

Autumn 2019 Funded Projects

Primary school successes, ages 5-10. Page 1-2
Secondary school successes, ages 11-16. Page 2
Primary and Secondary successes, ages 7-16. Page 2-3
Secondary and Further Education successes, ages 11-19. Page 4-5

Primary school successes, ages 5-10

Stirling Light Science Week

Light Lab Project, Scotland

A new ten-day stem event based in Stirling, includes a series of exciting primary school touring workshops based on the science of light for children. A large drop-in family weekend event to be held in the new Engine Shed building run by Historic Environment Scotland.

Lighting Up the Curriculum for Excellence

SCDI, Scotland

The project introduces primary pupils and their teachers to the exciting world of electronics. Teachers come to a half-day CPD soldering workshop with plenty of support from a team of three engineers and a physics teacher. Teachers are often terrified for the first ten minutes but soon the room goes silent as they become confident and excited about mastering these new skills, which they look forward to passing on to their pupils. We provide each school with a starter kit containing a soldering iron and all the necessary tools, along with 40 assorted circuit kits. There are three types of LED-based circuit - a flickering magic candle, a colour-changing rainbow and one with five twinkling lights which are ideal for greetings cards. Pupils incorporate these into all sorts of enterprising artwork projects. The project has been very popular with pupils who love the chance to construct their own electronic device rather than just interact with them. Several high schools and universities across Scotland are also using the circuits as an introduction to electronic engineering. Since 2010 we have given around 350 starter kits and over 20000 circuits to schools across Scotland, funded by grants and sponsorship. The response has been overwhelmingly positive.

Getting Around Town (GAT) – an interactive gallery exploring engineering that makes transport possible

Eureka! The National Children's Museum, Yorkshire and Humber

GAT is a new permanent gallery at Eureka! Museum. It will educate children and families about the unseen engineering that makes transport possible; that powers our vehicles, gets us around efficiently and cleanly and keeps us safe. It will:

- reveal the engineering behind transport systems & the day-to-day running of vehicles
- showcase roles associated with designing, manufacturing & maintaining vehicles
- explore the environmental impacts of transport, showcasing sustainable engineering
- excite children from all backgrounds about careers in engineering
- demonstrate that engineering is gender neutral & inclusive

GAT is a key element in our strategy to create new STEM experiences, especially for the over 9s. It will consist of 3 zones covering 150m²: On The Street - townscape exploring the engineering behind vehicles from electric bus to bicycle; Workshop - hands-on discovery of how vehicles work; and Studio - demonstrating how new products are brought to life. The target audience is our 300K+ annual visitors from across the UK, including groups under-represented in engineering. We're working with industry to inform gallery content and involve real engineers in engagement activity. By visiting GAT, children will be inspired by the creativity in STEM and see that engineering is relevant to their lives - now and in the future. Engineers will develop skills and confidence in sharing their knowledge and passion with the public. Engineering's place at the centre of society will be promoted and celebrated. GAT opens 18 May 2020 with a minimum lifespan of 5 years.

Engineering Buskers

The Engineering Volunteering and Outreach Society, North West

A programme run by the EVO society, part of The University of Manchester, to deliver fun and interactive activities to local primary school children, aimed at inspiring an interest in engineering. A group of approximately 30 engineering students will create fun and interactive activities that will teach a basic principle of engineering. We also aim to incorporate a theme of continuity in our activities, and so will leave behind resources that will allow the school children to build upon their findings of our day of activities. The mission is simple: to inspire the next generation of engineers.

Make Some Noise – Let’s get ready to Crumble

Skill Supply Ltd, North West

This project will see children engineer simple "musical" instruments and use the Redfern Electronics Crumble board to programme servos to strike or pluck to make sounds. They will learn how to design and make the instruments, wire the components and programme the control board to make the instruments work and make them work better to produce the sounds. Extending from this activity will be the opportunity to develop an understanding of rhythm and beats. We will use tablet-based applications to discover additional aspects of sound including amplitude, frequency and link to how acoustic engineers impact on the built environment.

Stratford School Sustainable Programme

Graduate Planet CIC, West Midlands

Working with 9 Stratford schools and 8 local charities we will take primary school children aged between 7-10 on engaging environmental sustainability educational visits to inspire, educate and nurture their respect for the natural environment and environmental sustainability. These visits will ignite their curiosity, broaden their awareness of career opportunities and consolidate their Science, DT Maths skills. **Forest day** – Planting trees and visiting a mature woodland at HOEF to learn about the importance of trees and animals. **Biodiversity day** – visit natural habitats with WWF to discover rare and endangered species bats, birds, insects and small mammals. **Energy day** – visit the UK's largest community solar farm HECE to understand Solar, Wind, hydroelectric nuclear power. **Food day** - Visit an organic farm to cook a delicious meal from the vegetables they have harvested themselves and eat a healthy lunch together to learn about food production, soil health, seasonal eating and importance of biodiversity. **Water day** – Visit an wetlands habitat, an inland water eco system demonstrating one of the most valuable, natural resources. **Waste day** – Visit the Pure Recycling Centre to learn about changes in lifestyle, sustainable fashion and alternatives to plastic. Sustainable Cities day involves a giant Lego sustainable city workshop to capture the children’s imagination, illustrating how a city could be designed including energy solutions, low carbon buildings, smart LED street lighting, tree lined streets, green walls, light rail and autonomous vehicles, electric and Hydrogen vehicle charging, recycling, waste to energy plants and future homes.

Secondary school successes, ages 11-16

GCSE Curriculum Education Plans

Urbaser Environment Ltd, South West

Central to the vision of the Gloucestershire Energy from Waste (EfW) facility, is the provision of educational resource to the local community. The site will have a fully equipped visitor centre that can accommodate up to 44 visitors at one time. This will provide a venue for schools, colleges, community and other interest groups to meet and learn about sustainable waste management and resource use, with access to a working facility. The aim of the EfW facility is to establish the visitor centre as a “Knowledge Hub” for the community of Gloucestershire. Within the UK there are several power-generation sites that incorporate a visitor centre for community visits, but none specifically offer qualified teacher developed GCSE curriculum related Education Plans for local Secondary Schools. The purpose, design, function and activities of the EfW site directly relate to content of the National Curriculum and illustrate in a very real and practical way topics and technologies students are taught. To ensure effective use of school term-time for student trips, sessions need to be closely linked to curriculum topics to support both the students’ learning, as well as teaching staff in the provision of high-quality teaching resources. As well as meeting curriculum needs, schools are encouraged to promote and offer STEM (Science Technology Engineering and Maths) activities for students, as well as offer independent careers guidance. Visits to sites such as the Gloucestershire EfW plant are a wonderful opportunity to inspire and broaden students’ awareness of potential career directions available.

Primary and Secondary successes, ages 7-16

Wearable Technology Workshops

Coding Bug, South West

I will be offering workshops free of charge to children in North Somerset at local libraries. The content of the workshops is aimed to inspire young people into the world of wearable technology using e-Textiles - combining textiles and electronics. The students will be introduced to the basics of electronic principles and combine textiles and crafts to make a wearable product. The students will learn about the materials used in e-textiles and use them to make electronic circuits with conductive thread. The students will design and make a wearable product in a 3-hour workshop with all materials provided. Finally, the students will learn how to test and debug their product.

ENGINEERING@WORK

STEM@WORK, South East

ENGINEERING@WORK offers the opportunity for local secondary schools to take part in different projects in electronic/computer, civil, mechanical, chemical, electrical and aerospace engineering to get engineering working in schools. Allowing students to experience the wide ranging and exciting disciplines within the field of engineering and gain a hand on and deeper understanding of engineering. Students will learn how to design, build and apply knowledge of engineering to build their very own hydraulic pump, wind turbine, conveyor belt, bath bombs, jewellery, bridge, rocket/car whilst learning about different career opportunities. Each school will have training on how to run the project with equipment empowering schools to deliver out-of-this-world STEM projects that will enthuse students. The project minimum requirement is 10 students from every school however the aim is for schools to make these activities bigger and develop this into clubs and set up their STEM infrastructure so even more students can take part.

Coding with Robotics' Workshops and Training

Start2Code, Greater London

To enable students living within South London to experience the 'Coding with Robotics' workshops for free. They will construct/assemble, code, operate and de-bug their robots in order to enable the robot to complete a task and have the opportunity to add in their own enhancements to the construction of the robot and its uses, thanks to the versatility of the Robotics equipment used, which is 'Roborobo'. 'Roborobo' emphasises; 'Making, Coding, Moving and Thinking', providing a fun learning resource while enhancing creativity, logic and spirit of inquiry. One Roborobo pack allows up to 10 different types of robots to be assembled - making them very cost effective.

The venue of the workshop will make it accessible for local children of all backgrounds and genders to take part, for example Clapham library draws in a range of children from ethnic minorities and social disadvantage. The cost of room hire is also affordable.

This project will be driven by 2 STEM Ambassadors, myself and a qualified teacher, we are already involved in education.

To date we have used feedback sheets from children and parents to provide us with data on our impact. We also ask for feedback which measure the levels of enjoyment and learning outcomes for each workshop.

In future we can look to advertising, funding from Local authorities, partnering with other organisations such as schools as sources of revenue.

Make it to Mars

Urmston Grammar School, North West

"Make it to Mars" Faraday Challenge where teams of 4 year 8 pupils will design a rocket, assemble and programme a rocket transporter and a mars habitat where astronauts can spend long periods of time on Mars. Make it to Mars is a DIY Faraday which we have adapted, we use 8 legomindstorm robots as transporters and pupils must programme the legomindstorm transporter to move to the exact launch site carrying their cardboard rocket, this requires mathematical calculations. They also adapt the transporter to carry the rocket without causing the rocket to move. We launch the rocket at the end of the day. The team then need to design and make a prototype Martian habitat for humans to spend long periods of time. We have run this challenge at our own school for our own pupils for three years. Pupils really enjoy it and now we would like to invite students from other schools to take part. Each team member chooses a job: software engineer to programme the robots, aeronautical engineer to design the rocket, civil engineer to design the habitat, accountant to manage the budget and project leader. Team members buy equipment for the project and need to stay in budget.

Sustainable Futures – Machines, Forces and Energy

Edmund Rice College, Northern Ireland

The project will have two key strands that will run in parallel throughout the months of January 2020 – March 2020. In this time 3 primary schools will be working on a sustainable transport project. Year 10 Students in Edmund Rice College will be using solar panels to design and make a prototype energy solution with the sole target of making a greener future. All of this work will be linked to the recent work of Greta Thunberg who has already captured the imagination of a generation. All of this work by students and staff will be showcased at a Big Bang Day in school. The Big Bang at school day is part of a larger STEM celebration week run by Sentinus in Northern Ireland. As a result of this partnership we have links to engineers and additional resources to make this project a success. The engineers in particular that we will have access to link directly to sustainable transport and sustainable futures as they are employed by Bombardier Aerospace and Sensata Technologies.

Secondary and Further Education successes, ages 11-19

Community Youth Board Maker Clubs

Bright Box Makerspace, Yorkshire and Humber

This project has been created to increase the life chances of young people in Castlegate, one of the 10% most deprived areas according to the government's indices of multiple deprivation. We will tackle the social and economic barriers preventing young people from accessing STEM careers. To do this, we are creating a Community Youth Board. We will give 10 young people the opportunity to engage with STEM ambassadors and professionals to create a programme of STEM activities that will reach a further 240 children and young people throughout the year. The grant will provide us with the necessary funds to execute the Clubs and reach 240 children and young people with inclusive STEM activities led by role models in STEM industries. The youth board will be introduced to activities including coding, 3D modelling and printing, electronics and machines, led by role models in STEM. They will then use what they have learned to create a programme of activities that are wanted by children and young people in Castlegate. We'll then implement the programme they've created, giving a further 240 children and young people access to informal STEM learning and role models. They will be able to interact with inventors, makers, and engineers from a range of industries - enabling young people to learn about careers in STEM while experiencing fun and exciting STEM play and development. Our Clubs will use Maker Education frameworks which are proven to encourage creative problem solving and hands-on inventing.

Electronics Electronics Electronics

1st Mid Suffolk Boys Brigade and Girls Association, East Anglia

Introduce young people to practical electronics by using small electronic project kits (eg flashing LEDs, crystal radio, intruder detector etc). Then expand that to include integrating electronics and computing (eg Raspberry Pi) to build real world solutions with electronic hardware and coding.

OEM TIER manufacturing of Electric Vehicles by schools

UOW and Gwawr, West Midlands

The project is based around the manufacture of small electric vehicles (EV) and more specifically solar powered cars. This project will also provide the children and schools with an understanding of tier manufacturing to supply chain. Regularly schools report that they are unable to handle a large scale project such as the single build of a Greenpower car, yet in discussion it is found most schools would or could manage the build of a sub system on such an EV with the appropriate support. e.g. one school will manufacture the uprights, another the wheels, another control the logistics supply chain. Schools will then come together during a 'Big assembly week' to build 4 solar cars from their OEM manufactured parts at the Telford Campus. Schools without manufacturing capability can be involved using STEM to plan and calculate the needs for the total engineering activity. Cars will be raced during the UoW SciFest in July. To manufacture a car is one thing, but the maths and science to race it are a whole other area to contemplate. Teams will need to ensure they are driving at a speed to match the charging capability from the weather on the day. Teams will need to broaden their skillsets to include for example catering students who will learn how maths is embedded in all subjects as they research supply chain and the finances they need to feed their team on the day. Body kits will be manufactured by UoW to reuse each year.

Our Diverse Planet - to survive, to move and to entertain

Enfield Town Schools Partnership, Greater London

We will deliver a term-long STEM project with a focus on 'energy transfer' (the theme was inspired by British Science Week's). Year 5 primary pupils (age 10) from 20 schools will engage in engineering workshops delivered by external organisations. Workshops will explore our theme of 'energy transfer' so pupils can learn how things work, move and grow as energy converts from one state to another. This will help develop an understanding of engineering as well as generate excitement and engagement in our STEM project. Staff will also receive specialised STEM CPD to enable them to support pupils. Pupils will be encouraged to think about 'our diverse planet' by inventing something to improve the ways we design our homes, transport and leisure time and to make these environmentally sustainable. Pupils will showcase their science projects to their school community who will vote for the best projects to represent their school at a celebratory science fair. A local secondary school will host this event and their Year 9 (age 14) students will support delivery. The celebratory fair will include a carousel of different 'energy transfer' engineering and science activities plus opportunity for pupils to engage with STEM Ambassadors from a variety of STEM backgrounds who will also judge the pupils' work. We will also deliver a STEM careers fair for Years 10 and 12 students to showcase the diverse range of STEM careers and the different paths into these fields.

The Internet of Things and Our School Environment

Canterbury Christ University, South East

This project involves the creation of engineering solutions for school environments using the Internet of Things. Environmental factors such as air quality, water quality, temperature, humidity, noise and vibration are examined by collaborations of students, teachers, IET and IMechE members and STEM Ambassadors. These collaborations use physical computing and the Internet of Things in schools, to identify environmental problems and build a network of sensors, computers and actuators to propose and trial solutions.

The project, aligned with the STEM [Curriculum](#) and Engineering Habits of Mind [\[1\] \(EHoM\)](#), allows teachers and students to: gather data from sensors in a school environment; examine and analyse data in their school's learning and social spaces using the internet and Microbits; and programme physical actuators to react to the data. Activities include: selecting and constructing sensor networks for environmental problems; examining data sets; negotiating team roles for installing and coding; testing hardware; working scientifically through enquiry and dialogue across STEM subject areas; and examining industrial, scientific and medical [grand challenges](#) for engineering.

[\[1\]](#) See also Hanson, J., & Lucas, B. (2014). Thinking like an engineer: using engineering habits of mind to redesign engineering education for global competitiveness. In *The State of Engineering Education – SEFI Conference*. Birmingham.