Spring 2018 Funded Projects

Greater Manchester Engineering Challenge Plus
Science & Engineering Education Research and Innovation Hub
The University of Manchester
Primary, Secondary & FE College Activity

The 'Greater Manchester Engineering Challenge' (GMEC) was developed for the first time in 2017-2018. It has been an ambitious project, engaging over 1500 primary and secondary pupils and their teachers in the engineering design process and developing engineering habits of mind. Success from this, together with core areas of learning that arose during the process, mean that the GMEC model can be further enhanced to meet the needs observed in schools - specifically girls into engineering, teacher confidence to teach 'through' engineering contexts and how to support professional engineers to engage with curriculum learning opportunities. It is believed that by focusing more concertedly on raising professional consciousness of issues related to engineering as a career option for young people, as well as providing inspiring engineering challenges for pupils relevant to their aspirations (with particular emphasis on girls), is the next step.

As such this project responds to the Wellcome Trust (2017) 'State of the Nation' Primary Science Education Report that 35% of boys and only 2% of girls considered engineering to be a career preference. Building on successful partnership with Siemens and University academics, the approach will be refined to create a transferable programme of intervention that can reach beyond Manchester, that up-skills teachers to be confident in how the curriculum can be addressed 'through' engineering contexts, engages children in contemporary real-world challenges and profiles how professional engineers can best engage with mainstream learning in schools.

Maker Camp
Bright Box Makerspace
Mount Tabor - a community space in Parson Cross, Sheffield
Primary, Secondary & FE College Activity

This project was created and planned to increase the life chances of children in Parson Cross, one of the 10% most deprived wards according to the English Indices's of Deprivation, and as a response to the socio-economic barriers into STEM careers for children living in disadvantaged communities.

Maker Camp is a week-long STEM programme for children aged 7 to 11. The IET grant will provide us with the necessary funds to launch a pilot project in Parson Cross, Sheffield with the intent to grow the programme across all Sheffield wards over the next 5 years, enabling all children to have the opportunity to access informal STEM learning and STEM role models.

During the week, children will be able to interact with inventors, makers and engineers from a range of industries. The children will complete projects using coding, 3D modelling and printing, electronics and simple machines, led by industry professionals and partner organisations.

The Camp will use Maker Education frameworks to encourage children to be problem solvers and inventors. Maker Education has been proven to engage children from underrepresented backgrounds and with special education needs with STEM and encourages creative problem solving.

Beyond the week-long Maker Camp, the resources provided by this fund will create a legacy project to:

Development and document a Maker Camp programme to be expanded to each of Sheffield's 28 wards

Create a library of hardware to be used in community spaces throughout the year for a range of STEM programmes for children and training for teachers

Future Engineers: Tinker, Maker, Coder, Try
Science Oxford (The Oxford Trust)
Rose Hill Community Centre
Primary, Secondary & FE College Activity

Our project aims to inspire young people who have had limited opportunities to engage with STEM subjects to consider a career in engineering. Through a combination of hands-on activities driven by the engineer design process, visits to real engineering workplaces and support from engineer and technician role models from a variety of backgrounds, the project will allow young people who may never have considered engineering 'for them', a chance to understand the wide range of opportunities available to them.

The young people involved will see first-hand how engineering impacts all aspects of their lives and will be able to create a tangible outcome by building a maze solving robot, using the BBC Micro:bit computer. Through this process, they will develop essential skills, both technical and social, which are valued highly by employers. They will make decisions and be encouraged to drive their own learning, developing self-confidence and resilience. The project will be carefully designed to appeal equally to young people of all genders and will be specifically targeted at those living in an area of high socio-economic deprivation. Support will be available to ensure that level of academic achievement is no barrier to participation.

The final celebration event will be open to families and friends of the participants and will be an opportunity for the young people to show what they have learnt and achieved across the week. Our partners, volunteers and IET/ IMechE members will also be invited to contribute to and share in this special event.

Me an engineer?
See Science
Across Wales
Primary, Secondary & FE College Activity

Think about the world around you: planes, cars, roads, mobile phones,medications … even a bottle of water, everything manmade has been designed by someone. Currently the new curriculum in Wales is also being redesigned laying the foundations for a new twenty first century curriculum shaped by the very latest national and international thinking. The new Curriculum aims to extend and promote learners' experiences as well as being inclusive,broad and balanced

Man has been constantly engineering solutions to problems, making life better for those around them whether it is crafting a blanket from wool or designing a large bridge to link an island to the mainland and many of these have had a significant influence on Wales. The purpose of this project will be to educate and inspire teachers and primary students about the breadth of opportunities in STEM careers whilst improving their STEM related skills, by introducing STEM Ambassadors with an engineering background into the classroom, exposing students to inspiring role models as well as offering bespoke hands on workshops.See Science will offer a half day workshop for primary students across Wales and provide a work package that will offer inspirational activities to engage students in engineering and appreciate the broad range of careers on offer to them.

Connecting engineering with the curriculum
The STEM Workshop Ltd
Shropshire
Primary, Secondary & FE College Activity

The proposed programme will embed the teaching of engineering into the primary curriculum offering sustainable solutions to contextualize the learning from across Science, Technology and Maths. The STEM Workshop will work closely with 10 primary schools, working with up to 640 children and 20 teachers (up to 1064 children, 120 teachers and 120 parents exposed at showcase event), providing three projects to each school which will run as part of their daily curriculum offer. The projects will be designed to support better engagement and improved progress in learning. It will develop children's understanding of the world of engineering and expose them to three different sectors within

engineering to help them understand the potential for careers within these industries. It will raise their understanding of how critical engineering is to improving lives.

The three projects, each linked to different engineering disciplines (Civil Engineering, Aerospace, Mechanical and Electrical engineering) not only develop children's skills but also raise their aspirations across a range of STEM sectors to highlight the diversity of activities available.

Schools involved will be supported by The STEM Workshop who will provide them with three full day workshops within the school to launch the projects to the children, along with planning and resources for teachers to continue the learning throughout the term. The projects will rely on low cost resourcing to allow for sustainability of the curriculum in following years. The learning will be showcased at the end of the year to schools across the region.

Engineering Vehicles of the Future
The Design and Technology Association
Stoke on Trent
Primary, Secondary & FE College Activity

The Design and Technology Association is seeking funding to develop and pilot a five-week project designed to engage and inspire young people in micro-electronics. Working with Year 5 pupils, the project teaches the basic principles of coding before challenging them to use their skills to develop their own autonomous device. Through the project, the pupils will be able to explore the place of autonomous devices in modern society and develop a broader understanding of how engineering provides solution for both society's and individuals' needs.

The pilot will take place in Stoke-on-Trent, an opportunity area identified by the Department for Education as an area with high social deprivation. Working with up to 15 primary schools and 5 secondary schools, the project will help address primary teachers' critical skills shortage in the area of design and technology. It will provide them with the training to develop their skills and confidence, and a comprehensive resource to deliver in school. The project covers aspects of both the Design and Technology and Computing curriculum and applies knowledge and understanding from the Key Stage 2 Mathematics and Science curriculum. Pupils will work in small groups to design and develop their own project to create their autonomous device, which will also develop their team working and problem solving skills, and improve their self-esteem.

This model can be replicated in other schools in Stoke-on-Trent, and in other parts of the country.

Bluecoat STEM Festival
Bluecoat Academy
East Midlands
Primary, Secondary & FE College Activity

The 2018 STEM Festival is free to attend and is intended to enthuse year 5, 6 and 7 children from across Nottingham in STEM subjects. The demonstrations in past events, particularly by the University of Nottingham involving cleaning industrial effluent and capturing carbon, illustrate how Engineering can improve lives.

Below are details about the 2017 event:

Saturday 8th of July was the date of the second Bluecoat STEM Festival. STEM stands for Science, Technology, Engineering and Maths and we had some fascinating shows, activities and demonstrations for primary students from across Nottingham.

We had demonstrations and displays from the Universities of Nottingham, Derby, Staffordshire and Nottingham Trent as well as an amazing live show from Mad Science. Game City came along to do a programming activity, and we had fossils on display – including some genuine dinosaur poo! Wates again supported the event, leading the construction of a giant pyramid and the Institute of Engineering and Technology's torch making activity was very popular. GHD Environmental provided interactive fun, and the students could learn about water repellent surfaces with the team from Nottingham Trent.

There were crime scenes, an exercise bike which measures power (it turns out to be very hard to power even a toaster using your own power!) and too many other activities to mention.

By far the most inspiring part of the festival was the way in which Bluecoat students came together to create a day which reminded everyone that STEM subjects are challenging, rewarding and can enrich our lives.

Local Area After School Club - Engineering Inspiration Programme
Cockermouth After School Scheme (CASS)
Held at Cockermouth After School Scheme (CASS) facility in Cockermouth
Primary, Secondary & FE College Activity

In the spring of 2018, Cockermouth After School Scheme (CASS) developed a link with a group of IET STEM ambassadors from local industry. This link has been to develop and facilitate an initial 10-week STEM club during the term time wraparound provision on Tuesday afternoons. So far the activities have included bridge building, egg drop challenges and other basic engineering activities with links drawn to KS1 and KS2 themes on understanding materials where relevant. The rest of this programme will continue using basic resources that are provided by CASS.

The project for which we are seeking funding via the EEGS is an enhancement of this STEM club to provide some more engaging project equipment including modular electronics kits, motors, solar panels, small robotics starter kits and programmable controller kits to show the children how engineered systems can be designed and prototyped.

Given the link to the Year of Engineering theme - "Engineering improves lives" we plan to work with the IET STEM ambassadors to develop sustainability projects including enhancing the children's understanding of renewable energy sources and their ability to bring amenities to remote and rural locations. This builds on the KS2 science national curriculum themes on materials and electricity. Through the continued engagement with the STEM ambassadors and during the delivery of the projects we plan to discuss and dispel misleading myths about engineering careers, seek to inspire a greater proportion of females to consider engineering careers and ultimately broaden the perception about the breadth of the profession.

I'm an Engineer... Can I get out of here???
King James 1 Academy
North East
Primary, Secondary & FE College Activity

The Project will focus on developing STEM based skills in Primary School pupils in order to gain an understand of the importance of STEM careers after leaving school. By introducing STEM at a young age we hope to motivate and encourage pupil them to take an interest in engineering with the hope of them pursing this as a future career choice. Pupils will undertake 4 STEM projects throughout the course of a school year, each one focusing on how engineering can be used to solve a range of different challenge in real world scenarios. Each project will undertake a different theme to engage the pupils: Life on Mars, Being Stranded on a desert island or becoming an aerospace engineer. The aim is to work alongside local engineering companies so that the pupils get as much first hand experience as possible. This will allow pupils to understand how engineers are vital in all aspects of daily life.

The funding from this project will enable us to buy the equipment necessary for the project and allow us to engage with as many primary schools as possible. 50% of the staffing from this project will be carried out by King James 1 staff however some aspects of the project may need to be outsourced to specialist centres in order for students to gain maximum potential from the project.

What Have Engineers Ever Done For Us Exhibition
Common Room of the Great North Ltd
North East
Primary, Secondary & FE College Activity

The Common Room's vision is to use the unique engineering heritage held within our archives, located within the Mining Institute, to inspire the next generation of engineers and innovators. As 2018 is the Year of Engineering, The Common Room aims to promote this initiative by engaging young people and their influencers with STEM by introducing them to the wonderful, inventive world of

engineering. Our 'What have engineers ever done for us' exhibition will tour around the region to a range of heritage and industry sites and will enable the theme of 'engineering improves lives', past and present to be explored by a diverse range of young people and their influencers, including teachers, parents and carers.

The Engineering UK 2018 report highlights that in order to maintain the pace for the population's demand, there will need to be 203,000 people with Level 3+ engineering skills in the UK per year between now and 2024. With statistics such as 36% of parents and 35% of teachers expressing their lack of confidence in advising children about their future career options, is it crucial that STEM based activities are introduced from as early as KS1 to post 16+. This will enthuse the imaginations and inspire future career opportunities in STEM for all 5 - 19 year olds. 'What have our engineers ever done for us' exhibition will enable young people to challenge preconceptions around engineering and investigate STEM skills used by past innovators such as Nicholas Wood as well as identifying them within themselves by completing engineering challenges.

Tomorrow's Engineers Days
Steam Co.
Yorkshire/Humber
Primary, Secondary & FE College Activity

This project will show how engineering improves lives by developing and delivering an inspirational/engaging day for primary children, initially in three schools in some of the UK's most challenged communities in the North of England during national 'Tomorrow's Engineers Week' (2-6 November) before being made available nationwide.

It will open with an all school assembly/talk which will demonstrate and bring engineering and various career pathways to life for these children by featuring stories of engineers from a range of socio economic, gender and ethnic backgrounds and how their work 'improves lives'.

Working with partners and content from Barclays, Rotary, The IET and STEM Learning we will curate a range of engineering-based activities, delivered by the school community that the children can engage in, all built on our proven STEAM Co. Day format.

We will use some budget to create one custom activity pack featuring a real/diverse engineer to 'celebrate the world and wonder of engineering' as per the objectives of The Year of Engineering.

Project legacy will be key and to maximise the investment that will go into producing this day, we will take it to other UK schools in the following year as well as work with a leading primary education practitioner to deliver a project activity pack for schools to use after the day to link it back to the curriculum 'after the circus has left town'.

Sense-able Engineering
Science Made Simple
Yorkshire, Berkshire, Buckinghamshire, Hertfordshire

Sense-able Engineering will see Science Made Simple (SMS) tour their new engineering workshop, Keep Calm! I'm and Engineer! , to 7 deaf schools across Yorkshire, Hertfordshire, Buckinghamshire and Berkshire. The workshop was developed through a previous Royal Academy of Engineering (RAEng) Ingenious Award, and is loosely based on Professor Lewis Dartnell's popular science book "The Knowledge. How to rebuild our world after an apocalypse".

The idea that engineering improves lives is a common theme throughout the workshop. Students are encouraged to engineer their way out of a series of challenges that a post-apocalyptic society might face (e.g. sending messages without technology, building boats for transport etc.). In this sense it focuses on engineers as problem solvers. It builds on the idea that advancements in engineering have helped create the world we live in today, and that basic engineering knowledge would be vital to re-build it after a disaster.

Although not essential to the project, we intend to inviting volunteer engineers to attend and support the workshop delivery in schools. This would give student participants the opportunity to meet and talk to "real" engineers. Through discussion they will learn about engineering as a career and make

connections between engineering in the workshop and engineering in the real world. This will further emphasize how engineering improves lives.

The following blog article provides more information about the Keep Calm! I'm an Engineer workshop and our RAEng Ingenious Award: http://www.sciencemadesimple.co.uk/news-blogs/keep-calm-im-an-engineer.

Brick Dinos – Family Learning Initiative
The Beacon Museum
Whitehaven
Primary activity

The Beacon Museum is a regional museum in Western Cumbria. It offers 4 floors of local history, science and changing exhibitions. Currently employing around 25 people in part time and full time roles, the museum welcomes around 26000 visitors per annum. The museum actively collaborates with Sellafield Ltd in delivering a STEAM agenda whereby STEM is interpreted and brought to life through the arts and heritage. This manifests in a visitor attraction that tells the story of nuclear as part of the history of the area.

We have opened up the theme of the sessions to match more general STEM themes that are present in our museum collection. This can include Roman catapults, Viking sailing ships, nuclear robotics and gear and pulley systems (Victorian maritime amongst many others). These themes are backed up by items from the museum collection which can be looked upon from a more creative perspective. Themes we feel will have relevant activities found within the LEGO WeDo 2.0 programme to cater for a range of STEM based sessions that continue to analyse historical objects through their mechanical motion, and forces exerted by that motion, as well as the design process that the original creator would have gone through.

Festomane Primary Challenge
Festomane
Gloucestershire
Primary Activity

The project focuses on family learning sessions on engineering as way to improve lives though problem solving, creativity and communication skills. This is done through active collaboration in learning activities outside of the school classroom between parent and child. The core audience is children aged 5-11 alongside their participating parents or guardians.

The premise of the bespoke session is to create and programme a robotic LEGO T Rex head using the WEDO 2.0 classroom kit. The sessions will combine natural sciences with physics, computing and design. We will ask basic questions such as 'How did a T Rex move?' and 'How do we see similar principles in modern mechanics?'

Helping young children engage with rudimentary computer programming and mechanical design through LEGO WEDO 2.0, the aim is to use the experience of parents to compound understanding of forces, friction and gravity, whilst also enabling children to think creatively in taking the lead as 'Dino project managers'.

In a region whose workforce is dominated by nuclear sciences, large proportions of the local population engage with mechanical engineering on a daily basis. However the region also struggles to retain its young workforce at school leaver and university leaver stages, resulting in a rapidly aging workforce with narrowing skill sets. Through family learning, there lies an opportunity to impassion children from an early age about their family, or community story in engineering, computing and design, driving aspirations to work in STEM.