A DECADE OF DIFFERENCE
2014-2024
SCIENCE & ENGINEERING EDUCATION RESEARCH AND INNOVATION HUB’S 10TH ANNIVERSARY IMPACT REPORT
SEERIH Vision: A world-class environment for Science & Engineering teaching and learning from age 5+ years

Our mission is to inspire communities of confident and curious teachers to drive the continuous improvement of teaching and learning in science and engineering education in the UK, with specific focus on supporting inclusion.

This is a prime opportunity to celebrate and acknowledge the support, professional mentoring and inspiration that colleagues with the Comino Foundation have offered for many years. Their continual commitment to SEERIH’s work has undoubtedly provided the security and backing to innovate and think differently about how we unlock potential for all pupils and teachers in science and engineering. The full SEERIH team would like to thank them for their trust in our vision.
A REPORT TO REFLECT ON

SEERIH was founded in January 2014 in what was then the Faculty of Engineering & Physical Sciences. With big ambitions, the plan was to establish a centre that would champion and support in-service science teachers in Greater Manchester, with reach across the UK.

Growth and impact developed as successful applications for funding for curriculum development, innovation and research projects strengthened over the years. With the support of the University and the Comino Foundation (2014-to-date) and Primary Science Teaching Trust (2014-2021), SEERIH’s strategy was further honed with the publication of the Trajectory of Professional Development (Bianchi, 2016).

The SEERIH team includes core staff and consultants that have been brought together to respond to teacher and pupil needs from individual school support, group projects, clusters, networks and large-scale campaigns.

In 2020, SEERIH responded swiftly to the CV-19 pandemic, increasing the use of digital approaches to continuously engage teachers, engineers, scientists and pupils in improving learning in science and engineering. SEERIH’s approach has always been to focus on mainstream education, in order to give every child a chance to explore their own questions, wonderings and conceptual understandings.

A decade for SEERIH seems to have passed in a blink of an eye. Take a moment to reflect on its top 10!

“Giving pupils high-quality science learning experiences has been at the heart of my work since being a primary teacher in North Manchester. Whether they choose to take further study in STEM or not, the important thing for me is that they have made an informed choice, based on learning experiences that have been meaningful and inspiring for them.”

Professor Lynne Bianchi, SEERIH Founder and Director
A vote of thanks to The University of Manchester, the Faculty of Science & Engineering staff and students, all past and present SEERIH staff, consultants and collaborators. We appreciate the shared endeavours and hard work undertaken to enable SEERIH to achieve impact over the past 10 years.
IN-SERVICE TEACHER PROFESSIONAL DEVELOPMENT APPROACHES

Professional learning comes in a wide range of forms. SEERIH’s portfolio has included 10 impactful approaches including conferences, campaigns, secondments, projects, courses, social media, academic research, mentoring, school improvement visits and resources.

‘Fascinate’ was SEERIH’s first campaign to inspire and develop teacher confidence through creative and innovative ways to explore curriculum requirements.

Taking an immersive approach, teachers get hands-on and experience the wonders of science and engineering, often alongside those involved in cutting edge research.

Just some of the innovative research and development projects SEERIH’s led on with one clear purpose – to engage and upskill teachers to enhance pupils’ mainstream science learning experiences:


2015 Organised Chaos: an innovation project exploring scientific practices at the STFC Diamond Lightsource.

2015 Making Space for Me: a community–voice project with the Ideas Foundation challenging perceptions of science careers.

2016 Stellarium: a fusion of Science and Arts exploring scientific evidence through pattern and movement. Targeted at non-traditional audiences through music, dance and science.

2016 Robot Orchestra Primary School Engagement: upskilling teachers and pupils in computer coding and engineering.

2017 Science for Families: a GM school community project engaging whole school and families in science learning.

2018 Inside Out: cocreated digital resources to explain features of working scientifically, used within Manchester Museum.

2019-2021 QuSmart: a research and development study focused on pupils’ scientific question-asking.


2021-current Royal Society Partnership Grant: a GM school programme, upskilling teachers to enhance links with professional scientists and researchers.

3rd party advertisement:

SEERIH Teacher Champions and Fellowships

FOCUS: Building teacher leadership capacity through mentoring for primary science and engineering teachers across Greater Manchester.

IMPACT: Since 2014, teachers have worked part-time within SEERIH. This has provided close-to-practice knowledge and enhanced teacher retention and development through an immersive university experience. Many have taken up national consultancy roles as Primary Science Quality Mark Hub leaders, achieved Chartered Science Teacher Status (CSciTeach) as well as promotion and progression into Initial Teacher Training and into the SEERIH team itself.

More than 40k Professional Learning Hours

www.seerih.manchester.ac.uk
The Great Science Share for Schools is an inclusive campaign for everyone who cares about young people and their understanding of the world they live in.

Aimed at pupils aged 5 to 14 the Your Planet, Your Questions event took place in June 2021, featuring Professor Brian Cox and a panel of experts including Dr Emily Shuckburgh from the University of Cambridge, Dr Mark Richards from Imperial College London, and Dr Lindsay Turnbull from the University of Oxford.

PIONEERED IN MANCHESTER – MAKING A DIFFERENCE WORLD-WIDE

Awarded Patronage of the UK National Commission for UNESCO for 2024

United Kingdom National Commission for UNESCO

www.greatscienceshare.org

Examples of GSSfS resources

Share Spinner

What do you need?
- A sheet
- A pencil
- A pair of scissors

How does it work?
- Fold your sheet
- Write 10 questions
- Cut along the folds
- Put questions on the wheel
- Flick the paperclip
- Ask your question

Great Science Share

greatscienceshare.org

Share your questions on Twitter using @GreatSciShare | #GreatSciShare

Participants in 31 countries

Australia, Brazil, Bulgaria, Belgium, China, England, Finland, France, Hungary, India, Ireland, Italy, Malaysia, Mexico, Netherlands, Nigeria, New Zealand, Northern Ireland, Norway, Portugal, Scotland, Singapore, South Africa, Spain, Switzerland, Thailand, Tunisia, UAE, USA, Vietnam, Wales.

524,415 pupils engaged in 2023


2022 v 2023 165% pupil engagement compared to last year
Since 2014, SEERIH has delivered termly professional development for primary science subject leaders through regional networks. Networks focus on themes and evidence-informed research to enable effective teaching and learning of National Curriculum science. Teachers are supported to reflect on the impact of their learning through ongoing impact portfolios.

Making the leap from a trainee teacher to an Early Career Teacher can be a daunting one for non-specialist teachers of science. In 2021, SEERIH responded to national guidance for early career science teachers by designing a bespoke mentoring programme. With a focus on subject knowledge and specific pedagogies for primary science, the programme instils confidence within those new to the profession.

The training was incredibly informative and I soon found myself sharing information and resources with others in my school. I have since taken on leadership of science in my school as I felt that I had been given such a great insight into what a quality science curriculum looks like.

Jason Jarvis, Rochdale
SEERIH’s partnership with the Royal Academy of Engineering has benefitted pupils’ futures by identifying teaching and learning approaches that successfully embed engineering into the mainstream curriculum.

Together with the University of Winchester’s Centre for Real-World Learning the research and development programme has interpreted how the Engineering Habits of Mind make a difference to practical learning, Design & Technology and Maths in primary and lower secondary schools.

A series of reports demonstrate how teaching and learning can be tailored to enhance pupils’ learning and to work towards addressing the well-documented shortage of engineering skills. This through-the-curriculum approach is what SEERIH is proud of, playing out the values of inclusive education for all.

2014
Tinker Tailor Robot Pi

2016
Tinkering for Learning Primary Science Journal Special Issue

2017
Learning to be an Engineer

2018
Tinkering for Learning

2019
Tiny Tinkering Tasks Class Resources

2021
Progressing to be an Engineer

2023
Progressing to be an Engineer – the Approach

NEXT STEPS towards national impact

The focus on development of engineering skills will always be key to STEM industry success. SEERIH’s commitment to embedding engineering education within the mainstream curriculum will continue by working with teacher clusters across the UK.

Progressing to be an Engineer: The Approach will be further extended to address all features of progression across age groups from 5-14 years.

Collaboration with The Institution of Engineering & Technology, the Design & Technology Association and networks such as the Engineering in Primary Schools Network and NEON (Engineering UK) are vital to a joined up approach across the sector.
How do we make a wide-scale difference from a hub based in the North-West of England?

A critical question that we often ask ourselves. Our decision was to communicate and disseminate our work in ways that mattered to other people.

Sharing our thinking, collaborating with key organisations to challenge and progress thought leadership in the sector has been invigorating. It has pushed SEERIH to consolidate its position on educational policy, and to align the many years of research and insight to make a difference UK-wide and internationally.

We are proud to work with the STEM Learned Bodies and sector leaders to support head teachers and senior leaders in their decision making and strategic thinking.


2022: BIANCHI, L. & TURFORD, B. Shining a light on inclusive science teaching and learning (7-14 years).


2021: BIANCHI, L., WHITTAKER, T & POOLE, A. The 10 Key Issues with Children’s Learning in Primary Science in England, University of Manchester & The Ogden Trust.
5. DOTS ON ‘THE ARROW’

The ‘arrow’ has become the easy way to describe the Trajectory of Professional Development (ToPD). This framework represents the ‘how’ behind SEERIH’s vision – the underpinning structure that provides the scaffold to all activities undertaken in the Hub. It describes a progression of collaborative professional learning that we apply to teacher development. The 5 dots represent the type of engagement a teacher may have with science professional development, and the gaps between the dots are the areas of challenge and interest to providers to consider how we support teachers to move ‘up’ the arrow.

Most importantly though, the ToPD isn’t a ‘one-size fits all’ approach. A teacher may move up or down the arrow throughout their career. The main thing SEERIH is interested in is that there are opportunities to provide access to the right CPD topic, for the right teacher, at the right time in the right way that suits them. The 4 rights are what makes learning using the ToPD most powerful.

By 2024, SEERIH will have led 5 of its own Regional Conferences in Manchester, Stockport, Bury and Oldham. These are an ideal way to inspire teachers to engage at different points on the arrow, either as participant or presenter.

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<table>
<thead>
<tr>
<th>The individual is</th>
<th>Pre-engage</th>
<th>Participate</th>
<th>Collaborate</th>
<th>Co-create</th>
<th>Connect</th>
</tr>
</thead>
<tbody>
<tr>
<td>...yet to consciously identify their own development need. They access professional learning in a way that is ad hoc and informal.</td>
<td>...seeking out the opportunity to take part in professional learning focused on a topic of interest or identified area of need. They are willing to be around new learning, showing interest in the opinions of others.</td>
<td>...coming together with two or more people to reflect on, discuss and learn through engaging practically in a task or area of development together.</td>
<td>...moving from sharing learning with others to using and applying their new understandings in creative ways.</td>
<td>...leading the learning of others by sharing knowledge, skills and understanding.</td>
<td></td>
</tr>
<tr>
<td>Their motives to engage</td>
<td>Happy with the status quo.</td>
<td>Intrinsic or extrinsic motives to participate – e.g. being sent on a course by a senior colleague, or feeling the need or interest to self develop.</td>
<td>Intrinsic motives generated through interest in other people’s practice. Extrinsic motives may be that senior leaders wish to be part of a group.</td>
<td>Intrinsic interest to showcase and share knowledge and expertise. Interest to be creative and explore new learning opportunities.</td>
<td>Mainly driven by intrinsic interest to support and inspire others. Aspirations to be a role model or advocate.</td>
</tr>
<tr>
<td>Typical behaviours</td>
<td>Passive, information is received, e.g. during a meeting, via social media or in the newspaper.</td>
<td>Actively engaged – the receiver of information, showing willingness to discuss and interact with the information in order to align the new learning with their own contexts and need.</td>
<td>Actively engaged with others, discusses their own practice and can justify their choices. They learn with others, sharing and cooperating.</td>
<td>Actively engaged in creating through the cross-fertilisation ideas, learning or opportunities.</td>
<td>Actively disseminating and supporting others. Requires good communication skills and creativity to share learning in ways that have a connection with their audience’s roles, expertise and experience.</td>
</tr>
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4. SUSTAINABLE DEVELOPMENT GOALS

SEERIH’s team apply the principles of social constructivism to teacher and pupil learning.

This emphasises thinking and working collaboratively to develop knowledge of the world in a social context. Talking and reflecting together are fundamental to the new SEERIH STEM Masterclasses and Pupil Panel.

As newer approaches to immersive professional and pupil development, these experiences are enabling primary teachers to work with and alongside their pupils within the University environment. Focused on topics aligned to the UN Sustainable Development Goals (SDGs), the learning links curriculum to real-world challenges. Evaluating the impact will exploit story narratives and numerical data.

What’s most special about these opportunities are the direct links with schools in areas of socioeconomic disadvantage with academic and industry scientists, engineers and professional services staff who support the development of Science Capital across the SEERIH community.

Linking professional scientists and engineers, from academia or industry has been a meaningful way to improve the quality of education and to dovetail curriculum learning to real-world research and global citizenship themes.

The STEM Visitor in Primary Schools guide gives vital support to those involved in outreach. Practical advice has been brought together by teachers to maximise the benefits for all involved.
3. HIGHER EDUCATION PEDAGOGIC REPORTS

SEERIH’s positioning within the Faculty of Science & Engineering means that the years of teaching experience held by its staff can be used to also enhance Higher Education teaching and learning practices.

Three projects with the Centre for Higher Education, Research Innovation and Learning (CHERIL) saw engineering academics adopt Collaborative Lesson Research approaches to study pedagogic practice in schools and Higher Education. Focused on enhancing collaborative learning and questioning, professional discussion and observation led to deeper understandings and diversified approaches to enhance the student experience.

SEERIH’s research into inclusive science teaching and learning in schools, led to opportunity to extend this into the HE sector. Task & Embed groups enabled key insights to be gained around the factors affecting student learning and how to enhance consistency in group work practices with undergraduates.

Links with the Teaching College means that knowledge exchange about assessment, blended learning, feedback, also invigorates SEERIH’s work with schools.

Pedagogic Project outputs


Mind the Gap (2019) Film explaining a shared approach between academics and school teachers to improve student feedback.


Two Heads are Better than One (2022) Supporting group work in Higher Education settings. A UKRI Enhancing Research Culture Project.
2. ENGINEERING EDUCATES CAMPAIGNS

The size and scale of The University of Manchester has always provided inspiration for awe and wonder. SEERIH is surrounded by world leading researchers making ground breaking discoveries in science and engineering.

How engineers think and work is an area of continued interest and intrigue. This is what inspired the launch of the Greater Manchester Engineering Challenge in 2017. Supported by the Institution for Engineering & Technology and the Institution of Mechanical Engineers the SEERIH team created campaigns that enabled 7-14 year olds to learn about and apply the Engineering Design Process.

Whether through creating multiple marble runs that incorporated sensors and electrical components such as The Crumble, or by working to scale to research, plan and build a new civic space, the focus on engineering with schools was novel and exciting.

During Covid the campaign went completely virtual reaching from Glasgow to Guernsey with the support of key partners including SSERC, Barefoot Computing and industry partners including Balfour Beatty, Vinci Construction and Civic Engineers.

In 2022, a new name branded the national campaign as Engineering Educates, with the purpose to enhance the reach across the UK.

In partnership with the National Farmer’s Union the Engineering Educates Farmvention Challenge was created. This has registered over 97K pupils and exemplified how the engineering design process can be taught through a cross curricular approach using Science, Design Technology, Maths and Computing. In 2024, a brand new campaign will be launched in association with the Robotics & Autonomous Systems UK-RAS Network (funded by EPSRC).

For more information visit www.engineeringeducates.org
1. VISION FOR SCIENCE AND ENGINEERING EDUCATION

A clear and focused vision to improve the quality of science and engineering education has permeated the 10 year SEERIH programme.

Close-to-practice research has underpinned the evidence base for many innovative projects and events. Scholarship across the SEERIH team has led to research outputs in the form of peer-reviewed papers, policy reports, journal articles, blogs, podcasts and social media messaging.

The most current Nuffield Research Foundation 2-year research study is undertaken in partnership with Bath Spa University, focusing on purposeful and effective practical work in primary science.

In 2021, the SEERIH Research Frame was published, explaining the philosophical, theoretical and analytic approaches that influence the choice of research methods in this and similar studies.


OTHER FIRSTS

1 newly published book


Drawing together experiences supporting pupils’ learning in working scientifically over the years, QuBuild brings a new classroom approach for primary teachers to teach the explicit knowledge of scientific question-asking. We whole heartedly believe that this is an essential skill when pupils are involved in finding out about the world around them through science enquiry.

1 trip to No. 10 Downing Street

SEERIH joined a roundtable event, with representatives from industry and academia, including The Institution of Engineering and Technology (IET), Social Mobility, Youth and Progression Minister Mims Davies MP. The discussion was focused on the following question: How can improving the provision of engineering skills reduce disparities, improve social mobility and diversity within the STEM workforce?

Central to this dialogue was the IET’s ‘Engineering Kids: Futures’ report, a keystone document that will support SEERIH’s roll out of its approaches to embed engineering in the mainstream school curriculum at primary level. Truly a fabulous experience to be part of.

www.seerih.manchester.ac.uk
During my first SEERIH network meeting I was inspired by the content and quality of training. They have guided me thoroughly in how to improve practice within my school by signposting resources and research to base practice on. I share my learning back at school in staff meetings. As a result, working scientifically has significantly improved within the school. We have just had an external ‘deep dive’ in science and the feedback was outstanding. This is all through the guidance of SEERIH.

Sally van Valburg, Primary teacher, Trafford

Being guided by SEERIH as a Teacher Champion provided me with a wide range of experiences to broaden my expertise and renew my confidence as a subject leader. From being part of research projects, working with national experts in the sector and delivering training to others, I realised that I was now having impact beyond my own school. Today, I continue to use much of the training and guidance in my current role which is testament to the influence SEERIH has had on my personal career development.

Cath Heys, Senior Lecturer, Edge Hill University

With SEERIH’s support, schools throughout the UK and beyond have become more effective at helping young people to develop questioning habits of mind and a lasting commitment to active problem-solving. Each year SEERIH provides inspiration and encouragement linked to a robust infrastructure which enables teachers and their schools to put such approaches into practice. The impact and reach of its contribution to STEM learning in schools is unique.

Professor Jose Chambers MBE, Comino Foundation Chair of Trustees

I took part in the SEERIH Early Career Training which was by far the best training I have ever received. I found science a daunting subject as there was so much knowledge and skills to teach. The training was incredibly informative and I soon found myself sharing information and resources with others in my school. I have since taken on leadership of science in my school as I felt that I had been given such a great insight into what a quality science curriculum looks like. I have recommended this training to other ECTs at my school who have also benefited. The impact has been widespread throughout the school. This training is an absolute must!

Jason Jarvis, ECT, Rochdale

SEERIH’s flexibility to address contemporary topics in education place them front and centre in this space. They are a superb catalyst to bring people together for action rather than just discussion, which is essential as the gap between education and industry continues to challenge both sides. Their work on addressing the inspiration and aspiration of younger students into STEM is paramount to addressing the skills need industry have; without campaigns such as the Great Science Share for Schools and Engineering Educates, the next generation wouldn’t see the wonderful opportunities within the STEM sector.

Mark Wood, Schools and Corporate Citizenship Manager, Siemens
THE NEXT 10 YEARS...

Who knows where life will be in 10 years’ time?

What we do know is that whilst science and engineering remain at the heart of economic success, the need for young people to be inspired into learning STEM subjects will be there.

Beyond those direct needs though is a greater and possibly more important goal; that of giving everyone the access to high quality education to better themselves and to broaden insight and information to make informed choices for their futures.

What SEERIH does will always be needed.

We commit to continue to push the boundaries and to possibility-think about how we can purposefully engage in-service teachers of science in ongoing professional learning.

We commit to relentlessly seek out the creative opportunities that emerge from collaborations and partnerships across the education sector, industry and cultural community.

We commit to listen and respond flexibly to the needs of our networks, striving to add additional benefit whilst reflecting and learning from each and every opportunity.

We invite you to be part of this journey – supporting us, challenging us and collaborating with us each step of the way.

Get in touch on 
fascinate@manchester.ac.uk
ACKNOWLEDGING THE FUNDERS AND SUPPORTERS ACROSS THE STEM SECTOR

- Aramco
- Artful Fox Creatives
- Association for Science Education
- Balfour Beatty
- Barefoot Computing
- Bath Spa University
- BASF
- British Science Association
- Civic Engineers
- CLEAPSS
- Climate Action Partnerships in Education
- Comino Foundation
- Creative Manchester
- CREST
- Curious Minds
- Design & Technology Association
- Department for Education
- Explorify
- Halle Orchestra
- Ideas Foundation
- I’m A Scientist Get Me Out of Here
- Institution for Engineering & Technology
- Institution for Mechanical Engineers
- Institute of Physics
- Linnean Society
- Local Authorities, Diocesan and Multi Academy Trusts
- Manchester City Council
- Manchester Museum
- Manchester Science & Industry Museum
- Medical Mavericks
- National Farmers’ Union
- NW Maths Hubs
- Nuffield Research Foundation
- NUSTEM
- Ogden Trust
- Oldham Enterprise Trust
- Primary Science Teaching Trust
- Primary Science Quality Mark
- Royal Academy of Engineering
- Royal Society
- Royal Society of Biology
- Royal Society of Chemistry
- Science Oxford
- Science & Technology Facilities Council
- SSERC
- STEM Learning
- Science Across the City
- SHINE Trust
- Siemens
- Whitworth Art Gallery
- Worshipful Company of Glass Sellers
- UK Space Agency
- Urenco
- Vinci Construction
...and many more!

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THE 2024 SEERIH TEAM

Professor Lynne Bianchi
Founder and Director

Grace Marson
Specialist Lead

Jennifer Crompton-Muir
Specialist Officer (Projects)

Dr Aneta Garvey
Specialist Officer (Campaigns)

Kate Goodley
Specialist Business Officer

David Xu
Programme Administrator

Eleanor Atkinson
Consultant

Dr Jon Chippindall
Consultant

Tina Whittaker
Consultant

Dr Zoe Crompton
Consultant

Dr Julie Jordan
Consultant

Lea Jagendorf
Consultant

Ben Davies
Consultant

www.seerih.manchester.ac.uk/about/people

LOCAL AND NATIONAL AWARDS

2016
The University of Manchester Making a Difference Award for Social Responsibility (Winner – SEERIH)

2017
The University of Manchester Making a Difference Award for Social Responsibility (Winner – GSSfS)

2018
Northwest Chemical Industries Association – Charity of the Year (Winner – GSSfS)

2019
The University of Manchester Better World Showcase Award (GMEC)

2020
The University of Manchester Making a Difference Award for Social Responsibility (Highly Commended – GMEC)

2022
THE Awards Shortlist for Widening Participation Initiative of the Year 2022 (Shortlisted – GSSfS)

2022
The University of Manchester Better World Showcase Award (Winner – GSSfS)

2022
The University of Manchester Better World Showcase Award (Winner – GMEC)

2022
The University of Manchester Making a Difference Award for Social Responsibility (Highly Commended – GMEC)

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