B: Yes.
Zoe: Yes, you would, so if you didn't know how to do something and if you made a mistake, you said you would try again, but what would you do if you didn't know what to do?
Child B: I would ask someone to help me.
Zoe: Yeah, great how about you, would you have another go if you made a mistake?
Child B: Yes, I would ask an adult.
Child A: I'd have another go if I made a mistake.
Zoe: What would you do if you didn't know what to do?
Child A: I'd probably just see if I can find any other information. Anywhere else. But if it's not anywhere else like on the wall or something, then I'll ask an adult.
Zoe: Yes, how about you. Do you have another go if you make a mistake and what do you do if you don't know what to do?
Child D: Yes, I'd ask the teacher.
Zoe: Thank you, so last question. Do you like doing easy things at school where you know how to do it straight away or do you like trying more difficult things where you have to work out what to do so your choice is difficult or easy.
Child A: Difficult.
Child B: Difficult
Child C: Difficult.
Child D: Easy
Zoe: So, why difficult, why do you like to do something that's difficult?
Child B: I don't really know.
Zoe: OK that's alright, why do you like difficult things when you've got really try hard to work it out?
Child C: Because when it's easy, I get bored.
Zoe: Great and how about you said difficult why do you like it when it's hard.
Child A: Because I like to set a challenge for myself and also, I think it's good to have difficult challenges sometimes.
Zoe: Yes, and how about you, you said easy.
Child D: Because I don't need to do a lot of hard stuff because some stuff is tricky for some of us.
Zoe: Yes, so it could be tricky for some of us couldn't it, yeah great, that's my last question.

School A Group 1 focus group 1.11.24 Child A and C are boys and Child B and D are girls.

Zoe: So, my first question is looking at your drawing, and that's six weeks ago you did that, so, it's quite a while ago and I want to know if your ideas have changed. Since you did the drawing, is there anything more that you might want to add? The task was my drawing of a scientist or engineer. So, looking at your drawing, who wants to go first? Have you thought of something that maybe you would have added to your drawing now that you didn't know six weeks ago?

Child A: I would have added a little table there and then with a little rack on the wall with like a potion holder.

Zoe: Yeah. And anything else, anything else that you've learned new about what scientists or engineers, how they work, anything new that you would add as well as that as well as the rack with the potions on it?

Child A: So, what do you mean?

Zoe: Well, here it says my scientists or engineer at work, so anything else that the scientist might do, because it's a scientist, isn't it? Anything else they might be doing at work?

Child A: They might be experimenting things, so like experimenting how things work. Like the hinge of your jaw.

Zoe: OK. So, you're saying it's not just potions?

Child A: No.

Zoe: So do you think your ideas have changed? So now you're talking about a scientist might find out about how your jaw works?

Child A: Yes.

Zoe: Great. Thanks.

Child A: And like how your arm works and your wrist and fingers.

Zoe: OK. Great. Brilliant. Anyone else? Anyone else's ideas changed or anything that they would add to their drawing that they know now about how scientists and engineers work?

[children shake their heads]

Zoe: No? Ok, thank you. Next question. If you didn't know how to do something. What would you do?

Child B: I would ask somebody to help me.

Zoe: What would you do?

Child C: If it was maths I would use a ruler.

Zoe: Yeah, you would use a ruler. What would you do?

Child A: I would tell your parents, who looks after you, a teacher, or like your nan or your granddad.

Zoe: Now. If you went wrong or made a mistake, would you try again?

All children: Yes!

Zoe: And is that OK? Is it OK when you've made a mistake? Is it OK to just try again?

All children: Yes.

Child A: Everyone makes mistakes in life. Nobody is perfect.

Zoe: And would you try twice? Wow, that's a lot of yeses. Would you try three times? Would you try four times?

Child B: Yes. I'll try it a million times.

Zoe: You'd try a million times. Even if you made a mistake.

Child B: Yes

Zoe: Now do you like doing easy things or difficult things. So, do you like doing easy things at school where you know how to do it straight away? Or do you like doing difficult things where it's really difficult and you have to work out what to do?

Child A: Difficult.

Child B: Easy.

Child C: Difficult.
Child D: Difficult.
Zoe: All right, why difficult?
Child C: Because I like a challenge.
Child D: The same.
Zoe: OK, and why easy. Why do you like to do things that are easy that you know what to do straight away?
Child B: Because it's faster.
Zoe: Because it's faster. And how about you? What is it you really like about something difficult?
Child A: Well, the thing I really like is because when it's difficult, you get a challenge and when you get a challenge you try hard and if you make a mistake, you can try again and keep working through it.
Zoe: Yeah, great. Thank you very much. Right now, the next question is, are you a sciency person? So that's somebody who likes to learn about science. You know, in their own time, like outside of school, like a science reading book or a science TV show, or finding out about science, talking about science. So that's a yes or no. Are you a sciencey person? Not sure.
Child D: No
Child B: No.
Child A: Well, kind of, I do learn a lot about science, but I don't enjoy it as much as you do, but I do still enjoy it a bit.
Zoe: OK, right. And you, you're saying you're not a sciencey person? Why not? What is it about science that you don't like?
Child D: I don't know.
Zoe: Not sure. Ok, how about you? Why no?
Child B: Because it could be dangerous.
Zoe: So, is there anything you like about science, can you think of one you like about science?
Child B: Not making potions.
Child A: Well, I like science a bit because you can learn a lot of new things in in it and you don't always have to just be making potions and doing all that jazz. Like, you can watch how to do science and I've got some science sets at home that I haven't done yet, like grow your own crystals.
Child B: I've grown my own crystals.
Child A: And like how does that work? It says on the back all you need is a rock and some water and a few different chemicals.
Zoe: So, you said you had grown your own crystals, is that something you like doing about science?
Child B: Yes, but my mummy destroyed it. You get different colours, like a white crystal and a red crystal and a green crystal.
Zoe: Right. So, is there anything else you like about science? Anything else you like about science, apart from crystals?
Child B: I like about science that you get to learn some new stuff and also you discover stuff like how your brain works or what it can do.
Zoe: Wow, thank you very much. Thank you. That's loads you know about science, isn't it? Did you have one more thing to say? Go on.
Child A: Yes. So basically, so in science you also figure out how your body works.
Zoe: Yes. Brilliant.
Child A: And like how your body all works together. So, there's like bits of bones that moves that is actually a piece of bone, we learnt in English that a there is a dinosaur with flexible bones.

Zoe: Now I've got two last questions. First one, how much do you know about what an engineer does? What does an engineer do? Anybody. Yeah.
Child B: Does it fix like cars? Like if the tyre's broken, it can just pump it up and they can also fix the car like if they're broken.
Zoe: Yeah. Anything else?
Child A: So, they talk to the people who they work with and see if they agree with that. They don't want to just cut something straight away and then go like, oh well, we can't use that now.
Zoe: Yeah, they talk to the people. Is there anything else about engineers? Anything else you know about engineers?
Child C: They fix things.
Zoe: Would you like to be an engineer when you are older?
Child B: No.
Child C: No.
Child D: No.
Child A: Maybe.
Zoe: Great answers. Why maybe?
Child A: Because, if you're an engineer, it's basically, like finding out your job. So, you can look for something with one of your friends. Like you can look for a job with one of your friends and then you can see if that job is good. If you book a job straight away and then go like, uh-oh, I don't want that job anymore.
Zoe: Yes, so that's why maybe isn't it? Yeah. Anyone want to say any last thing about science or engineering?
Child B: I want to speak about engineers. I want to be an engineer a little bit.
Zoe: You want to be an engineer a little bit.
Child B: Yes, because, you can fix stuff and if there isn't a lot of cars to do, so you can relax a bit, so you're full of energy and you can get steam on your face.
Zoe: Yeah. Thank you very much. Thank you.

Appendix 6 Transcripts of focus groups at School B

School B Group 1 and 2 focus group 27.9.24 Child I and L are girls and J and K are boys (this is an extract of the full transcript).

Key

= stereotypical views about scientists (make potions) and engineers (fix cars)

XXX = more nuanced ideas about what scientists/engineers do

XXX = positive emotions/attitudes about being 'sciencey'

= evidence of resilience/determination (to work something out for themselves or do something difficult)

Zoe: OK, so now all I'm going to ask you is for you to tell me what you've drawn. OK. So, do you want to go first? So, is that a scientist you've drawn?
Child I: Yes.
Zoe: Is that a boy or a girl?
Child I: A girl.
Zoe: And what is she doing?
Child I: She's making some potions.
Zoe: And what are the potions going to do?
Child I: She's thinking that this one will explode like that.
Zoe: And that's her thinking about it. And the potion is going to explode.
Child I: And one of the others is going to make a cat.
Zoe: All right, thank you. Let's have a look at your drawing. So, what have you drawn then? Is that a scientist?
Child J: Yes.
Zoe: Is that a boy or a girl?
Child J: A boy.
Zoe: And what's he doing then?
Child J: He's doing experiments.
Zoe: What sort of experiments is he doing?
Child J: He's trying to make his robot come alive.
Zoe: And do you like science?
Child J: Yes
Zoe: And do you think you want to do something with science when you grow up.
Child J: Yes.
Zoe: And do you know what an engineer is?
Child J: Yes, they fix stuff.
Zoe: Yeah. Thank you very much. Do you want to be an engineer when you grow up, do you think?
Child J: Yes, maybe.
Zoe: Yeah, maybe. Thank you very much. OK, have you found your drawing? Can you tell me what you've drawn?
Child K: I've drawn a man doing some potion science.
Zoe: Can you tell me what this is then?
Child K: The pipe.
Zoe: Yeah. Wow, and is that the sort of thing that scientists do?
Child K: Yeah.
Zoe: Do you like science?
Child K: Yes.
Zoe: I can tell from your picture. What is it you like about science?
Child K: I just like everything about science.
Zoe: And what about engineering? Do you know what an engineer does?
Child K: They fix stuff.
Child I: Yes, they fix stuff.

Zoe: You think they fixed stuff as well? Anybody else know what an engineer does?
Child I: They fix electronics.
Zoe: Let's look at your drawing. Is this a scientist?
Child L: Yes.
Zoe: Yeah. Is that a boy or a?
Child L: A girl.
Zoe: And what is she doing?
Child L: I don't know what she's doing.
Zoe: What's that that you've drawn here?
Child L: That's a volcano.
Zoe: And is that something to do with science?
Child L: Yes.
Zoe: So, do you like science?
Child L: I don't know.
Zoe: No, you don't know if you like science. No. Anybody else like science. Do you like science?
Child J: Science is kind of my jam.
Zoe: It's your jam. Yeah. What is it about science that you really like then?
Child J: When they build machines.
Zoe: Yeah, well you talked about robots, didn't you? Yeah. But you're talking about machines in general. Amazing. Thank you everybody. Thank you. We'd better go to the performance, haven't we? Thank you so much.

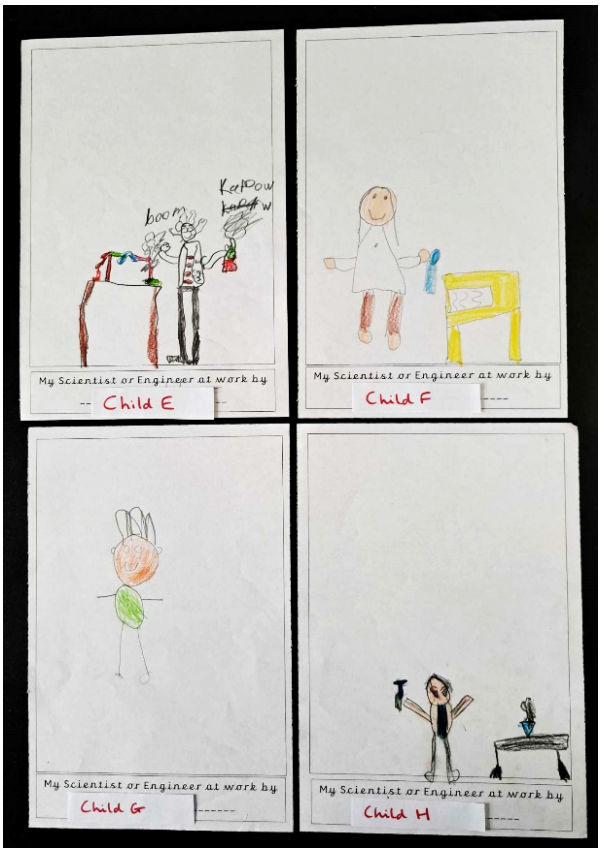
School B Group 1 focus group 1.11.24 Child I and J are girls and Child K and L are boys.
Zoe: Anybody thought of something new, a new idea that they've had about science and engineering since last time I was here?
Child I: Do engineers build stuff?
Zoe: Yes, engineers build stuff. Now, that's a new idea. Any ideas about what you've drawn there, about how scientists work? Have you got anything new to add? Anything extra?
Child J: I would draw an astronaut stuck in space.
Zoe: Oh, is an astronaut, a scientist?
Child K: Yes, some scientists go up in space.
Zoe: So, do you think a scientist can be an astronaut?
Child K: Some of them can.
Zoe: Thank you very much. And you said that engineers build things, didn't you? Is there anything else they do?
Child J: They make potions.
Zoe: Is that engineers that make potions or scientists?
Child J: Scientists.
Zoe: So, do scientists do anything apart from making potions?
Child K: They travel around to investigate things.
Zoe: Where might they go in the world to do an investigation?
Child K: Everywhere.
Zoe: Everywhere. Great. Right now. Thank you for waiting. Now you haven't got a drawing, but if you could draw a scientist or an engineer at work, what kind of work does a scientist do? You've been thinking about it. What do you think?
Child L: So, look at things which are already been dead for a while.
Zoe: Yeah, like what?
Child L: Like T Rex.

Zoe: So, scientists can go into space, and scientists can learn about dinosaurs. Yeah. Anything else scientists or engineers can do? Any other ideas? No. OK, now here's my next question then. So, if you didn't know how to do something, what would you do?
Child L: I don't know.
Zoe: Ok, if you didn't know how to do something. What would you?
Child K: That one was the easiest one for me, I would work it out.
Zoe: You'd work it out. Yeah. Anyone do anything different? Yeah, go on. Were you going to say something else?
Child I: I would try to figure it out.
Zoe: Anything else? Yes. What would you do if you didn't know how to do something?
Child L: Look it up on a website.
Zoe: Yeah, absolutely. Look it up, couldn't you? What have you thought of?
Child K: Try and do it.
Zoe: Yeah, try and do it. Now, this is a good one for you, if you went wrong and made a mistake. Would you try again?
[All children say "yes"]
Child I: I would rub it out or just do it over again.
Zoe: Do it over again, yes. If you made a mistake, would you do it again? If you got something wrong?
Child I: I would just cross it out and then do it again.
Child K: And I'll try again and again until I get it right.
Child I: Yes, I'll just try again.
Zoe: You just keep trying again. How about you? Would you try again If you've made a mistake?
Child L: Yeah.
Zoe: So, why is it OK to make mistakes?
Child I: Because you can just carry on.
Zoe: Yes. OK, right. How about this question then? Do you like doing things in school that are easy to do, so you know how to do it straight away or do you like trying things that are more difficult to do, where you have to work it out?
Child I: I want to do stuff that is difficult to do because it will be nice.
Zoe: Yeah. Why do you like it? Why do you like it to be difficult, then what's nice about it?
Child I: It might be a bit tricky, but it might be a bit easy though.
Zoe: Yes, so why do you like doing something difficult?
Child L: Because I don't want to be lazy and do the easiest thing.
Zoe: How about you? You said difficult, didn't you? Yeah. Why do you like doing things that are difficult?
Child J: Because It's really good to practise.
Zoe: Yeah. Great. OK, now. Are you a sciencey person? So that means somebody who likes science, who maybe they get a reading book about science. They try to find out new things about science. They watch TV shows about science, they watch documentaries, they find things out on the Internet. They're a sciencey person. Are you that kind of person?
[All children say "yes"]
Zoe: All four of you!
Child K: Yes, and my mum is a science teacher. I get it from her.
Zoe: She's a science teacher. Do you know what sort of science she was teaching? Do you know what sort of science it was?
Child K: No.
Zoe: OK. Can you tell me something that you're particularly interested in about science?
Child K: Staying healthy.

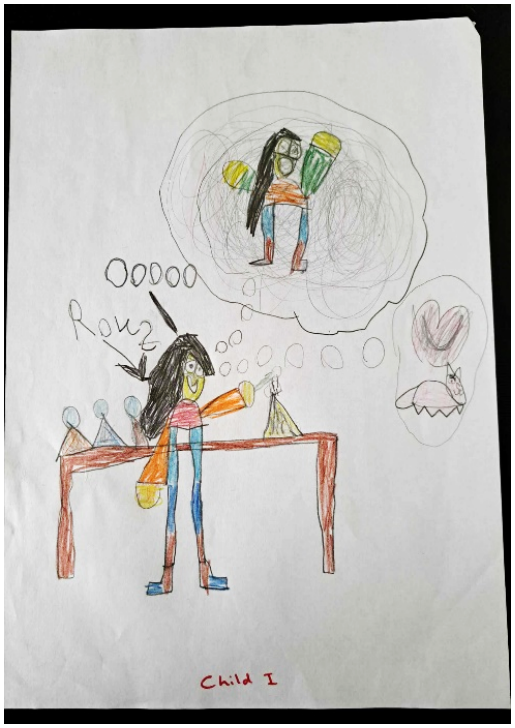
Zoe: That's what you're learning about in science. Yeah. How about you? What do you like learning about in science? Because you said you're a sciencey person. What would you like to read about or learn about?
Child L: Animals.
Zoe: Absolutely. What is it you like about animals? Is there a particular type of animals?
Child L: It's because I like trying to save the animals.
Zoe: Yeah. Was there a particular part of science you like?
Child I: Dinosaurs.
Zoe: Yeah, absolutely. One last question then is about engineering. So, anyone know what an engineer does for their work?
Child L: They fix cars.
Zoe: That's right. What else?
Child J: Some build stuff for other people.
Zoe: Yeah. OK. Would anyone like to be an engineer when they grow up?
Child K: Yes.
Child I: I want to be something else.
Zoe: What do you want to be?
Child I: A vet.
Zoe: Did you want to be an engineer?
Child K: I've got loads of other things that I want to.
Zoe: Yeah, you can have a long list. It doesn't have to be just one thing. What would be on your list? What else?
Child K: My favourite one is a librarian because I read a lot of books. I also want to be a farmer.
Child L: I want to work in a museum.
Zoe: You want to work in a museum? That would be great. Doing what kind of things?
Child L: Dinosaurs.
Zoe: Great, thank you.

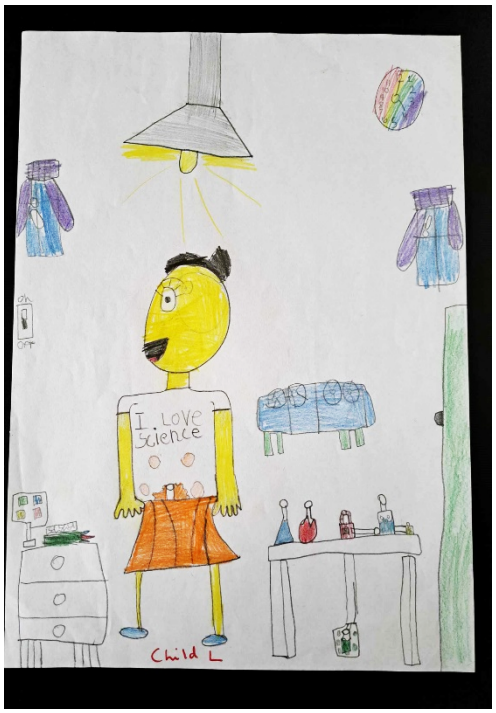
Appendix 7 Children's drawings

School A, pre-programme



School B, pre-programme



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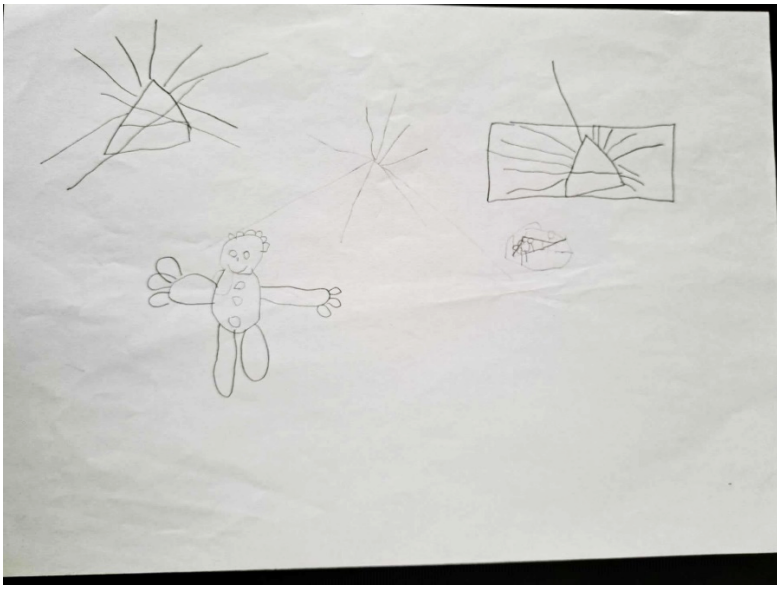

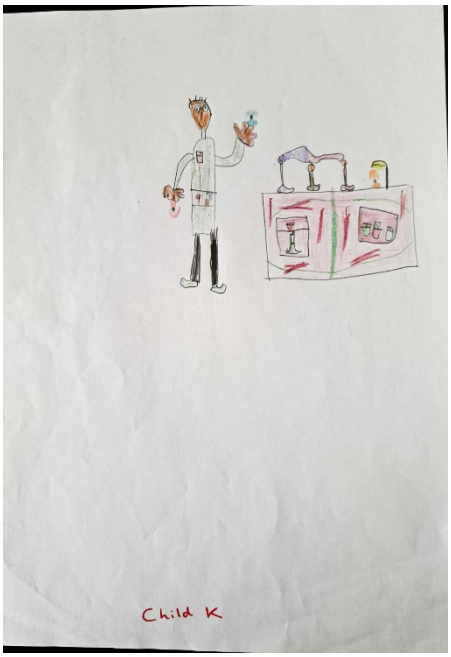
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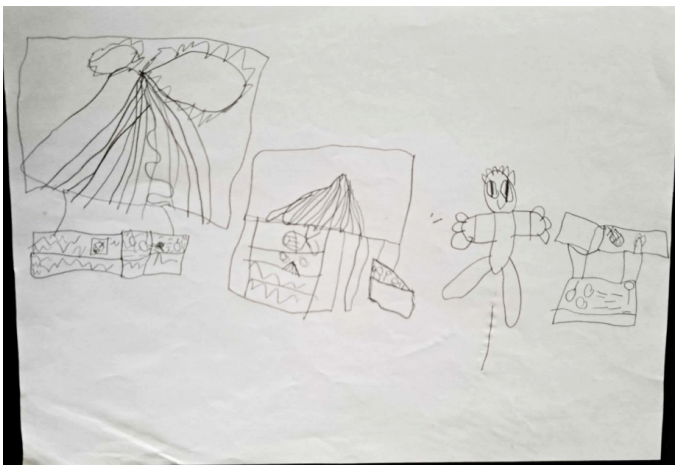
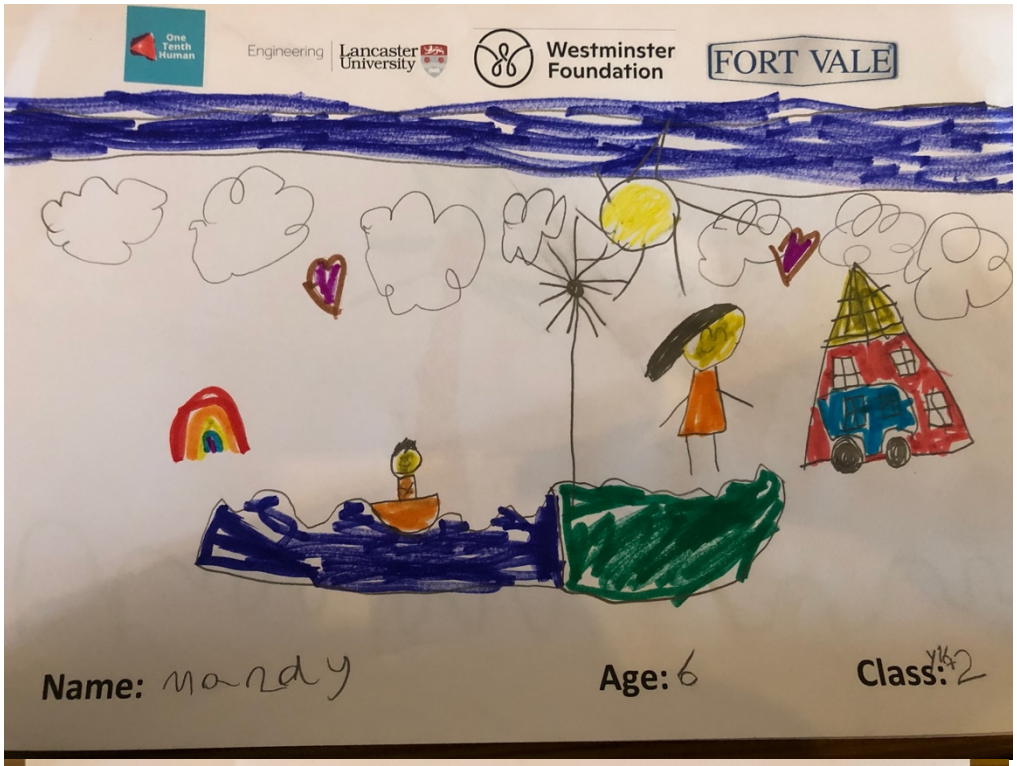
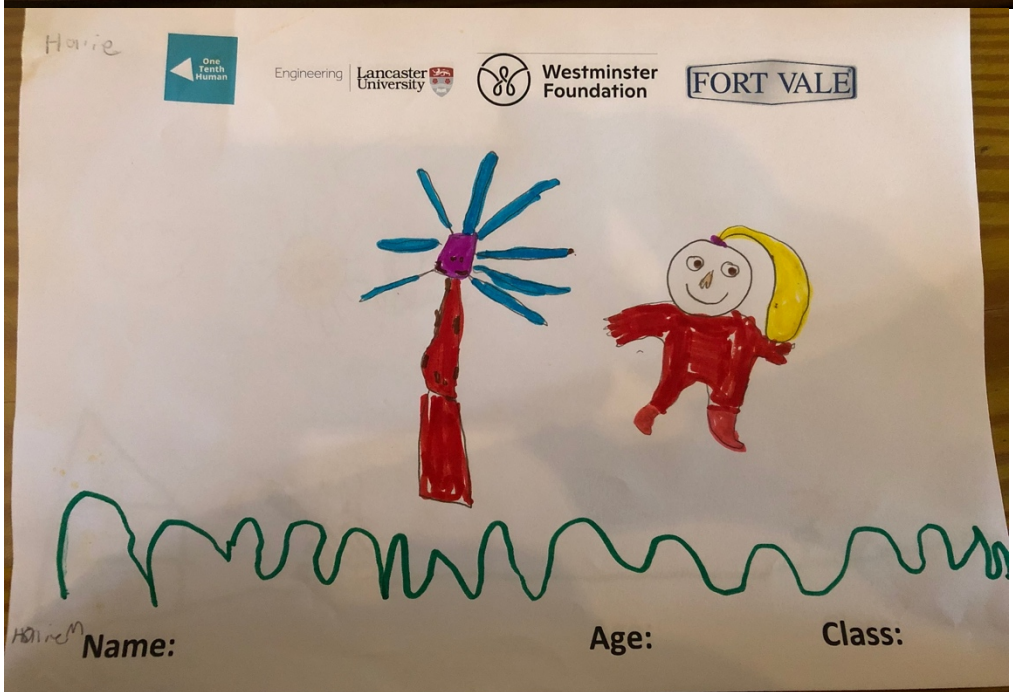


School B: post-programme – “draw an engineer at work”



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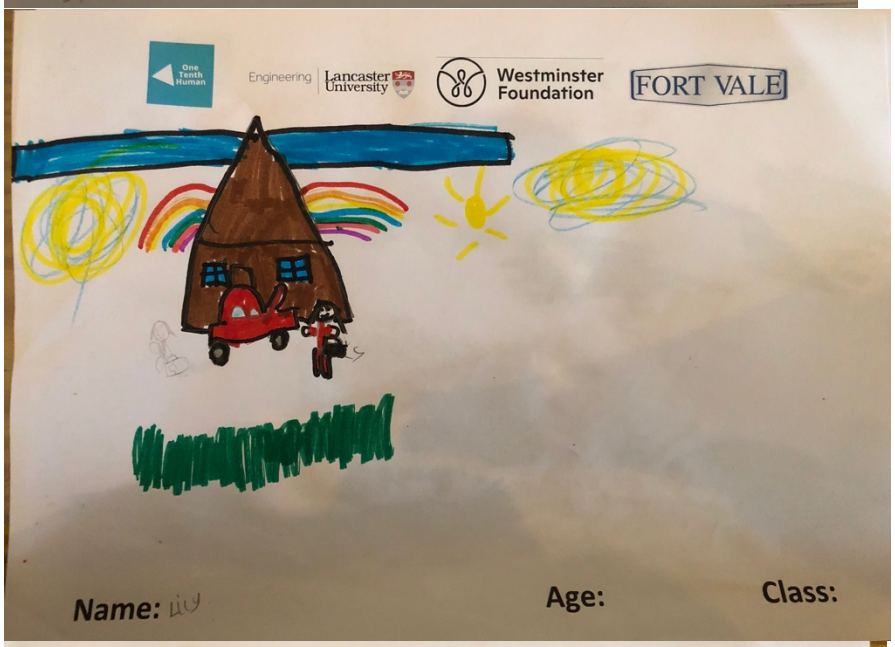
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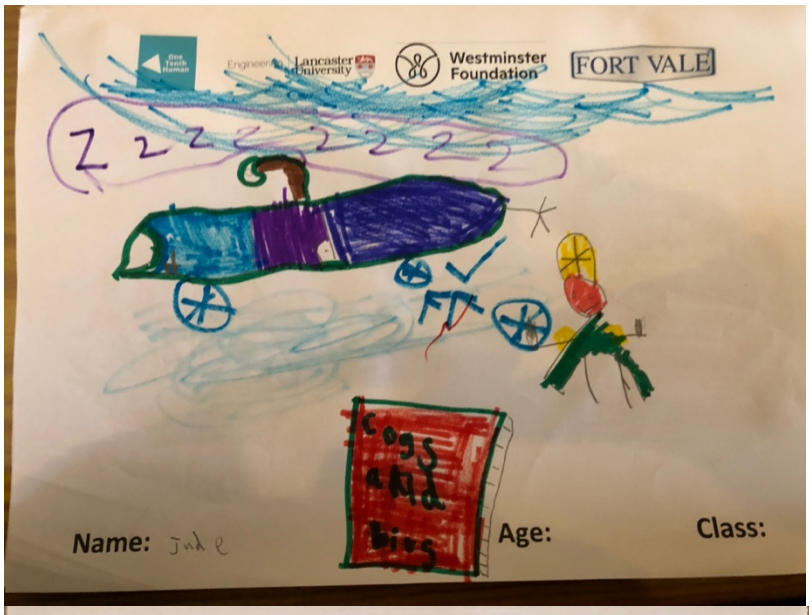
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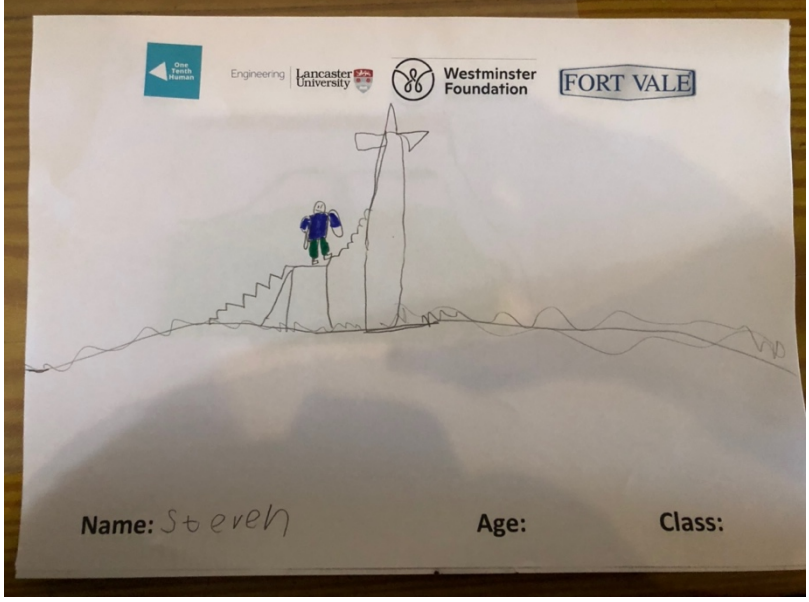
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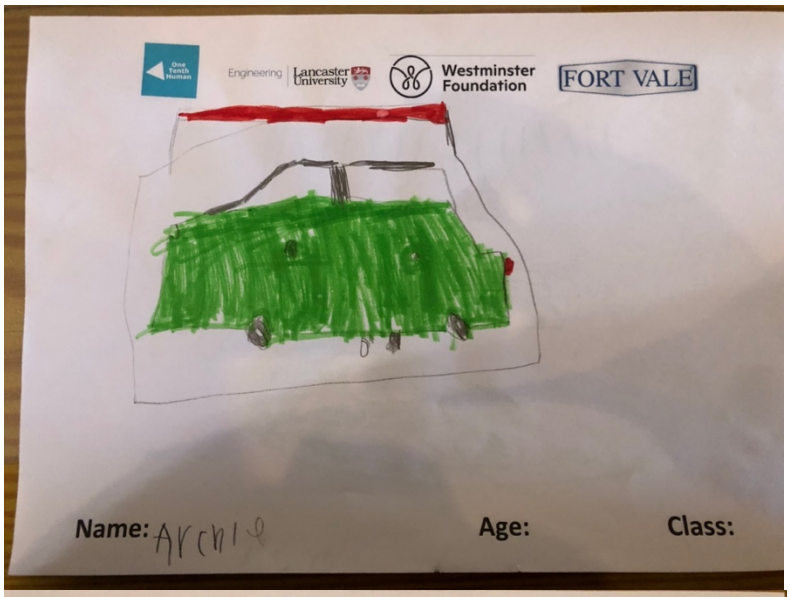
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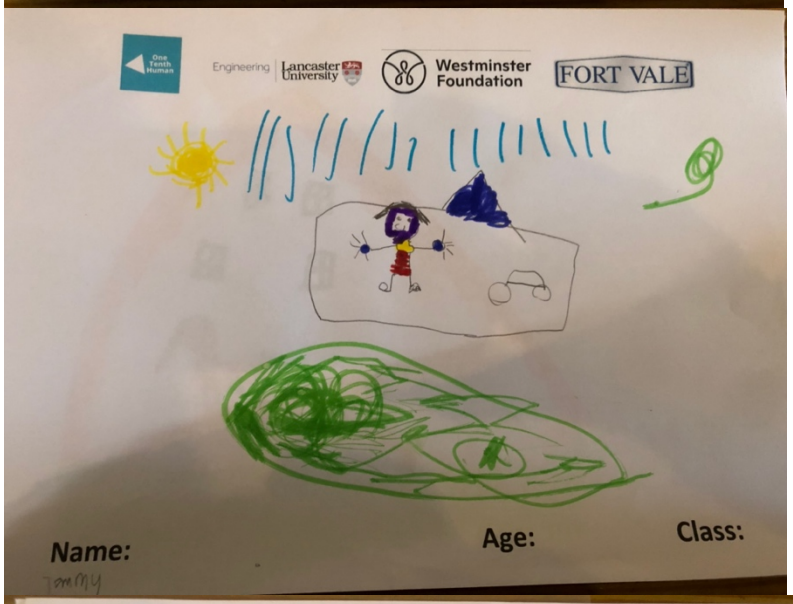
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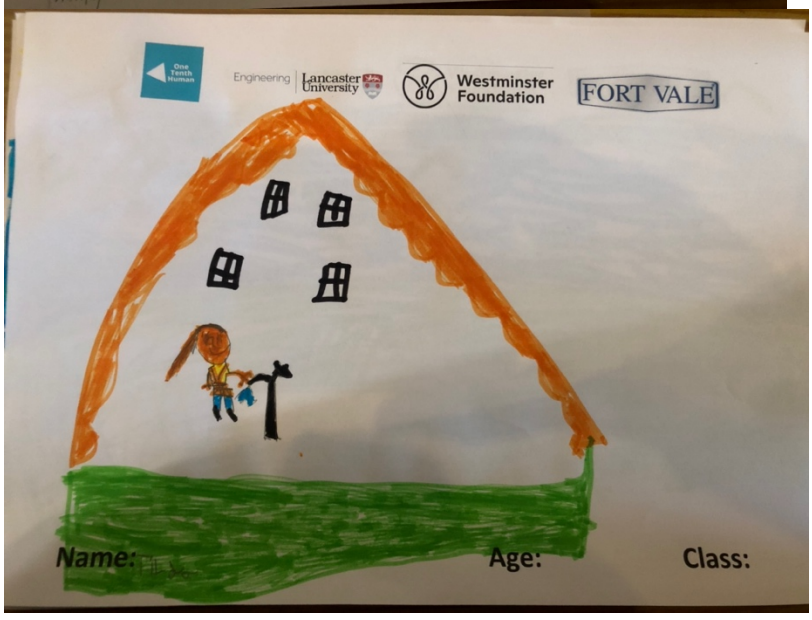
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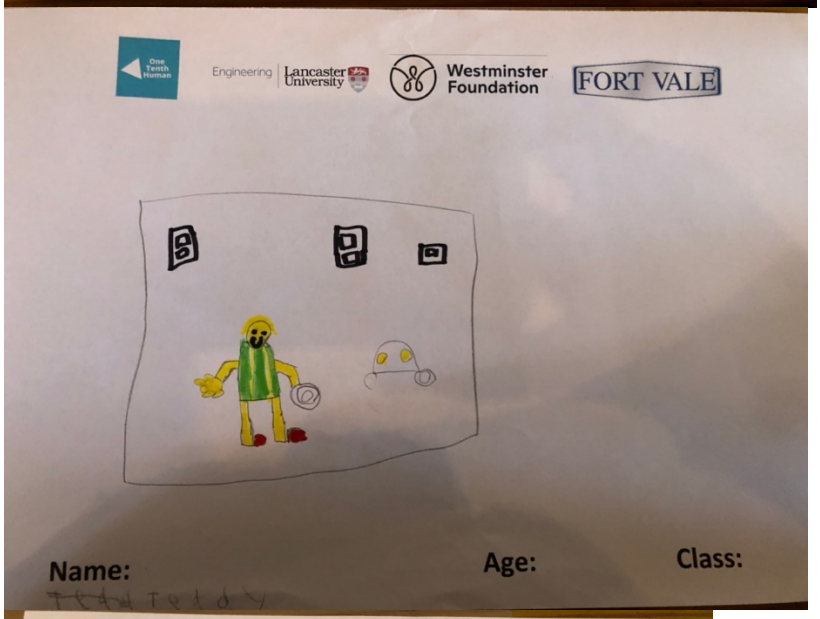
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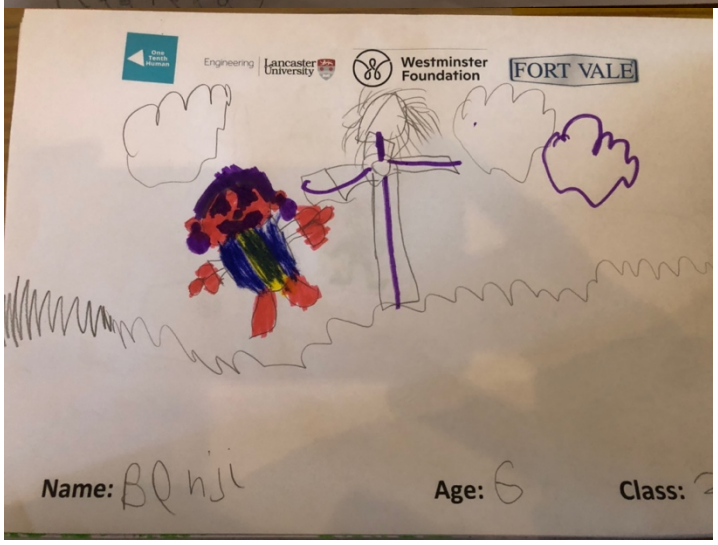
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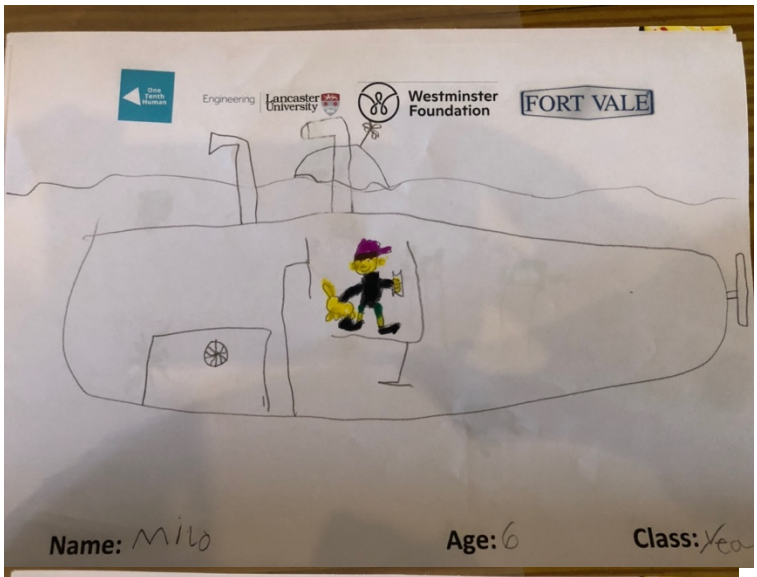
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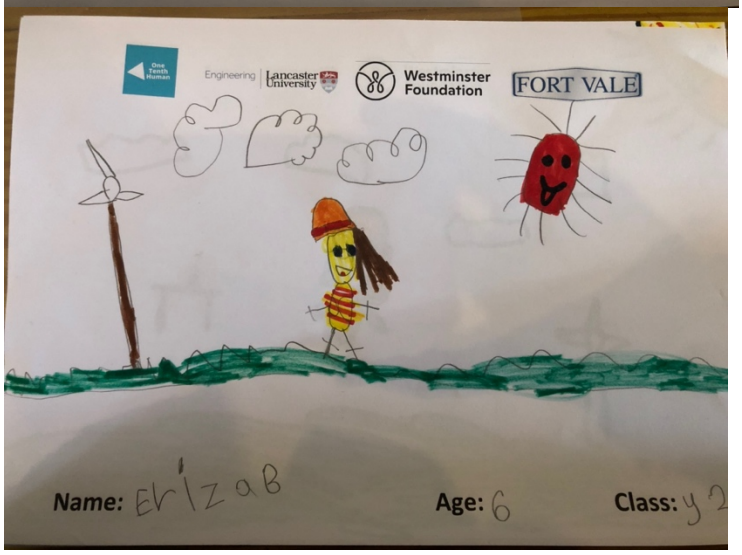
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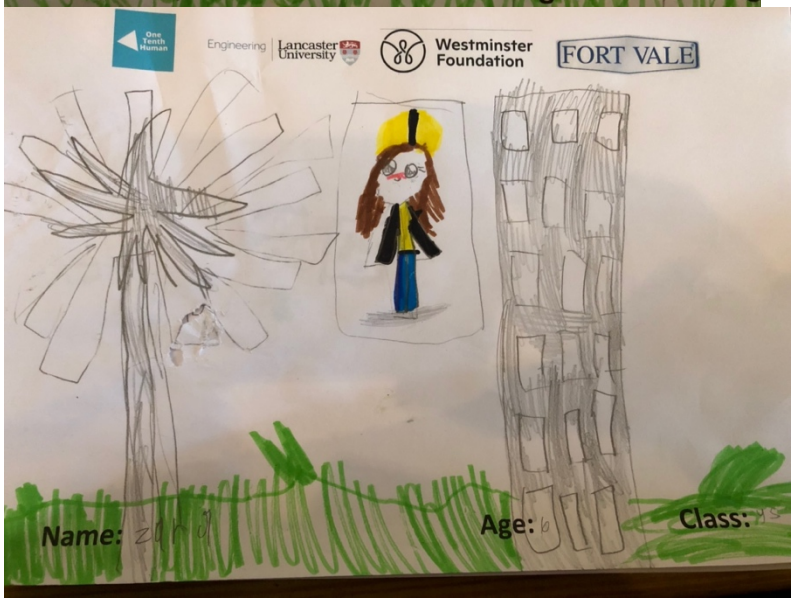
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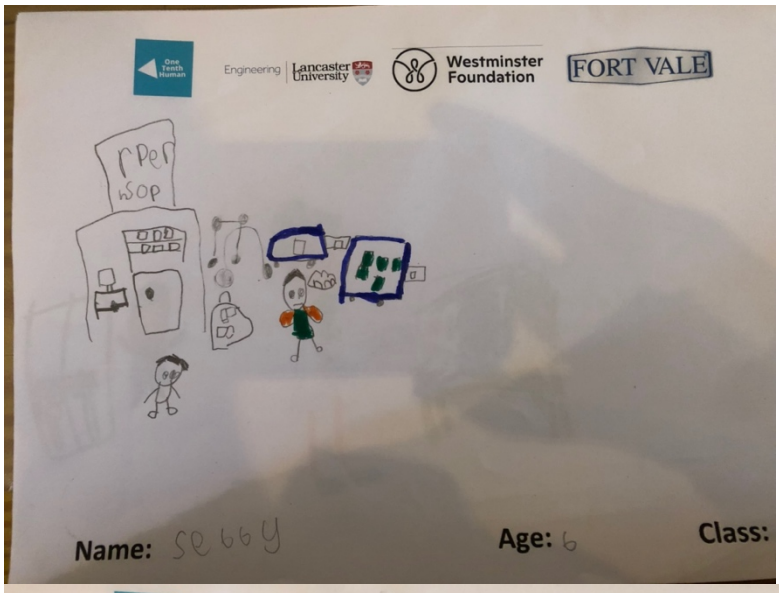
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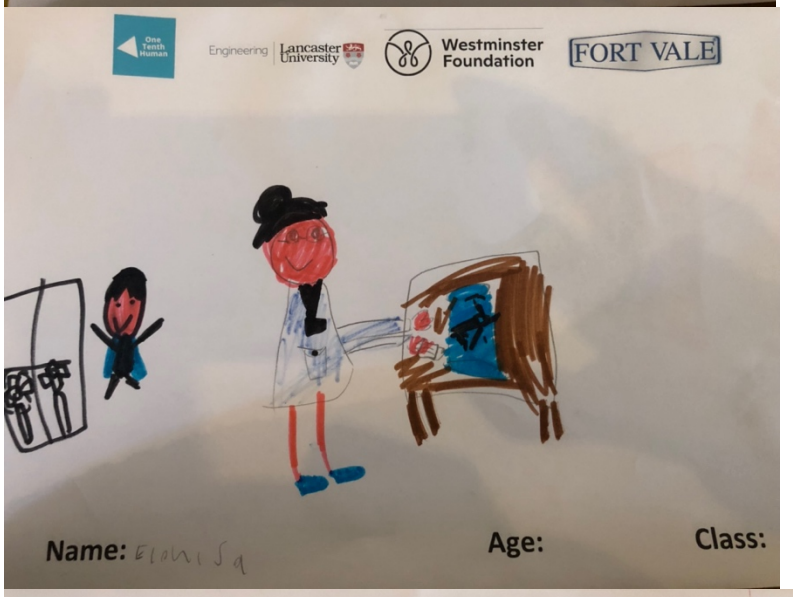
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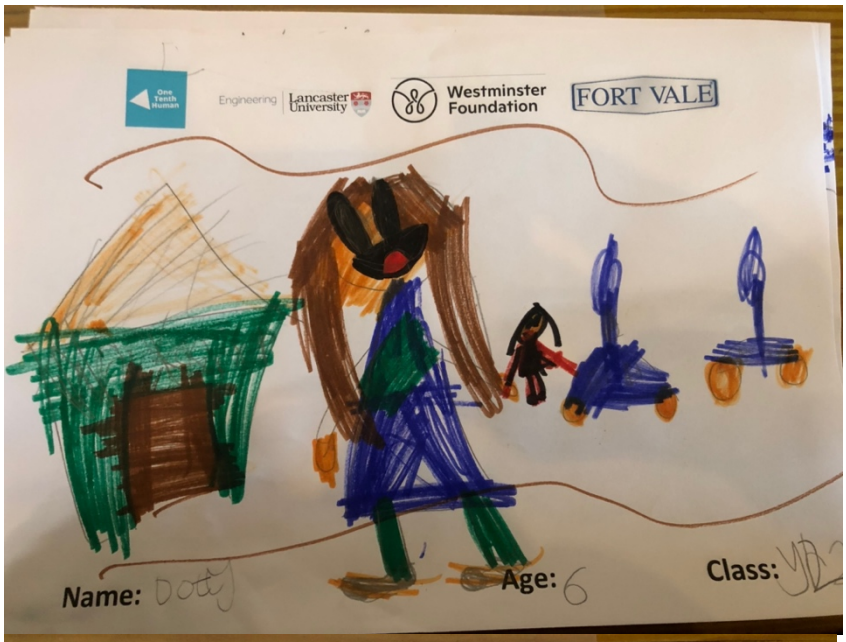
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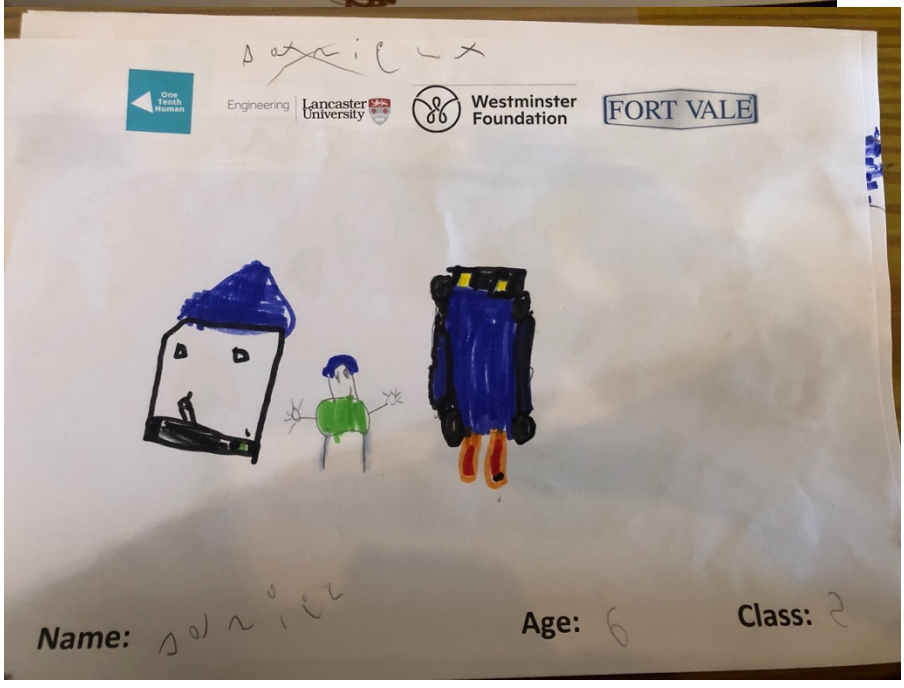
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Appendix 8 Full list of venues and schools visited

Venue Name	Post Code	Date	Pupil Premium (schools)	Levelling Up for Culture location?
Skerton St Luke's CofE Primary	LA1 2JH	27 Sep 24	42.6%	no
Nether Kellet Community Primary	LA6 1HH	30 Sep 24	8.1%	no
Ormsgill Nursery and Primary	LA14 4AR	1 Oct 24	60.9%	yes
Ramsden Infant School	LA14 1AN	2 Oct 24	42.2%	yes
Cambridge Primary	LA13 9RP	3 Oct 24	66.1%	yes
St George's CofE	LA14 2JN	4 Oct 24	53.6%	yes
Attenborough Arts Centre	LE1 7HA	6 Oct 24		no
				no
Caton Primary	LA2 9NH	7 Oct 24	11.0%	no
Archbishop Hutton's V.C Primary	LA5 9QU	8 Oct 24	18.0%	no
Dolphinholme CofE Primary	LA2 9AN	9 Oct 24	9.9%	no
Cawthorne's Endowed (at Dolphinholme)			3.3%	no
Overton St Helen's CofE Primary	LA3 3EZ	10 Oct 24	23.2%	no
Derby Theatre (Studio)	DE1 2NF	12 Oct 24		no
Wolverhampton Arena	WV1 1SE	13 Oct 24		yes
Brunshaw Primary School	BB10 4PB	14 Oct 24	40.8%	yes
Padiham Primary School	BB12 8SJ	15 Oct 24	45.4%	yes
Green Haworth CofE Primary	BB5 3SQ	16 Oct 24	38.0%	yes
Cherry Fold Community Primary	BB11 5JS	17 Oct 24	63.6%	yes
Lincoln Arts Centre	LN6 7TS	19 Oct 24		no
The Albany	SE8 4AG	20 Oct 24		no
Burton Brewhouse	DE14 1AA	21 Oct 24		yes
Nottingham Playhouse	NG1 5AF	22 Oct 24		no
Mansfield Museum	NG18 1NG	23 Oct 24		yes
Exeter School, Corby	NN18 8DL	24 Oct 24	37.5%	no
Hempstead Library	ME7 3QG	26 Oct 24		yes
The Kenton Theatre	RG9 2BP	28 Oct 24		no
The Curve	SL1 1LE	30 Oct 24		yes
Leighton Buzzard Library Theatre	LU7 1RX	31 Oct 24		no
Eastleigh The Point – studio	SO50 9DE	1 Nov 24		yes
Spring Arts and Heritage Centre	PO9 1BS	2 Nov 24		yes
Ropetackle Arts Centre	BN43 5EG	3 Nov 24		yes