STEM Challenge Days Impact Summary

Report for Heart of England Community Rail Partnership

September 2022

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STEM Challenge Days Impact Summary

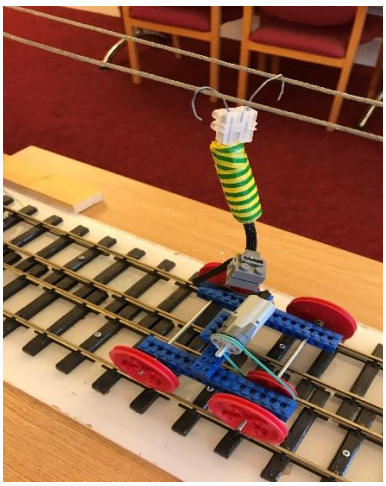
STEM Challenge Days are delivered in school by a Smallpeice Trust educator. They provide students with STEM enrichment linked to the national curriculum and give the opportunity to build essential skills. Each challenge highlights the engineering design process and gives students the chance to take on a range of roles.

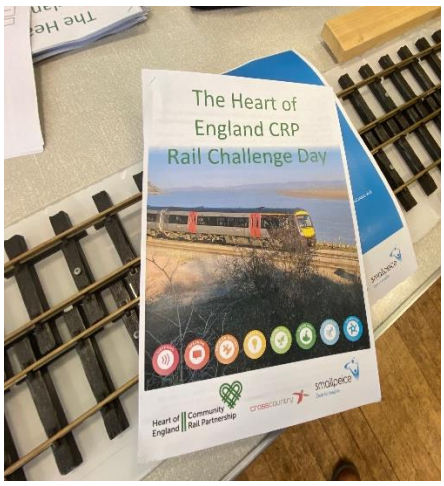
Key stats:

230 students benefitted from a STEM Day

88% learnt something new and 84% gained new skills

86% gained an appreciation of what rail engineers do





The Activity

Four STEM+ Challenge Days were provided during the Academic Year 2021-2022 to schools identified by Heart of England Community Rail Project, in schools across the CRP area, identified by local authority partners as those schools where pupils may not receive these sorts of opportunities.

The sessions were raising awareness of rail in the Midlands and giving pupils the opportunity to understand the different routes into careers in the rail industry, with a focus on engineering, but with elements of project management, marketing, presentations.

Key themes explored:

- Sustainability and the importance of electrification in the rail industry
- Careers in the engineering and the rail industry

Workshops benefitted underrepresented groups, where possible, with schools being asked to ensure: 50% of all places are held for girls or students that identify as female; and 25% of places are held for students on FSM/Pupil Premium.

HoECRP (Heart of England Community Rail Partnership) and CrossCountry attended sessions and gave a talk on the rail network and sustainability in the rail industry.

All four STEM Challenge Days have been delivered to:

- Lyndon School (25//03/2022)
- Blue Coat School (12/05/2022)
- Bordesley Green School (24/06/2022)
- Myton School (28/06/2022)

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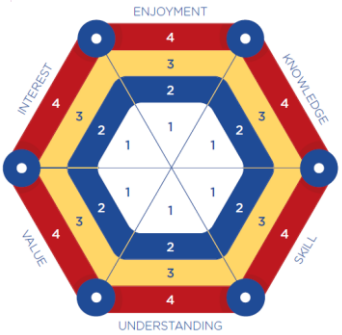

Measuring impact

The Smallpeice Trust uses the IMechE 6-point model for assessing the impact of the STEM Days (this model was adopted by the Government for the Year of Engineering). We request that all students and a teacher complete a feedback form.

- 100% of teacher evaluations were received
- 80% of student evaluations were received (177)

Encouraging students to learn through exploration

Each STEM Challenge Day is an interactive workshop which brings science, technology, engineering, and maths (STEM) to life, complementing the national curriculum.

Teachers were asked to rate their STEM Challenge Day:

Standard of project	Excellent
Delivery of the day	Excellent
Overall score	Excellent

They thought the following curriculum areas were addressed:

Science	✓✓✓	Engineering	✓✓✓
Maths	✓✓	Inclusion	✓✓
Design & Technology	✓✓	Learning & thinking skills	✓✓✓

Every teacher would like to request another STEM Day and would recommend it to another school.

> Really well organised, all students engaged for the whole event

Teacher, Bordesley Green School

> Good for engagement in science

Teacher, Myton School

230 students took part in the four STEM Days.

119 female (52%) : 105 (46%) male : 6 (2%) prefer not to say.

Feedback from the students shows:

- **91% enjoyed the day**
- **88% learned something new**
- **83% understand engineering better**

> Engineering is not just about cars, and you need to think

Male Student, Blue Coat School

> Engineering requires a lot of creativity

Female Student, Lyndon School

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Students building essential skills for the future

STEM Challenge Days give students the opportunity to build essential skills, incorporating the Skills Builder Universal Framework. Research by the Skills Builder Partnership shows the importance of young people developing these skills and how they can increase earning potential, wellbeing and life satisfaction, which reducing the likelihood of being out of work.

The evaluation shows that 84% gained new skills.

Here are some of the skills students said they learnt on the STEM days you funded:

> I learnt about what things are useful to include in a station for the community

Female student, Lyndon School

> I learnt how to be more patient and to be an engineer

Female student, Bordesley Green school

> I learned how trains help our environment

Male Student, Blue Coat School

Inspiring the next generation of engineers

Research with students by EngineeringUK* shows the power of role models.

- Young people who met an engineer held more positive views of engineering (81% compared with 64% who did not)
- Young people who spoke to someone about a career in STEM were more likely to see a career in engineering as desirable (71% compared to 53%) and have a good knowledge of next steps (73% compared to 54%)

The support from partners CrossCountry and Heart of England Community Rail Partnership alongside Smallpeice educators all helps bring this to life for the students. The evaluation shows:

- **86% now have a greater appreciation of engineers**
- **57% would now consider being an engineer**

> I have learnt how to work as a team and use my imagination, I have learned electrical skills and communicating skills, how to design and make a sustainable train

Female Student, Bordesley Green School

> The day couldn't be improved as it was so fun, and I learnt so much

Male student, Myton School

> I learned how interesting Engineering can be and how much work and dedication goes into it, I am forever grateful for today.

Female Student, Bordesley Green School

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Inspiring the next generation of engineers – Birmingham University Rail Course

Name of sponsored student : Nazeefah Ali

Name of School : Bordesley Green Girls' School and Sixth Form

What did you enjoy about the Rail course?

I enjoyed designing my train and applying the equations of my train's kinetic energy in real life. I liked how supportive my mentors and teammates were when I needed help on the analysis of my trains crash. I enjoyed how it challenged me as repeatedly testing my design was outside of my comfort zone. I was exposed to equipment that I had never used or even heard of like bogies and foam cubes for my train, so the course was always exciting as I learnt as I went along

In what ways has attending the rail course informed you about engineering and the rail industry?

I learnt a lot about trains and the importance of their defences. I saw how crumple zones absorb the energy of a collision along with mechanisms involving friction or spring to stop a train. Via my mentor, I learnt about a train that he and his team made that was fuelled by hydrogen to prevent carbon emissions and how the rail industry is growing in an environmentally friendly direction.

Were you considering a career in the Rail industry before attending this course?

Maybe

Would you now consider a career in the Rail industry?

Yes

What skills have you demonstrated and\or learned on this course?

The course enabled me to use my initiative which was at first was challenging but slowly I got the hang of it and created train that could survive a crash. The course demanded a lot of innovation, quick thinking and problem solving, the wheels of my trains would constantly derail due to its loose wheels instead of being frustrated I was forced to look for other solutions to these minor problems. Due to this, I realised how important it is to not fall at the first hurdle as at times I just needed to try again to succeed, along with that I demonstrated a lot of attention to detail as each rail glued on my ramp needed to be connected and precise, if not it would derail and not crash my train

What other comments do you have for us and\or Heart of England Community Rail Partnership?

I was surprised that I was able to build a train and crash it successfully and thanks to this program I was able to see that I am capable of more than I think . This makes me happy, and, in the future, I hope to be part of programs like this in order further enhance my capability and my knowledge. I'm very thankful for this opportunity.

Thank you so much for your support from the young people who have benefitted and from all of us at The Smallpeice Trust

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Appendix 1 – STEM Day statistics summary

STEM Day Secondary	All	Female	Male	PNS
	AGREE	AGREE	AGREE	AGREE
I enjoyed the STEM Day	91%	93%	88%	100%
I learned something new	88%	89%	84%	100%
I've gained new skills	84%	83%	84%	83%
I now understand engineering better	83%	86%	82%	67%
I now have a greater appreciation of engineering	86%	89%	82%	83%
I would now consider a career in engineering	57%	56%	61%	50%

Appendix 2 – STEM Day data by gender

All

STEM Day Secondary - All Student Summary		Strongly Agree	Agree	Disagree	Strongly Disagree	Total
S1	I enjoyed the STEM Day	62	100	10	5	177
S2	I learned something new	42	113	19	3	177
S3	I've gained new skills	44	104	27	2	177
S4	I now understand engineering better	48	99	27	3	177
S5	I now have a greater appreciation of engineering	42	110	23	2	177
S6	I would now consider a career in engineering	27	74	46	28	175

STEM Day Secondary - All Student Distribution		Strongly Agree	Agree	Disagree	Strongly Disagree	Total
S1	I enjoyed the STEM Day	35%	56%	6%	3%	100%
S2	I learned something new	24%	64%	11%	2%	100%
S3	I've gained new skills	25%	59%	15%	1%	100%
S4	I now understand engineering better	27%	56%	15%	2%	100%
S5	I now have a greater appreciation of engineering	24%	62%	13%	1%	100%
S6	I would now consider a career in engineering	15%	42%	26%	16%	100%

Female

STEM Day Secondary - Female Student		Strongly Agree	Agree	Disagree	Strongly Disagree	Total
S1	I enjoyed the STEM Day	28	61	5	1	95
S2	I learned something new	28	57	9	1	95
S3	I've gained new skills	27	52	16	0	95
S4	I now understand engineering better	32	49	14	0	95
S5	I now have a greater appreciation of engineering	22	63	10	0	95
S6	I would now consider a career in engineering	15	37	24	17	93

STEM Day Secondary - Female Student - Distribution		Strongly Agree	Agree	Disagree	Strongly Disagree	Total
S1	I enjoyed the STEM Day	29%	64%	5%	1%	100%
S2	I learned something new	29%	60%	9%	1%	100%
S3	I've gained new skills	28%	55%	17%	0%	100%
S4	I now understand engineering better	34%	52%	15%	0%	100%
S5	I now have a greater appreciation of engineering	23%	66%	11%	0%	100%
S6	I would now consider a career in engineering	16%	40%	26%	18%	100%

Male

STEM Day Secondary - Male Student		Strongly Agree	Agree	Disagree	Strongly Disagree	Total
S1	I enjoyed the STEM Day	32	35	5	4	76
S2	I learned something new	12	52	10	2	76
S3	I've gained new skills	15	49	10	2	76
S4	I now understand engineering better	16	46	11	3	76
S5	I now have a greater appreciation of engineering	18	44	12	2	76
S6	I would now consider a career in engineering	12	34	19	11	76

STEM Day Secondary - Male Student - Distribution		Strongly Agree	Agree	Disagree	Strongly Disagree	Total
S1	I enjoyed the STEM Day	42%	46%	7%	5%	100%
S2	I learned something new	16%	68%	13%	3%	100%
S3	I've gained new skills	20%	64%	13%	3%	100%
S4	I now understand engineering better	21%	61%	14%	4%	100%
S5	I now have a greater appreciation of engineering	24%	58%	16%	3%	100%
S6	I would now consider a career in engineering	16%	45%	25%	14%	100%

Prefer Not to Say

STEM Day Secondary - Unknown Gender Student		Strongly Agree	Agree	Disagree	Strongly Disagree	Total
S1	I enjoyed the STEM Day	2	4	0	0	6
S2	I learned something new	2	4	0	0	6
S3	I've gained new skills	2	3	1	0	6
S4	I now understand engineering better	0	4	2	0	6
S5	I now have a greater appreciation of engineering	2	3	1	0	6
S6	I would now consider a career in engineering	0	3	3	0	6

STEM Day Secondary - Unknown Gender Student - Distribution		Strongly Agree	Agree	Disagree	Strongly Disagree	Total
S1	I enjoyed the STEM Day	33%	67%	0%	0%	100%
S2	I learned something new	33%	67%	0%	0%	100%
S3	I've gained new skills	33%	50%	17%	0%	100%
S4	I now understand engineering better	0%	67%	33%	0%	100%
S5	I now have a greater appreciation of engineering	33%	50%	17%	0%	100%
S6	I would now consider a career in engineering	0%	50%	50%	0%	100%