

Primary Engineer®
...the first step

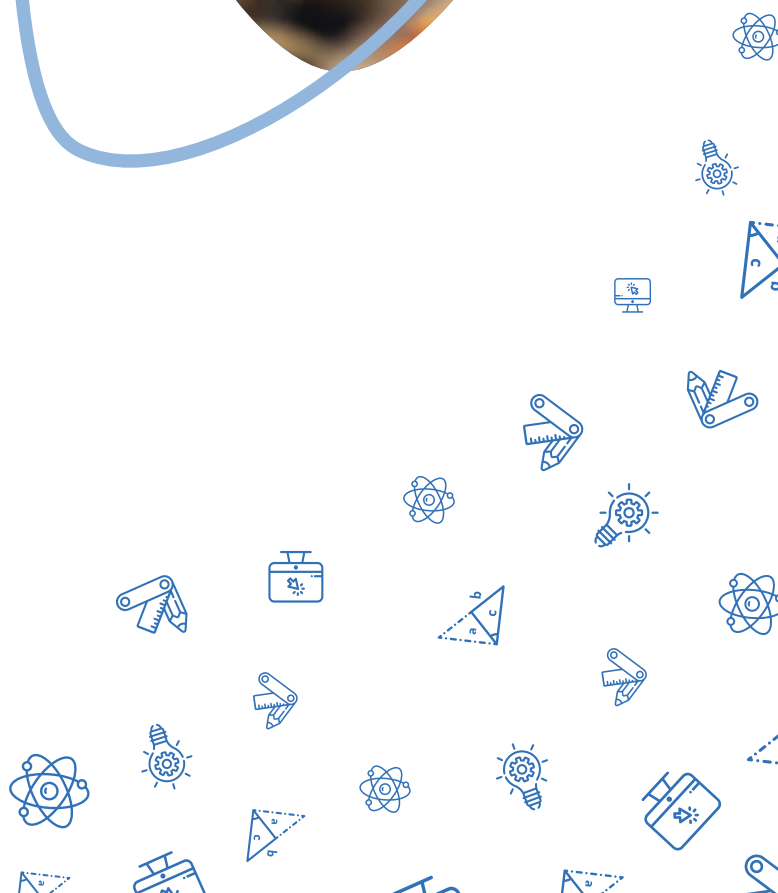


Primary Engineer
Impact Report
2021-2022

ENGINEERS IN THE MAKING®



Contents





Introduction from our CEO

Welcome to our 2021-22 Primary Engineer Impact Report. The year carried with it the remnants of the challenges Covid brought to schools and the wider community. All our programmes, adapted for pandemic delivery, started to move back to face-to-face engagement and public exhibitions and events started to fill the calendar.



At the outset of the year we had the privilege of attending COP26, alongside Scottish Engineering and INWES. We announced the winners of our first Primary Engineer MacRobert Medals, shared the Flat Pack Wind Turbine, designed by a pupil and built by Glasgow Caledonian University on our stand and for the first time gave the Climate Change STATWARRIORS a voice. Whilst still at COP26 we joined Scottish Engineering to give a presentation at the COP26 Rail Low Carbon Logistics. The experience was unforgettable and yet seems like a very long time ago now. The impact of the conference was a renewed drive to develop and engage teachers and pupils with the STATWARS Climate Change Challenge focusing on the use of data to make decisions about the choices they can personally made to improve their own impact on the climate and feel empowered to share those decisions.

Our work with UCLan and our PhD candidate Rory MacDonald continued over the year impacting on our own evaluation processes and understanding. His research and that of Laura Fogg-Rogers from UWE will hold many insights for the engineering community and we are looking forward to sharing those in the course of 2023.

Our programmes and approaches have gained the attention of industries and government bodies and their support of our work has enabled us to reach further and fuel our ambitions to enable all children to have engineering experiences that help to inform their futures.

As ever at Primary Engineer we relish the slightly left of field, from interviewing Colonel Charles Duke (the last astronaut to walk on the moon) at Royal International Air Tattoo (RIAT) in front of a reverent audience to the glitter and sparkle of CampBestival. What ever we do, where ever we go, our passion for engineering in primary schools is front and centre but none of it would happen without the outstanding Primary Engineer team and our amazing funders. With much thanks and looking forward to 22-23.

Dr Susan Scurlock MBE, Founder & CEO Primary Engineer

“Primary Engineer provides a vital service to help promote engineering careers throughout the entire education sector. The work that Susan does through schools and colleges also aids the development of the country’s future engineers and I’m proud that through Lancashire County Council backed support this excellent organisation will be able to help more young people across the UK.”

**Jayne Rear, Cabinet Member for Education and Skills,
Lancashire County Council**



Programmes, Qualifications & Competitions

“Primary Engineer exemplifies a ‘STEM by Stealth’ educational approach and brings the real world into the classroom in a practical and fun way. It also helps to inspire children with whole class project work, competitions and exhibitions.”

Gary Owen, St Teresa's teacher

Primary Engineer has developed a range of ways for schools to engage with engineering. These can be grouped into Programmes, Qualifications and Competitions, each are designed to engage teachers and learners in diverse ways.

Primary Engineer Programmes take the form of themed cross-curricular projects. Each project includes physical resources and tools for 2 classes, teacher training for up to 2 teachers, digital teaching resources, curriculum mapping, links to engineers and invitations to Celebration Events.



Primary Engineer Rail Project



Primary Engineer Vehicle Project



Primary Engineer Construction Project (Launched in 2021)



Early Years Engineer



Secondary Engineer Fluid Power Challenge

Qualifications for teachers/practitioners, educators and careers advisors who are looking for more research-based professional development can join our two guided learning courses; **The Engineering STEM in your Classroom** module endorsed by Education Scotland (Launched in 2021) and the **Postgraduate Certificate in Engineering your Curriculum** accredited by the University of Strathclyde. Both courses are designed to enable teachers and practitioners to further their understanding of the engineering sector, engineers skill sets and career paths. The courses also provide opportunities for teachers to develop their leadership skills in relations to whole school Engineering and STEM projects.



Competitions these activities are funded both nationally and regionally and open to all UK schools free of charge. Teachers are provided with teaching resources, certificates for all individual pupils and access to celebration events.



Leaders Award Competition ‘If you were an engineer, what would you do?’ aims to build and celebrate creative problem solving and career awareness. Each entry is graded by an engineer, named certificates awarded, entries exhibited at events and awards presented at ceremonies. In addition to the pupil engagement, our university partners build and unveil prototypes of selected entries, the Primary Engineer MacRobert Medals are awarded for innovation, and the ‘If you were an engineer...’ Podcast give voice to the young people and the engineers involved.



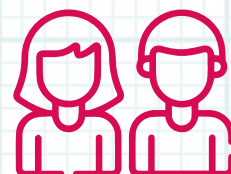
STATWARS Climate Change Challenge focuses on data to illustrate the things we can personally change to make a positive impact. This challenge addresses parts of the maths and geography curriculum links to climate awareness.

Our impact across the UK



1011
Schools

49%



51%

65,283
Total Pupils



1023
Engineers

Teachers



2749

“ As a school we feel on cloud nine. The recognition for excelling in engineering for both pupils and teachers is an outstanding achievement, and we are all feeling very proud. ”

Lynsey Third, Avoch Head Teacher

Our approach allows our activities to reach particular areas and communities to close inequality gaps and widen ethnicity representation.



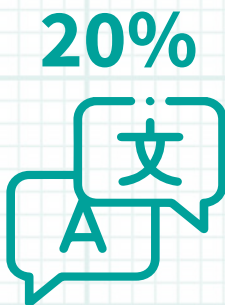
38%

**Pupils deemed
other Ethnic Origin**



391,698

Pupil Hours of Engineering



20%

**Pupils whose First
Language is Not
English**



94

Training Sessions



**Average
deprivation
index**



24%

**Pupils eligible for
free school meals**



75

**Celebrations and
Exhibitions**

Activities in 2021-2022

Primary Engineer Programmes comprise of practical teacher training, both digital and physical kit, curriculum mapped with links to engineers and opportunities to attend celebration events. In the academic year 21-22 approximately 26,993 pupils, 1,015 teachers from 485 schools participated throughout the UK across our Vehicle, Rail and Construction projects.

Whilst the training was successfully delivered virtually 2022-23 will see a hybrid model of training using of virtual and face to face. The Primary Engineer Construction Programme was a successful new addition to the range of themes offered to schools.



“Primary Engineer are incredibly beneficial in raising the profile of engineering, and it will hopefully plant the seed for ScotRail’s future workforce as these children are the skilled and qualified workers of tomorrow.”

Michelle Murray, ScotRail

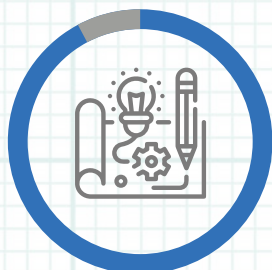
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What have teachers told us in 2021-2022?

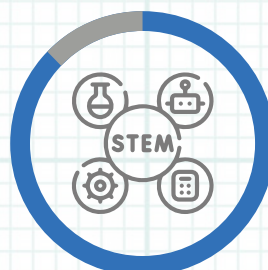
“ Each year the project becomes easier to facilitate in school. That comes from teachers being more confident in delivering the project, being better enabled to support the children, involving people at home to discuss ideas with the young people, and excellent support from Primary Engineer.
Portmoak Primary School ”

94%



of teachers report an **increase in their understanding of engineering** following the training

88%



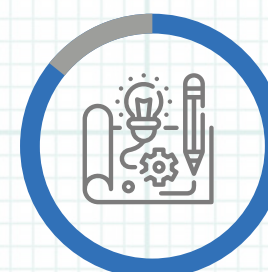
of teachers reported that the project was of **high value to teaching STEM** generally

95%



of teachers **agree or strongly agree** that their students have **enjoyed taking part in the project** and found its content interesting

85%



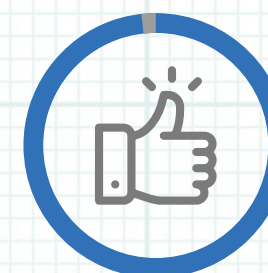
of teachers **agree or strongly agree** that they are now more **confident with the subject of engineering** in the classroom

90%



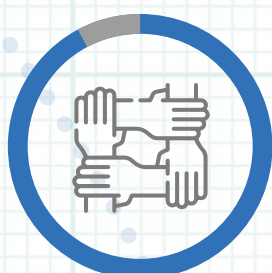
of teachers **agree or strongly agree** that their students understand that **engineering is important** following the project

99%



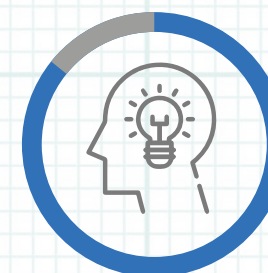
of teachers would **recommend taking part**

94%



of teachers report a **better understanding of the diversity challenges in engineering** and the belief that they **can make an impact on career aspiration**

85%



of teachers **agree or strongly agree** that pupils feel that **engineering is a career anyone can pursue** after involvement

Evaluation and Research

This last year saw the evolution of the Primary Engineer strategy used to determine the impact of programmes. This evaluation strategy examines the ways in which pupils and teachers are supported to develop through their experience with Primary Engineer.

This approach is informed by educational research literature to provide a deeper insight into the impact of these experiences. For pupils this includes examinations of enjoyment and curiosity for engineering, the development of engineering career knowledge and interest, and the acquisition of engineering skills such as systems thinking and creative problem solving. The impact of these experiences on teachers is also considered including teacher confidence with the engineering subject area and the value placed on engineering within curricular learning experiences. The use of this research-informed approach to evaluation supports the validity, reliability and wider insight developed through programme evaluations.

Primary Engineer has supported a PhD research project with Rory MacDonald and the University of Central Lancashire examining how young people are supported to become engineers. This project considers the distribution of engineering resources, including access to programmes such as Primary Engineer, as a perspective on how future engineers are developed pre-tertiary education. These resources, or 'engineering capital' have been found to align with greater interest in engineering education and career pathways.

Other research in 2021 by Laura Fogg-Rogers and Nathan Sanders, from University of the West of England: They undertook a detailed review of West of England entries into the 'If you were an engineer, what would you do?' competition. They looked specifically at the impact of socioeconomic status on problem solving. Their work looks to bridge the gap between how engineering is presented and what children value enabling engineering companies to reflect a more targeted emphasis within their recruitment material, widening its appeal to young people.

These research insights will be available in 2023



Events and Conferences



Royal International Air Tattoo (RIAT) Techno Zone hosted Primary Engineer and our curation of the Inspirer Stage with RAF Charitable Trust, which included Colonel Charles Duke, Major Tim Peake, Bake-off star engineer Andrew Smyth with Carol Vorderman.

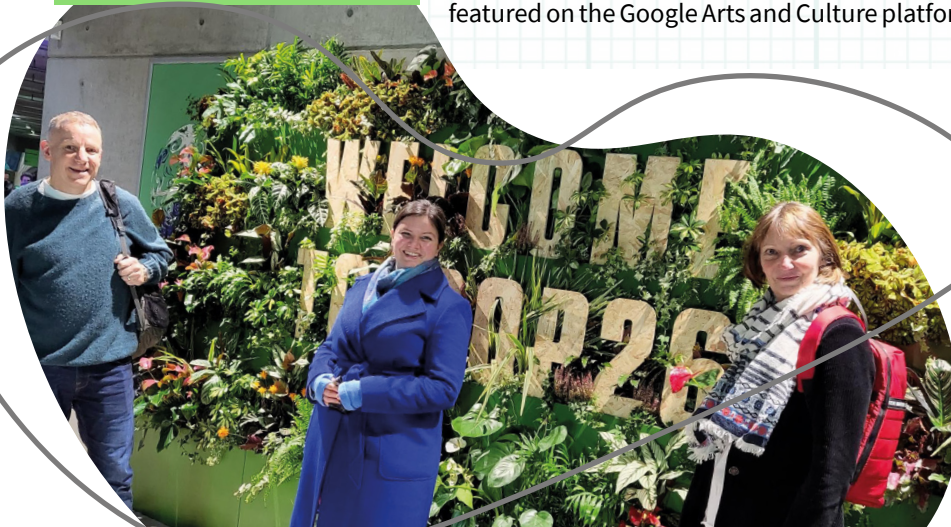


Camp Bestival in Dorset and Shropshire brought together STEM and music loving families to take part in Primary Engineer 'Engineers In The Making', Science Tent.



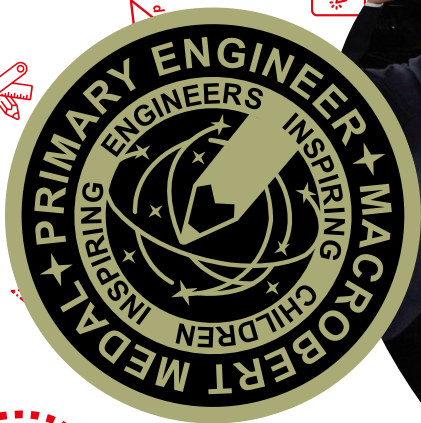
Primary Engineer at COP26, part of the exhibition showcasing the Flat Pack Wind Turbine and STATWARS Climate Change Challenge.

As part of the live events the Primary Engineer MacRobert Medal winners were announced and featured on the Google Arts and Culture platform.



Primary Engineer MacRobert Medallist

Presented by Ivan McKee, Scottish Minister
Merchant Hall, Glasgow



Outcomes of 2021-2022



“The best CPD I’ve attended in my time in education! The quality of the resources and the guidance was amazing!”

The Rosary Catholic Primary School

“The project is well-resourced and supported, with check-ins along the way and help in finding engineers. The lesson plans and curriculum links were extremely useful in minimising workload for school staff.”

Rashielea Primary School



“It is a great project and the support putting it in place is Super. Thank you for saving the future and keeping worthwhile jobs...”

Hautlieu School



“Through the training I have gained confidence in DT and engineering.”

Grange Lane Infant Academy

“Nick has been an excellent trainer. He has been very useful and taught me a lot about how to complete these activities in class as well as little tricks that will make teaching these sessions easier. Thank you!”

Gomersal Primary School

“Delivering a practical course online is extremely challenging. I admired Nick’s patience as he assessed the problems on the models. Some of the suggestions such as using the pencil sharpener at the end of the dowel and using the drill to twist the wires were inspired.”

Coppice Primary School



“ As the lead of the AMPI programme I am delighted to be working with Primary Engineer to bring this amazing opportunity to the wider Rochdale area. We want to help provide a platform for UK industry to develop its ideas and be a beacon of diversity and opportunity for people coming into the field and engaging with schools is vital to achieving that.”

Excerpt from ‘Life in a Northern Town’, published by The Northern Powerhouse Partnership



“ It is fantastic to see the enthusiasm from the school children and the Primary Engineer programme has been vital in helping open their eyes to a career in engineering.”

**Sambit Banerjee, Managing Director
Siemens Mobility Rolling Stock &
Customer Services UKI**

“As part of their arrival in the town, Siemens Mobility have worked with Primary Engineer who have an extensive record of working with Siemens in the UK more widely, to drive up STEM engagement in the immediate primary schools in communities close to the new factory. This approach to developing a long-term talent pipeline is to be welcomed and moves beyond an over emphasis on the role of employers in careers education to the exclusion of applied material in the curriculum. There is a role of greater significance in tying the curriculum to relevant opportunities for future careers, making subjects more applied to increase engagement.”

Excerpt from ‘Life in a Northern Town’, published by The Northern Powerhouse Partnership



“It’s an excellent opportunity to inspire young people and help build some of the practical and cognitive skills they need to pursue an engineering career.”
Alex Creswell, CEO of Thales in the UK

“Here at WEIR innovation is core to what we do, and we are delighted to support the Primary Engineer MacRobert Medal to encourage and develop innovation in young people and early career engineers – this is where, we believe, our futures begin.”

Jon Stanton, CEO WEIR Group



“The MacRobert Trust, with our long-term passion for supporting engineering across the country, at all levels, is truly delighted to be supporting the entire Primary Engineer initiative and the inspiring ‘If You Were An Engineer, What Would You Do?’ competition, in particular.”

Chris Hockley, The MacRobert Trust

“This government is keen to see more take-up and teaching of STEM subjects for all our children, which will be vital in empowering young people with the skills they need to secure good quality jobs and build our country for the next generation. That’s why I’m proud to be backing schemes like Primary Engineer, working with local schools and businesses to inspire children to become East Yorkshire’s next generation of engineers.”

Lee Rowley, BEIS Construction Minister



“We’re very pleased to work so closely with Primary Engineer, and this award is great recognition of the students’ efforts.”

Dr Andrew Cowell, Glasgow Caledonian University

With thanks to our supporters...



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