

Spring 2020 Funded Projects

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Primary school successes, ages 5-10

Cleaner Energy for a Better Tomorrow

Imperial College London, Greater London

This project seeks to introduce girls aged 7 - 8 to the importance of renewable energy using a range of commercially available solar, wind and hydropower energy kits. As children become more conscious of their activities and decisions, they should also learn about the environmental impacts of these activities. This includes understanding where the electricity they use comes from, why they should manage it and what alternate forms are available. Educating children about renewable energy practices and linking it to how engineers collaborate to develop new and more efficient ways to generate electricity from renewable resources can inspire the next generation of engineers and innovators. These early lessons ensure that children can grow up with these practices as opposed to adults who have to learn to adapt. This can also have a ripple effect on the energy practices of their family and their immediate community.

Tinkering Club

Institute of Imagination, Greater London

Incredible examples of engineering are all around us from saving lives to visiting the stars – all of this is made possible from a spark of imagination and inspiration. We want to empower children to re-imagine how STEM skills could be used to do something amazing and we want to ensure that every child knows that no matter what their background they have the potential to come up with the next big thing. iOi will create a 6-week STEAM Tinkering Club – workshops curated by iOi and delivered by our expert facilitators in partnership with engineering partners (i.e. Rolls Royce, LEGO, Concept Shed). Sessions will break down pre-conceptions of engineering for both adults and children and encourage self-directed learning and discovery. We recognise that parental engagement is essential in improving access to education for children – and Tinkering Club will provide a fun and accessible springboard for families to come together and learn tangible and intangible skills as well as increasing confidence with STEM subjects.

Outer Space

St Bede Academy, North West

This project trains and equips staff from 7 primary schools in Bolton to deliver a 2-week programme in their respective schools based around the theme of Outer Space. Once trained the staff will be able to repeat this programme in subsequent years at minimal cost.

The programme will enable children to explore exciting job roles in engineering, science and construction linked through the theme of Outer Space. The schools will work collaboratively throughout the training and delivery period, culminating in a joint exhibition and Dragon's Den for all participating schools. Winning entries from each age group will be rewarded with a VIP visit to the Museum of Science & Industry in Manchester.

Children from Early Years through to Key Stage 2 will be involved in the following activities:

- EYFS: design and make a rocket
- Key Stage 1: Design and make space suits
- Key Stage 1&2: Design and construct a Moon Buggy.
- Key Stage 2: Design and construct living facilities on the Moon.

Throughout the project, children will:

- Use a 'Career Passport' to evidence their knowledge of roles in STEM
- Meet and work with STEM Ambassadors from Science, Construction and Engineering backgrounds
- Broaden their knowledge of careers and roles within STEM
- Break down stereotypes in gender specific roles.
- Develop an initial understanding of enterprise through the 'Dragons Den' competition.

We have good links to Seddon Construction Ltd, a local company committed to support the project with their staff.

Starting from Scratch in Manchester

North West

This programme will reach young people and their teachers/group leaders across the Manchester area. It will introduce high quality teaching of coding using a variety of coding languages. Starting with Scratch, is a simple visual software allowing children to rapidly see the results of their actions; and building up to the more advanced Python language. The addition of digital controllable hardware will bring the coding to life (e.g. games, cranes, vehicles, robots etc). Initial research indicates that there is a strong appetite for this kind of delivery both within the education and community group sectors.

STEM @ Home

STEM Create, Yorkshire and the Humber

A programme of home-based activities to engage KS2 pupils with practical engineering based cross curricular STEM activities, primarily aligned to National Curriculum KS2 Design & Technology, Mathematics and Science programmes of study, during and/or in the aftermath of the current COVID-19 crisis.

A mailed box of materials and full resources is delivered directly to (primarily disadvantaged) pupils to enable them to carry out practical tasks that involve creative making based activities, revolving around 4 career linked topic themes:

- Historical

- Trebuchets - how did the Romans develop torsion engines?
- Powering the Industrial Revolution - why were water wheels important?
- Bicycles - how did the Victorians use and develop them?

- Space

- Travelling Further - How can spacecraft fly so far?
- Exploring Other Planets - What type of vehicle can drive around in space?
- Measuring Space - How big is space?

- Architecture

- Planning Cities - What goes where in a new city?
- Mega Bridges - How can we cross a big river?
- High-Rise Living - Who needs to live in tall buildings?

- Futures

- Alternative Energy - How can we provide electricity using cleaner methods?
- Powering Vehicles - What technologies can be used to make things move?
- Better Farming - Which farming methods ensure better growth of crops?

Each activity will be led via a weekly video release (via YouTube or similar), but also with adequate written guidance for pupils, should they not have access to the video.

Engineering Your Story

South East

Do you like Ana and Elsa from Frozen? How about Baby Groot? Or Moana? Or Fortnite skins? Or the new Pokémon? What if you could learn to create a 3D model of your own character, just like these, for free?

Children's entertainment is full of sophisticated technical engineering. Showing children how their favourite characters are made, by allowing them to create their own, is an accessible and exciting way to introduce three dimensional concepts and software. The project is a free, six-week programme for older primary pupils to get excited about creating in three dimensions. This female-led initiative is specifically designed to inspire all genders, ages and abilities. A practical and self-led approach that uses imagination and storytelling to enhance STEM learning. Students are guided step-by-step through concept to computer-aided-design (CAD) technology to make a 3D character of their own creation at different stages of fidelity. They start with clay and 3D pens to experiment with character proportions, then move to Tinker CAD to realise the basic character form and block scene setting. Finally, they use Blender for enhanced character definition and adding "bone structure" to the character to enable animation. Everyone loves stories – and bringing story together with engineering appeals to the widest audience. Funding this project allows children from all backgrounds to access engineering technology in a way that will inspire them for the future.

Secondary school successes, ages 11-16

Engineering: The Future - Make things happen

Ulster University, Northern Ireland (NI)

We want to inspire, encourage and support local school pupils, through early intervention, to create the next generation of engineers, especially promoting Engineering to females and under-represented groups across the Derry and Strabane district council area. Derry-Londonderry has a high level of financial and social deprivation. Five of the ten most deprived localities in NI are located within Derry and Strabane areas: [NI Multiple Deprivation Measure 2017](#).

Education through STEM introduces children to four specific subjects in an interdisciplinary and applied approach. Significant gains in learning can be made through integrating the subject areas into a more cohesive learning paradigm based on real-world applications of the subjects. The delivery of subject areas directly linked to real world examples and applications makes the vital link between theory and practise for aspiring engineers and scientists.

The next generation of Engineering will encompass the Industry 4.0 principles:

1. Artificial intelligence
2. Robotics
3. Automation
4. Industrial Internet of Things
5. Industrial digital technologies.

Within industry 4.0, AI and Smart Manufacturing are directly affecting change in industry, robots have become the intuitive outcome of advanced science and Engineering technology. The future of manufacturing will rely on robotic operation of tasks that suit the technology. However, the skills and knowledge required to support the introduction of such technologies are not readily available. In order that we can keep pace with the development of times, we need to introduce robotics learning to educate pupils within an interdisciplinary and applied approach.

HENRIETTA LEAVITT DAY: 'The Sky Was Not Her Limit'

Links to a Life, South West

Research and consultation leading to the commissioning of a new biographical play - the Henrietta Leavitt story - about American astronomer, Henrietta Leavitt (1868-1921), followed by the recruitment of a cross- discipline creative team and rehearsals for a tour of day-long intervention: 'HENRIETTA LEAVITT DAY: science through story', to six South West secondary schools and to the Norman Lockyer Observatory at the Sidmouth Science Festival, October 2020.

Leavitt's discovery, a method to determine stellar distances, is introduced in the classroom and the period luminosity relationship explained to participating students. Hubble, far better known for his scientific works than Leavitt, used Henrietta's discovery to reveal that the universe is expanding, demonstrating that scientists build on one another's work- a key narrative in all of Links to a Life's interventions

'HENRIETTA LEAVITT DAY' is modular and slots into a school day (5 x 1hr lessons)

Lesson 1 - introduces the protagonist and the team. The solar system stars are introduced and explored through 'Searching and Spotting' games.

Lesson 2 - the history; context of Leavitt's life (early 20th century America and Europe) and biographical details are shared

Lesson 3 - 'in research teams' using the Maths she used: hands on calculations including: trigonometry, graph plotting and determining relationships

Lesson 4 - Links to a Life present the play: 'The Henrietta Leavitt Story' - set in the school science lab, performed by three professional actors

Lesson 5 - plenary session led by creative team and supported by visiting STEM professional.

Design of an Music and Audio Engineering "Electronics Everywhere" Project for KS3

University of York, Electronic Skills Foundation (UKESF), Yorkshire and the Humber

This project will create a prototype toolkit (inc. hardware and software resources) for Key Stage 3 (years 7-9) teachers and students to enable them to explore the relationships between music, science, technology and engineering. The toolkit will be aimed specifically at classroom music teachers to allow them to introduce audio and music technology in a fun and engaging way. Importantly, it will help them and their students explore and understand the science behind sound and music. It will also showcase some of the possibilities and opportunities engineering and technology provide - i.e. it is a creative discipline with innovative and real applications, not limited to only maths and soldering.

Specifically, the project funding will enable this collaborative project between the UKESF and the [AudioLab](#), Department of Electronic Engineering at the University to run crucial needs analysis focus groups and develop a prototype toolkit in collaboration with local teaching staff from 5 schools, before testing with ~50 Key Stage 3 students to evaluate its effectiveness. Feedback gathered during the project will form the basis for further development and a wider rollout of the toolkit, across multiple schools as part of the "Electronics Everywhere" programme run by the UKESF.

Exploring Engineering

Leeds City College, Yorkshire and the Humber

The project will provide 40 students with immersive practical engineering workshops from a choice of key engineering disciplines (mechanical, electrical, engineering design, and automotive).

The workshops have been designed to have maximum impact for those young people taking part by not only enabling the students to develop new engineering skills, but also gaining confidence in their engineering ability and exploring opportunities in relation to engineering further study and career pathways.

The project is designed to be inclusive in its reach, with particular focus on ensuring representation from female students, students from ethnic minorities, neurodiverse students, and those from disadvantaged backgrounds. The project is far from light-touch in its format and will directly tackle known barriers to pursuing engineering study/careers for each individual attending. The project will project a flexible model of teaching to respond to diverse ranges of prior educational attainment, grow science capital, and combat negative perceptions and misconceptions around engineering.

Our project objectives include:

- ensuring young people attending the workshops realise they can become future engineers.
- giving students and teachers knowledge and confidence around the broad range of engineering opportunities for further study and careers whatever your background, or engineering aspiration.
- teaching specific engineering skills to young people that relate to their immediate world and connect them to engineering in a wider-context

Primary and Secondary successes, ages 7-16

Accessing advanced technologies for home schooling

UK STEM Ltd, Home Schooling Group in NE Lincs, Yorkshire and the Humber

Through 3 technology sessions the participants will develop an understanding of how advanced technologies in control and design allow engineers to develop solutions. The sessions will cover autonomous vehicles, control systems to mix your fruit-based drinks and robotic orchestra. They're all fun activities with many real applications from medical engineering to transport to control of remote robots even in space.

We are asking for funding so home educators' children can access STEM as a community project as they do not have the same opportunities a school child has to attend these projects in school settings, whether it be choice or because of complex disabilities.

Note from Sarah Baxter, Home Educator: There is a serious lack of opportunities for our children to access any science and technology-based activities in North East Lincolnshire. We are a group of Home educators looking for a STEM project for children aged 7-16. By working with Mike to organise a Pop-up project to enable our children to gain experience of STEM that we can have a gateway to this type of education we would not necessarily have access to. We are always looking for ways to facilitate extended learning to let our children explore possibilities in a fun safe environment. My son is having STEM lessons with Mike from UK STEM and I have had a lot of interest from parents asking for a workshop. There is a lot of creativity in our Home Educators group but no way of accessing STEM.

Robohub

Longdean School, East Anglia

We want to create a 'Robohub', to introduce robotics into the curriculum, and launch a STEM/Robotics extra-curricular club. Purchasing a class set of VEX IQ kits will facilitate this and allow students to develop expertise in programming, design and construction, with the ultimate aim of competing regionally and beyond in the VEX Robotics IQ Challenge. Robotics brings together all four aspects of STEM, while a competitive environment increases motivation and desire to succeed. This allows knowledge and skill development to flourish while increasing interpersonal skills, teamwork, creativity, perseverance, problem solving and time management – all key skills for the engineers of the future. We are a specialist Maths and Computing school and in 2019 we established a specific 'STEM' stream amongst our new year 7. Students with an interest and aptitude made an application and were selected to form a class which has additional STEM lessons and an expectation to participate in extra-curricular activities. This class has a gender balance and we are trying to involve students from all backgrounds inc. those which have not traditionally focussed on STEM subjects. This STEM stream will be an annual feature of our Year 7 intake, and we envisage outreach into our feeder primary schools to increase enthusiasm even before students join Longdean. The flexibility of the VEX IQ equipment will allow the projects to grow and develop as children move up the school.

The excitement of robotics cannot fail to catch the imagination of our pupils.

Make Live

Koan Arts, East Anglia

Make Live is a project bringing together STEM and Art to invent new physical interactive interfaces, encourage digital literacy and inclusion while having fun. It will take place in Roman Hill Primary School and Pakefield High School, which both serve socially disadvantaged communities in Lowestoft. Students will learn skills to design and craft interactive artwork. Students will explore aspects of their local heritage via the local Lowestoft Maritime Museum and interviews with family members, make audio recordings and imagery related to this. They design and prototype interactive artwork with trigger points for sounds and voices in response to their local area. At the end of the project these will go on public display with the students demonstrating them, either at Lowestoft Library or Lowestoft Maritime Museum.

Secondary and Further Education successes, ages 11-19

The Spirit of Vectis

South East

The Spirit of Vectis is a project designed to raise awareness of engineering as a career among young persons on the Isle of Wight. The project will gather some 40 youngsters who will build and fly a light aircraft. The aircraft selected is the Sherwood Ranger, a substantial and complex kit offering experience of working with Aluminium, steel, wood, composites, hydraulics, electrics, avionics and fabric. The timescale for construction is 3 years. The base will be Bembridge airfield on the Isle of Wight using a hangar formerly used by Britten Norman. The project already has an aircraft, a part complete kit of a single seat monoplane called a Team Max, presented by Youth and Education Support, an offshoot of the Light Aircraft Association. This aircraft will never fly again however the project will use it as a training buck. This will allow team members to “cut their teeth” on a real aeroplane but the inevitable mistakes will not affect the airworthiness of the aircraft but will provide a superb learning experience for the team. In the early stages team members will build small pedal planes from plans. Once again this will develop their basic engineering skills at an early stage without affecting the flying model. The pedal planes will be used to entertain infants at shows on the Island. Over the course of 3 years team members will get involved in Adventure Training and Charity work within the Community to create a well-rounded and eminently employable young person.