

**BUILDING STEM CAPITAL
IN GREATER MANCHESTER:**

HIGH IMPACT AND
COLLABORATIVE
CASE STUDIES

**GREATER
MANCHESTER**
DOING THINGS DIFFERENTLY

November 2019



In Greater Manchester, we know how important science, technology, engineering and maths (STEM) skills, knowledge and qualifications are in increasing life chances and social mobility.

Across the city-region, we have a strong skills offer but we know that it needs to grow in line with the predicted growth of sectors such as digital and creative, health innovation, advanced manufacturing and materials, low carbon growth and the associated infrastructure developments.

To ensure that Greater Manchester has the skills it needs, we have to link our high quality initiatives together to promote a line of sight for developing the right STEM skills at all ages and levels so that residents can keep on building skills in an agile, flexible way that can respond to changing employer needs.

However, we still face challenges. We lack specialist teachers and tutors with up to date industry knowledge, so we need to find innovative ways to co-deliver curriculums with industryadd 'with industry.'. We also know that our STEM industries suffer from a huge lack of diversity, which is not good for business.

We know that solving this is wider than STEM. It is about unpicking challenges that would support the entire skills system across the city-region, create opportunities to work across sectors and learn from each other.

In this booklet, we have set out some best practice case studies showing models of STEM skills delivery that have high impact, promote collaboration between industry and skills providers and focus on groups who may miss out. This is just a taster of some of the innovative ways that STEM industries, educators, learners and STEM facilitating organisations are working together across Greater Manchester.

Your organisation is likely already making a significant contribution to this rich ecosystem supporting and driving STEM skills. The question is – how do you collaborate?

Let's work together and move the STEM conversation on. We know how to do it and together we can ensure that no one is left behind and there are opportunities for all.

Councillor Sean Fielding
Leader of Oldham Council and GMCA Lead
for Education, Skills, Work and Apprenticeships

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EMBEDDING STEM INTO THE WIDER CURRICULUM AT PRIMARY SCHOOL

“
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”

The Royal Society of Chemistry (RSC) has found that many primary school teachers have not studied sciences since their own GCSEs and require support to feel confident to deliver high quality science sessions, lead science conversations and embed STEM elsewhere in the primary curriculum.

In 2018, with support from two postgraduate chemistry students from University of Manchester, RSC ran a 'Is Primary Science Real Science?' workshop at St Luke's Primary School in Manchester.

The interactive session, involving all 43 members of staff at the school, showcased resources on RSC's website and gave staff the chance to get hands on with six different experiments.

Three experiments use the idea of teaching science as a science, using RSC's solids, liquids and gases primary demonstration videos, including the 'Freaky Hand' experiment and 'Invisible Fire Extinguisher' experiment.

The other experiments looked at teaching science in context within topics such as the Vikings, Tudors, space and so on. Using RSC's science idea webs, 'Experiment with the Vikings' booklet and 'Mission Starlight' experiments allowed the teachers to look at materials suitable for astronaut space suits and visors as well as look at a Viking's diet by dissecting Viking poo.

The session received positive feedback from staff, one teacher said: "We just need the ideas and different ways of delivering them."

Embedding STEM in curriculums early normalises science and promotes its influence on all aspects of our lives.



Find out more:
www.edu.rsc.org
Email: Katayune Presland
katayune.presland@manchester.ac.uk



DELIVERING HIGH-LEVEL SKILLS FOR INDUSTRY 4.0

Siemens, like many engineering companies, is facing specific skills shortages. Challenged with attracting new, young talent into the business, the company has developed a degree apprenticeship route to assist with recruitment.

In 2015, Siemens partnered with the University of Salford to address the skills gaps within its business and customer base. Siemens apprentices now obtain a Higher National Certificate, Higher National Diploma and Higher Apprenticeship with Tameside College, then progress to the university to complete their BEng Control and Automation degree. This innovative skills solution has the benefit of being co-designed and co-delivered with industry, so it directly addresses a sector core skill requirement.

The programme is designed to provide apprentices with flexibility through a block delivery model which meets the needs of the business and its customers.

In December 2018, the first cohort of top-up degree students graduated, with 12 first-class degrees and one upper second-class degree.

Jason Phin, Training Solutions Business Manager at Siemens, said: "Working with a Further Education and a Higher Education partner, we are able to provide a single route from Level 4 to Level 6, covering the range of practical skills and technical understanding that is needed in our workforce to fully capitalise on the opportunities of Industry 4.0."

The Siemens Higher Apprenticeship programme is a fully-fledged degree apprenticeship and is offered to its employees as well as those of its customers, such as Amazon. The top-up degree solution is also offered as CPD enabling other employers from the wider industry sector to upskill their workforce.

Find out more: www.siemens.co.uk/sitrain
Email: Emma Worthington
emma.worthington@siemens.com

MAKING IT RELEVANT TO COMMUNITIES

In August 2019, 45 young football players aged 9-14 learnt about electricity, careers in rail and digital skills by creating a video, without even mentioning STEM.

Community Rail Lancashire (CRL), Abraham Moss Warriors FC, Network Rail and Charity Street Games worked together to create a You vs. Train safety video for children in Greater Manchester.

Network Rail kicked off the project with a safety talk to help the group understand the dangers of the railway. This content is packed full of scientific understanding of high voltage, effects of electrocution on the body, forces and stopping distances. They also discussed the similarities with trams, as many of the young people live close to the tram lines.

As part of the project, CRL accompanied team members and their families on trips to Windermere and Anfield in Liverpool. While travelling, the young people put their safety knowledge to test at the stations and on the train. They discussed the financial and environmental benefits of rail travel as well as potential careers in rail. Children had the opportunity to dress up in real uniforms and talk about paths into various roles.

Future engagement will look at planning trips to depots and visiting where new trains are made. These trips will aim to further inspire the young people to think about careers in rail and STEM in general.

The project received positive feedback from both participants and their families. Mrs Rashid, said: "I am really grateful that my son has had the opportunity to take part in the project. Not only has it taught him important safety information about going on trains or messing about near train lines but it has also improved his confidence and self-esteem as he has been chosen by his peers to make one of the videos. He is really excited about it and helping other children learn about the dangers."

Find out more:
www.downtheline.org.uk

CONNECTING SCHOOLS WITH ENGINEERING CENTRES OF EXCELLENCE

The 'Make in Salford - Engage, Educate, Engineer' programme is a collaboration between The University of Salford, The Morson Group and CREATE Education.

The project aimed to engage and inspire students into a career in Engineering through delivering high quality engineering experiences, a practical project for the students to participate in and information about engineering career opportunities.

Nine Salford schools took part in the pilot, with each school receiving a 3D printer, a full day CPD for teachers and a workshop day for up to 60 Year 8 students. During the workshop, students learnt about additive manufacturing and engineering careers. They took part in a practical CAD/CAM workshop where they learnt how to use 3D modelling and slicing software, then they designed, sliced and 3D printed an item.

A celebration event was attended by finalists from two schools, a team from Primrose Hill Primary School and a team from All Hallows R.C. High School. Each team were invited to present their Morson Challenge projects at the event.

One team designed a Bullet Train that uses electromagnets to propel a train at high speed through a tube. The other team developed the Medi Drone, which could be used to transport and deliver medication in rural areas.

At the end of the presentations, students and schools received certificates and 3D printed medals to recognise their success in the project.

Find out more:
www.createeducation.com

The University of Salford
Email: Maria Stukoff m.stukoff@salford.ac.uk

The Morson Group
Email: training@morson.com



PROMOTING STEM APPRENTICESHIPS THROUGH ROLE MODELS

William Hare has made the most of the government funded STEM Ambassador Programme to promote their apprenticeship opportunities to young people.

Previously, the company struggled to reach young people in schools. Since the launch of the programme in 2016, William Hare now promotes its sector and roles to 40 schools and 6 colleges.

With 30 STEM Ambassadors across various departments, William Hare can showcase the depth and variety of its workforce at STEM engagements, allowing them to connect with as many young people as possible. This engagement has had direct impact on applications for their apprenticeship programmes, which have tripled in the last 3 years.

Not only has this resulted in an influx of apprentices, but the growing presence of STEM within the business has encouraged more employees to become STEM Ambassadors, giving them the opportunity to share their passion for their specialities.

Design Engineer, Sian Pearson recently won William Hare's internal STEM Ambassador of the Year Award.

Through her commitment to supporting others to better understand the industry, she has had great successes mentoring young people in Years 11 and 12. One student decided to apply for an apprenticeship with William Hare and another is now studying Engineering at university.

STEM Ambassador, Sam Vaughan, said: "I wanted to help increase awareness of opportunities within STEM and apprenticeships as this is something that I feel myself and my peers would have benefited from when facing the same decisions only a couple of years ago."

Through the STEM Ambassador Programme, William Hare has also been able to reach audiences outside of school including family engagement events at The Science and Industry Museum.

Find out more: www.stem.org.uk/stem-ambassadors

Email: Cerri Travers, Learning and Development Manager
apprenticeships@hare.com



EMBEDDING FUTURE TECHNOLOGY INTO THE CURRICULUM

Trafford College spotted an opportunity to deliver the project management unit of its HND Engineering Apprenticeship through the ProtoEV Kart Challenge.

The challenge, delivered by social enterprise The Blair Project, invites schools, colleges and training providers to convert petrol-fuelled carts into high powered electrical vehicles to race against each other on a track to see which is fastest and most fuel efficient.

Aimed at students aged 13-19, this hands-on STEM learning programme leverages the thrill and appeal of karting to engage young people who may have low awareness of careers in engineering and technology or local research and innovation opportunities.

Weekly kart building workshops were delivered for 12 weeks leading up to two test days and the race final.

Participants developed a good grounding in electric vehicle technologies as well as the problem-solving and team working skills needed to deliver continuous performance improvement.

Apprentices have learnt the soft-skills of team work, time management and budgeting as well as the chance to apply mechanical and electronic engineering skills, knowledge of aerodynamics and understanding of energy efficiency.

The team exhibited their electric go kart at the Clean Energy Skills Summit at Manchester Metropolitan University in September 2019. Integrating hydrogen fuel cells to extend the battery range of the kart is the next step for the team who'll be visiting the Manchester Fuel Cell Innovation Centre and the Graphene Engineering Innovation Centre to understand the research and development work the institutions are doing in this area.

Find out more:

www.theblairproject.org

Email: info@theblairproject.org



REACHING WIDER AUDIENCES THROUGH PARTNERSHIP

The Institution of Civil Engineers (ICE) is committed to the promotion of the industry and encouraging the next generation of engineers. A major part of this is engaging with young people in primary and secondary education.

Over the last 18 months, ICE have been working in partnership with the Science and Industry Museum and has delivered a number of hands-on activities allowing members of the public to discover engineering related facts and career paths while having fun.

At MakeFest this year, ICE brought along its Bridge to Schools kit – a 15m long, 3m high cable-stayed bridge which allowed participants to take on the various tasks involved in building a bridge.

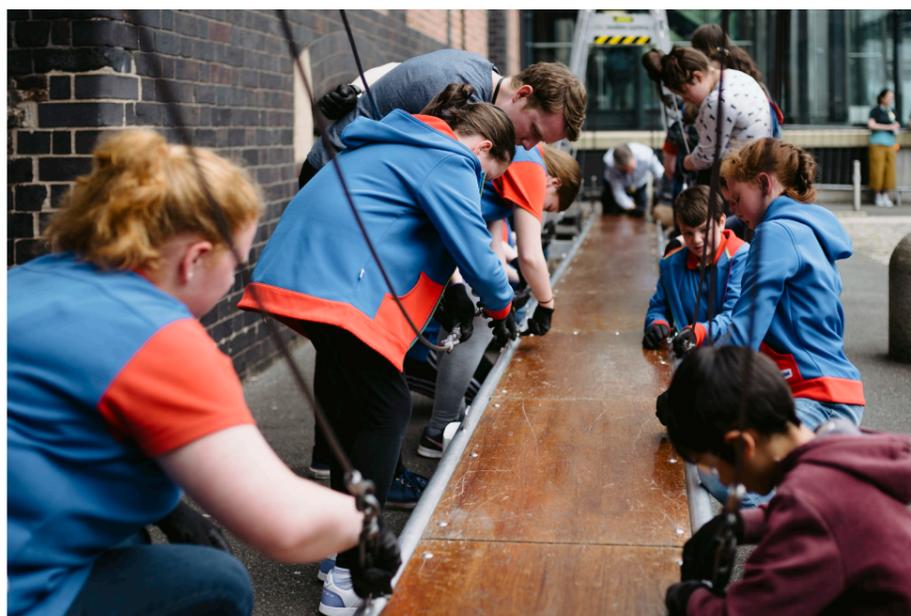
ICE has also supported the museum to participate in the Festival of Manchester, where participants were invited to construct the tallest free-standing tower from just 10 art straws and some masking tape – a challenge even for some of our professional engineers.

Working with the museum has allowed ICE to not only show off the engineering profession and what it has to offer as a career, but enabled the organisation to expand its reach to engage with the parents and carers of the next generation.

In 2018, ICE provided an engineering related activity for the Science and Industry Museum's Bee:Late event, held in celebration of the worker bee statues that occupied various of the areas around Manchester. ICE facilitated a mass build-off event to construct a giant bee hive with participants, enabling them to learn about the challenges of constructing complex three-dimensional structures.



Photos courtesy of Science Museum Group/Drew Forsyth



Find out more:

The Institution of Civil Engineers

www.ice.org.uk/what-is-civil-engineering

Email: icenw@ice.org.uk

Science and Industry Museum

www.scienceandindustrymuseum.org.uk

Email: contact@scienceandindustrymuseum.org

PROMOTING HIGHER EDUCATION FOR RAIL SKILLS

Fast Trackers is a multi-award winning project co-funded by the National Collaborative Outreach Programme (NCOP), Network Rail and the Young Rail Professionals.

Delivery was undertaken by Network Rail and Mott MacDonald, with support from several academic institutions and colleagues at HS1 and Alstom.

Young people aged 16-19, studying relevant A-Levels or BTEC qualifications and from disadvantaged backgrounds and ethnic minority groups were invited to take part in an engineering challenge and visit a station, higher education institution and employer.

The 2019 challenge was to develop a high-speed railway route to redevelop a hub station. Young people, including a Greater Manchester cohort run by Greater Manchester Higher, took part in regional heats, with finalists progressing to a 3-day residential in Birmingham.

Throughout the process, students had the opportunity to present ideas to industry professionals, develop them with practicing engineers and work with a focus on sustainability and highly digital future of the industry.

The young people involved now have knowledge on the variety of careers within the transport sector as well as a better understanding of the different routes and qualifications needed, including increased awareness of higher level apprenticeships.

Overall, this programme delivered a social value that exceeds £650,000 and a social return on investment of over £450,000. In 2020, the scheme is set to expand to engage with over 500 students, introduce an interview experience and involve the National Citizen Service.



Find out more: www.gmhigher.ac.uk



TAKING WORK EXPERIENCE TO A HIGHER LEVEL

Careers such as project managers, quantity surveyors, and design and planning managers are well paid roles that give people exciting opportunities to move around the industry across the world, and are opportunities that we want to encourage young people to consider. But how do young people and their families find out about them?

ISG has developed the World of Work Experience (WOWEX). The week-long programme sees students from a range of schools and colleges gain a taste of life in the construction industry. The initiative was established with the help of Construction Industry Training Board (CITB) funding with the first session taking place in ISG's Manchester office in 2016.

WOWEX offers students unique insight into the construction industry, and most importantly, gives insight into the full range of career opportunities on offer. Learners spend five days following the process of tendering for a project to final pitch, including a visit to a live construction site. Students are exposed to a range of professions from business development, planning and surveying to project management, and introduced to the real-world tools and techniques used in 21st century main contracting. Students carry out a range of tasks, designed to promote STEM skills, team work and interpersonal skills.

In Greater Manchester, ISG has worked hard to use WOWEX to reach groups who could most benefit, including schools with young people from low income and BME background as well as girls.

Furthermore, teachers are also encouraged to get stuck in so they can learn themselves and share their knowledge when they return to school.

So far, nearly all of the students who participated in the programme agreed that they learnt a new skill or gained knowledge, 67% said they would consider pursuing a career in construction management and three quarters said they felt clearer about what they wanted to do in the future. This year, ISG has taken on four apprentices who previously took part in the WOWEX programme.

Find out more: www.isgplc.com/careers

EMPOWERING PARENTS AND REMOVING BARRIERS

Catalyst Science Discovery Centre has an ambition to enthuse and build the confidence of local non-visiting parents and primary carers within STEM. The centre wants to nurture, encourage and lead on science engagement at home, not just in the centre.

The centre has secured funding to develop 30 STEM activity kits based on their own work with families, which will provide 90 opportunities to work with partners to target families who would not normally engage.

The aim is to embed good practice, informed by the latest science capital research, to encourage adults to incorporate STEM fun into leisure time with their children, and therefore increasing science capital of the whole family.

This project will attempt to remove barriers for families that may lack the knowledge, skills and resources by providing activity kits and encouraging engagement. This will empower adults and encourage them to engage with STEM activities in the future.

Find out more:

www.catalyst.org.uk

Email: Lucinda Lewis

lucinda@catalyst.org.uk

KEEP IT SIMPLE AND SHARE SCIENCE

The Great Science Share for Schools was launched as part of the European City of Science in 2016.

The campaign aims to get young people to communicate something they have been investigating, which starts with a question that they are interested in. The campaign is child-focused, non-competitive, inclusive, and collaborative.

Since its inception, there have been over 750 events which have engaged more than 100,000 pupils. For many primary school pupils, it gives them a day to be able to prioritise their own creativity and science communication skills by sharing their scientific questions to new audiences.

On June 16, 2020, the Great Science Share for Schools will celebrate 5 years of impact, mainly working with primary schools to:

- encourage young people to ask and explore their own scientific questions
- recognise the value of talking about and demonstrating science to others
- develop teachers confidence in working scientifically
- encourage collaboration to develop professional experience
- make connections with scientists and engineers in their locality

This award winning campaign has proven to increase teacher confidence as well as have a wealth of positive outcomes for pupils such as greater enthusiasm, interest and understanding of science as well as increased resilience, openness, problem solving and creativity. The school community also benefits hugely, as does the profile of science in and beyond the school.

This campaign has key support from BASF, Siemens, Manchester City Council, Association for Science Education, the Comino Foundation and other advocates, demonstrating how employers and other organisations can add value.

Find out more:

www.greatscienceshare.org

BUILDING DIGITAL TALENT

Delivering the aims of the Greater Manchester Digital Strategy, Go Digital and Digital Futures are two strands of GM Digital Skills, a programme to get young people excited about digital skills from a young age and build sustainable connections between education and the digital industry.

Go Digital is an inclusive, industry-led consortium between InnovateHer, Hive Learning and Digital Advantage, set up to address the digital skills gap and inspire the next generation into stem careers and to live fulfilling lives. Go Digital aims to bring core digital skills and opportunities to more than 400 children in Manchester across 50 schools over two years.

Digital Futures provides unique industry experience opportunities and careers guidance for students, educators and parents. The aim is to inspire young people to consider careers in digital and technology, ensuring they are aware of the key skills our industry requires.

By December 2020, 50 industry experts will help to deliver projects in the classroom that will link the syllabus topics that are difficult to map to industry, or difficult to teach, to the world of work. It is expected that over 150 schools will benefit from the programme with ring-fenced opportunities for girls, pupils from BAME backgrounds, SEND pupils and schools in areas of disadvantage.

The programme specifically works to increase interest and attainment in GCSE Computer Science by bringing the curriculum to life with industry-led projects. All projects will be turned into reusable resources for all schools to access. This engagement will complement the teacher's classroom delivery of the curriculum, inspiring students to carry on with computing.

Find out more:

www.gmdigitalskills.com



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For more information about STEM in Greater Manchester,
please contact:

Nichola Wallworth, STEM and HS2 Programme Manager, GMCA
Nichola.Wallworth@greatermanchester-ca.gov.uk

www.greatermanchester-ca.gov.uk