Patching the pipeline: how the UK can stop losing the STEM talent it inspires

International lessons from Canada, USA, South Korea and Japan

By Clare Meakin
Churchill Fellowship Report

2019 Fellow, published 2026

clare@curiousrootsconsulting.com

Figure 1: Seoul train station, Seoul, South Korea 2024

the CHURCHILL fellowship

Table of Contents

About the author **3**

Executive Summary **4**

Patching the pipeline: how the UK can stop losing the STEM talent it inspires **7**

International lessons from Canada, USA, South Korea and Japan **By Clare Meakin, 2019 Churchill Fellow Introduction** **7**

Why this matters: the UK context *7*

Aims of my Fellowship *7*

Countries visited *8*

Why these four countries? *8*

Purpose of this report *9*

Methods and Approach *9*

A note on limitations *10*

Main Findings **11**

The spark is critical: but it's not enough on its own *11*

A note on mathematics *16*

Teaching science for exams, not always for curiosity *17*

Student experience vs curriculum content *19*

Should STEM look like it belongs to the exceptional? *20*

Rethinking diversity: culture, power and who gets to progress *23*

No second chances: what about career changers? *28*

In summary **31**

Recommendations **31**

Recommendation 1: Invest in long-term programmes, not one-off events *32*

Recommendation 2: Measure what actually matters, over the long term *32*

Recommendation 3: Take scientific literacy seriously, not just as exam or career preparation *33*

Recommendation 4: Broaden how STEM is represented, and which careers are seen by young people *33*

Recommendation 5: Make access to STEM work and work experience genuinely equitable and accessible *33*

Recommendation 6: Take workplace culture as seriously as recruitment, and work with those who hold power *34*

Recommendation 7: Strengthen local pathways and treat informal learning as infrastructure *34*

Recommendation 8: Create genuine second chances *35*

Conclusion 36

What I plan to do next 37

Immediate steps: 37

Short-term (small grant funding required): 37

Medium-term (larger funding, or partners): 37

Long-term: 37

Acknowledgements 38

Glossary and abbreviations 39

About the author

Clare Meakin is an evaluation specialist with around a decade of experience in STEM engagement and informal learning across national institutions, including the Science Museum and National Museums Scotland, where she was Science Engagement Manager. She now runs her own evaluation consultancy, Curious Roots Consulting, working with heritage, cultural and STEM-engagement organisations to understand and evidence the long-term impact of their work. Her professional interest is in how we measure what genuinely changes for the people engagement programmes are designed to reach, particularly over the long term, and how that evidence can be used to build better, fairer systems. She was awarded a Churchill Fellowship in 2019 to investigate how other countries turn early interest in STEM into sustained participation and careers, with a particular focus on gender equity. This report is the result of that Fellowship.

Executive Summary

In this Churchill Fellowship, I set out to explore what the UK can learn from other countries about turning early interest in Science, Technology, Engineering and Maths (STEM) into sustained participation and careers, particularly for women and underrepresented groups. What I found is that the UK's challenge is not really one of aspiration; it is one of connection.

Aims of my Fellowship

I wanted to understand how other countries turn early interest in STEM into long-term participation and careers, with particular attention to gender equity, and what the UK could learn from them.

Countries visited

I visited Canada, the USA, South Korea and Japan, across two phases of travel (North America in 2019, and East Asia in 2024).

What I found (observations from the Fellowship):

- Long-term, well-resourced, organised informal engagement (e.g. the extra-curricular science-centre and museum programmes in the USA) showed high rates of converting early interest into STEM careers. That learning was dependent on those programmes being able to track impact over long periods, showing that longitudinal evaluation really matters.
- Everyone I interviewed could trace their career back to an early emotional engagement with the subject. But what carried them from that spark into a STEM career was their own talent, resilience and opportunity.
- Gender inequity in STEM careers still exists across industries and countries. It is often not malicious or even conscious, but it is present in everyday interactions, and those small moments have a cumulative effect on motivation over time. The women I met had reached the top of their fields, but none had had a straightforward journey; what consistently struck me was the unshakable confidence they had in their abilities, and their passion for the subject. Policy levers such as returner support, childcare and targeted action help, but they are not the whole solution: gender inequity is not only about caring responsibilities, and women without children also experience career progression obstacles.
- What people take from an academic paper depends on their level of scientific literacy: their ability to read, interpret and digest it was reported to differ markedly by age and experience.
- Countries with stronger STEM pipelines do not separate STEM and the Arts as rigidly as the UK and allow specialisation and choice later. They also showed stronger, smoother links between education and industry, so the transition did not rely on an early-adulthood choice.
- I could not find, on my travels or in research afterwards, any country offering a serious route into STEM as a later career decision, other than starting again with a degree.

What I think this means for the UK:

- We need to rethink how we provide STEM education in the round. As it stands: we make young people choose their paths too early, with little chance to re-engage later; subject choices are shaped by the perception that STEM subjects are difficult, boring and only for the brightest; too many experienced teachers are leaving the profession burnt out thinning subject specialism where it is already scarce; and we too often teach science for exams, not curiosity.

- We have no mechanism for later-career change into STEM, and we should.
- The UK system undervalues the role of informal learning in STEM and doesn't consistently fund it as key infrastructure, which reduces its potential as a complementary education and engagement vehicle.
- Gender issues still exist in STEM careers in the UK. Rather than focusing on how we get more women interested, we need to ask why they leave and what it would take to keep them, which means working with those who hold power and asking them directly whether they recognise they might be unconsciously perpetuating an environment that keeps excluding people.
- Work experience is more often based on who you know and where you live, rather than on encouraging interest and broadening perceptions of potential careers in STEM.
- Infrastructure and access remain a hurdle for young people consistently accessing the initial spark moment.
- STEM engagement campaigns are often weighted towards the exceptional, not the achievable.

Recommendations

Based on what I learned, I set out the following recommendations for the UK:

- Move beyond one-off or inconsistent STEM engagement activity towards sustained, long-term progression pathways
- Measure what matters, tracking real impact over the long term rather than counting attendance
- Take scientific literacy and curiosity as seriously as career preparation
- Broaden how STEM careers are represented, including technical, vocational and locally available roles
- Make access to STEM work experience genuinely equitable, not dependent on geography or family networks
- Address workplace culture and retention beyond recruitment
- Strengthen local STEM ecosystems by connecting schools, colleges, employers and informal learning institutions
- Create flexible second-chance routes into STEM for career changers and late starters

Each of these recommendations has been combined into the following pipeline model, representing a route to patching the pipeline of STEM spark to STEM careers in the UK, based on the international learning from my Fellowship below

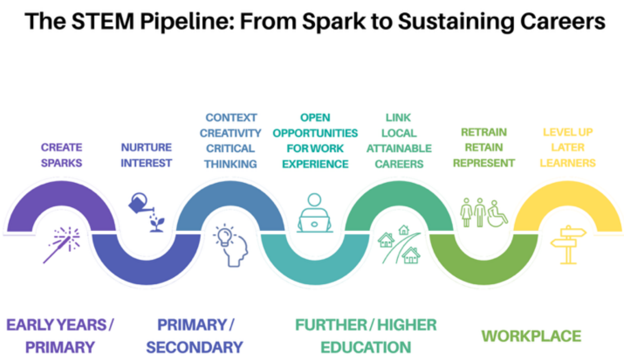

Figure 2: Patching the Pipeline: Summary graphic by Clare Meakin, Churchill Fellow 2019

Conclusion

My overall conclusion is that most of the answers already exist scattered across the countries I visited, and in real pockets of good practice here at home. The task ahead is not one of invention, but of assembly: connecting what already works, resourcing it properly, evaluating it honestly, and treating the pipeline as something we build rather than leave to luck.
My intention on completion of my Fellowship is to pursue opportunities to explore each of these areas in more depth, particularly around learning from other countries about outcomes within educational models different to the UK (Finland, Estonia), exploring how to support informal learning with my evaluation practice, and finding opportunities to capture and learn from successful systemic diversity initiatives. I would welcome discussion on any and all of these points from across education, informal learning, industry and academia.

Patching the pipeline: how the UK can stop losing the STEM talent it inspires

International lessons from Canada, USA, South Korea and Japan

By Clare Meakin, 2019 Churchill Fellow

Introduction

In 2019 I was delighted to be awarded a Churchill Fellowship. This 'travel to learn, return to inspire' grant is open to any UK citizen, and the charity awards approximately 100 Fellowships each year to individuals wishing to explore, in a non-academic way, a particular topic of interest, that could, on their return, actively benefit the UK. Fellowships span 37 categories from community and citizenship, to enterprise and social impact, and the category in which I was awarded: science and technology.

Why this matters: the UK context

Broadly speaking, this is the argument of my Fellowship: I don't believe the UK needs to tell young people to like or enjoy STEM more to see more of them go into STEM careers; there is strong evidence that STEM is interesting and engaging at a young age for many. But I do believe that we don't yet have a strong joined up system that moves from interest, to aspiration, to concrete and visible career pathways.

What I found in the countries that do STEM pipelines well, were findings that were both contextual, and more structural than I had anticipated. In the clearest examples of good practice, STEM participation was not one-off or random, it was supported by systems, long-term investment and visible pathways, by practical learning, institutional confidence, and cultures that helped people imagine a future for themselves in those industries. In the UK, by contrast, my experience was that whilst we are great at some parts of the pipeline (aspiration, one-off inspiration and individual resilience), we don't yet have the full plumbing in place to prevent significant leaks along the way.

You may notice I use the plumbing metaphor throughout this report; I found it quite useful as a tool to develop my thinking, and you will see that at the end of my report, I propose a pipeline graphic that captures the key elements of my discoveries and analysis from my Fellowship which I hope will be useful as learning back in the UK.

Aims of my Fellowship

My Fellowship sought to explore the different aspects of international STEM engagement systems (education, academia, industry, informal learning), and how they support progression from early interest to long-term participation and careers, with particular attention to gender equity.

The Fellowship had five broad goals:

- Understand how STEM engagement connects to real career pathways in different national contexts
- Explore how institutions and systems support sustained participation beyond initial interest
- Examine how gender inequality is framed and addressed within STEM systems
- Identify structural factors that support retention as well as recruitment
- Consider what lessons could realistically inform practice in the UK

Countries visited

The Fellowship involved visits to organisations and practitioners in Canada, the USA, South Korea and Japan. Travel took place in two phases: North American visits were completed in 2019, and East Asian visits in 2024, following disruption caused by the Covid-19 pandemic.

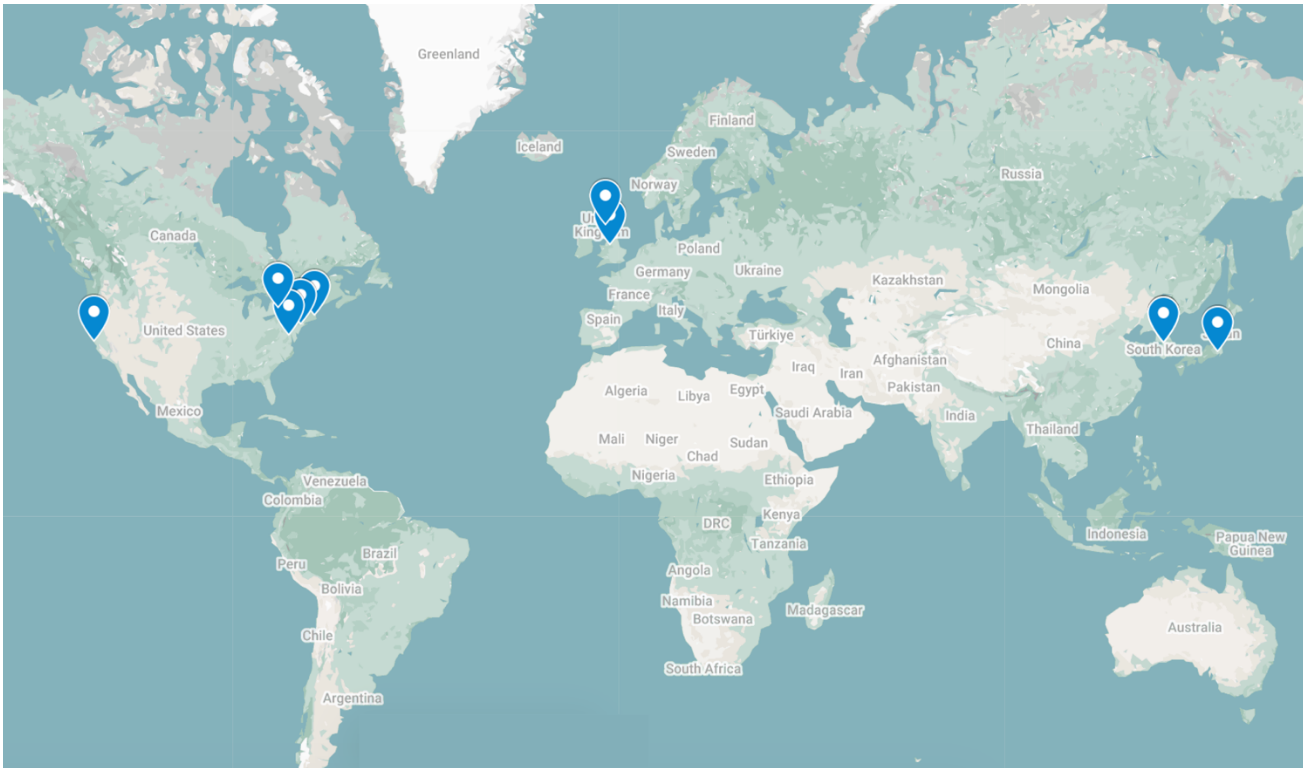

Figure 3: Map of cities visited across Fellowship including Toronto, Boston, New York, Washington D.C., San Francisco, Seoul, Sejong and Tokyo

Why these four countries?

The reason for selecting each of these countries was based on a number of factors including STEM education excellence, areas of technological advancements, and countries that would provide both familiar and potentially challenging perspectives.

In my Churchill interview for my Fellowship, I was asked if I felt there was a “silver bullet” for the issues I saw with the current UK system. My response was that I thought it was a complicated situation, and that it is unlikely that another country is doing everything well that the UK isn’t, and that lessons learned would be directly applicable wholesale as a cut and paste (and after my travels, I agree with myself on this point).

When I was developing my Fellowship proposal I looked at a range of data from PISA scores to gender distribution in STEM careers, education to industry programmes, policy etc. This research gave me a long list of about 10 countries that I could’ve visited which would’ve all given insightful and valuable experiences that would be relevant to the UK system. Part of developing a strong and contained Churchill Fellowship was narrowing that list down based on what I could learn, but also what was feasible travel wise, within the timeframe.

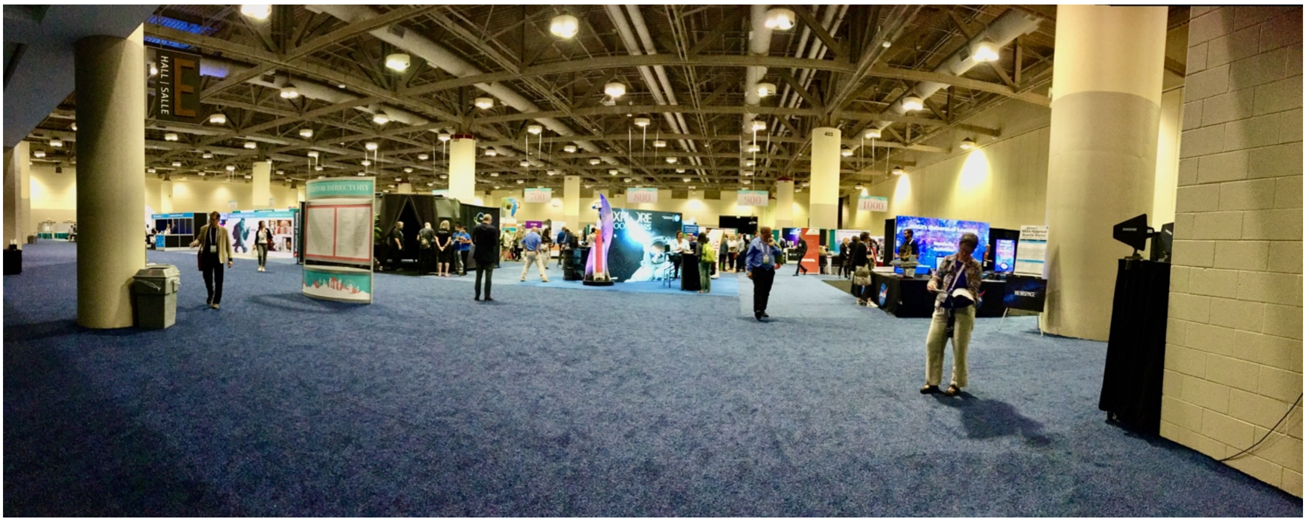

Figure 4: ASTC conference 2019 exhibition hall

From my longlist I selected Canada and the US as more closely matched comparators for the UK (and in the knowledge that ASTC 2019 was taking place in Toronto that year, enabling me to attend, and then visit East Coast cities directly after the conference), and South Korea and Japan as more diverse but comparative opportunities. I discounted travelling to Finland and Estonia, despite their strong reputation for STEM education excellence, because I wanted to cover scales of difference in my learning, but also with the ambition that after my Fellowship, I could take what I'd learned from those countries across the world, and compare it not only with the UK, but with closer European destinations. I still fully intend to do that, and therefore my mentioning of those excellent systems is more tangential than I would like, but it gives me a point of reference for future exploration, recognising that Fellowships are about continuous learning, much like all scientific and technological development.

Purpose of this report

This report intentionally presents a thematic synthesis of learning across my Fellowship as a whole, rather than a country-by-country comparison. Its purpose is to contribute to discussion among UK policymakers, educators, engagement practitioners and cultural organisations about how aspiration, access and retention interact within the STEM pipeline, and to identify practical areas where change could strengthen long-term participation in STEM careers.

Methods and Approach

My learning was gathered through meetings with museum and science centre practitioners, educators, researchers, engagement specialists and policy-facing organisations, alongside participation in professional conferences and site visits. The amount of content and learning I gathered across eight weeks of travel, across two continents, eight cities and nearly sixty hrs of interviews, means this report is a summation of my key findings that are relevant to the UK pipeline rather than a full recounting of each interview or discussion. The detailed and incredibly diverse learning I gained from my travels is something I value deeply, there is a great deal more in those sixty hours than appears here, and I will be drawing on it for a long time to come.

In Canada, I attended the Association of Science and Technology Centers (ASTC) conference at the start of my 2019 travels, which offered a concentrated view of international STEM engagement practice and direct access to professionals who then hosted site visits in the days and weeks that followed. My South Korean visits and meetings were kindly supported by the local embassy team, whom I remain extremely grateful to for the opportunities they provided for me to meet individuals from policy, academia, and industry. During that leg of my travels I was aided by a wonderful translator, who was able to continuously translate interviews where participants were more comfortable engaging in Korean, or where a particular point needed further explanation. Otherwise, all interviews were conducted in English.

A note on limitations

One methodological note: sadly, my 2019 North American visits were not audio recorded. At that point in my career, the habit of recording was not yet the instinct it has since become through my work as an evaluator. The observations and conversations from that leg of the Fellowship are drawn from my detailed notes and diary entries, but they are notes from 7 years ago, meaning some nuance and detail has been lost over time. Where I draw on that material, I've been mindful to present it as observation and reflection, rather than direct attribution. I mention that not to downplay the importance of the lessons I learned in 2019, but for the transparency that I expect of good reflective practice. If you are reading this as a future Fellow, my advice would be: record everything, both through audio, and your own notes!

I also need to mention that Japan was the least straightforward leg of the Fellowship. I found institutional engagement quite difficult to secure, meetings were limited (and sadly, cancelled) and the language barrier was far more significant than I'd anticipated. In hindsight, that leg of the travel should have been considered many months earlier than it was, with translators available for every meeting, but that is part of the overall learning of the Fellowship. As a result, I'd say my direct learning there was thinner than elsewhere. Even so, that difficulty taught me something - international learning is not just about policy and the Fellowship process. It's also about openness, networks, access, and the practical reality of how easy it is to connect across systems and cultures sometimes on the other side of the world. In my case, planning two phases of travel whilst working full-time was also a challenge in itself. It was however, a truly life changing experience, and I hope the report below adequately reflects the range and depth of learning I had, and the time to reflect and turn this learning into actionable recommendations (as I have transitioned through several eventful career changes) has also been very valuable.

A note on context, focus and perspective

Throughout this report I refer to “the UK” as shorthand for a broad set of cultural and structural patterns that encompass the United Kingdom, whilst recognising that policy, culture and practice differ across the four nations. My own perspective is shaped most directly by living and working in England and Scotland.

On my Fellowship travels, aside from exploring STEM pipelines, gender was a key area of interest. It was the question I asked most consistently, and it is the dimension of inequality I can speak to most directly drawing on my own experience, which also gave me a consistent personal marker to compare across the four countries.

The years of work experience in between phases also enabled me to reflect in real time about what it's like to be a woman in STEM right now; not necessarily purely my own experience, but, from every conference, meeting and conversation I had with individuals across STEM sectors in that interim time, it was an opportunity to sense check, rationalise, and enhance my understanding of themes around diversity. The STEM pipeline in the UK can ‘leak’ for many groups who are not the historic norm, and often for the same structural reasons.

What I present below is a collection of thematic observations I made across the countries visited, followed by a summation of what this could mean, in real practical terms, for developing and sustaining more young people (or otherwise) to engage with STEM in a meaningful and accessible way. In my data collection, I completed a series of semi-structured interviews, with central themes loosely influenced by science capital theory i.e. what you know, who you know and what extracurricular opportunities you are exposed to will affect your engagement in STEM as a subject, and as a potential career opportunity.

For the recorded interviews in Korea I provided questions to interviewees in advance, and across all countries I worked with a broad interview structure that enabled me to cover education, informal learning, policy, engagement and aspiration in various informal formats.

Across all countries, I always asked the question: '*What was it that first got you interested in STEM?*', and that is where I start my report.

Main Findings

The spark is critical: but it's not enough on its own

When answering that question, a consistent theme that emerged from everyone I spoke to was that their initial interest in STEM was created at a relatively early age, in a way that was often profoundly personal and emotionally connected. Some people referenced a favourite teacher, others talked about weekends in nature with grandparents, others talked about a "wow" moment at a science festival or museum; but each of them was able to visibly emotionally engage with that memory when recounting it, because it was the start of their spark story.

Figure 5: Boston Museum of Science, an Explainer doing a live demonstration for families 2019

When I asked this question to a senior academic I interviewed in South Korea, in the middle of a quite formal discussion, he enthusiastically lent over to his bookcase to retrieve a book his mentor had given him decades earlier, as a young researcher. As he brought it back to the table, he explained:

"So this is a book my advisor at the time gave me, and you know the title, 'The Art of Measurement'. It changed my whole life. How people describe science as an art, art to measure…..So, and he gave me this book and explained: 'Do you understand the meaning of this book, 'art of measurement'?' How people, scientists, physicists prepare some system to measure something, and how difficult it is? But they describe this course of experiment as an art, it contains everything…..so I [was] impress[ed] so much, and I chose my direction of research in this way: measurement, precision measurement, especially, and the mystery of universe – are [all] related."

What I found fascinating was the direction of his entire research career, precision measurement and the mysteries of the universe, could be traced back to that single interaction with an adult who took his curiosity seriously and took that spark and fanned it.

That word ('spark') came up more than once across my Fellowship, in different countries, different disciplines, different forms.

On one occasion, it presented as not only 'spark', but 'magic'. A mathematician I interviewed, also in South Korea, described the moment she first encountered a mathematical proof as a student, really seeing the elegance and "beauty" of the solution, which had a profound impact on her:

"One thing I still remember, why the power mathematics in there is a some theorem. Now, it's very technical, but…how can I say…… Like for instance, natural number,12345, and rational number, is natural number over natural number….. So [describes complex mathematics]… the proof was so beautiful, so I think that was kind of ….magic, even though it was very difficult."

As an interviewer, it was fascinating and really quite impactful to hear this personally. For many of the people I interviewed, when I asked them about those initial moments, it was like seeing not just a lightbulb, but almost like a stadium light go off internally: many of them may not have thought about that initial spark for years, but seeing them describe it, sometimes decades later, it was very obvious that it was still there. The sense of something clicking into place, seeing the world differently, realising that behind the ordinary surface of things there is a structure, a pattern, an elegance that most people never get to see - that is what a spark feels like from the inside. And that depth of engagement and impact really matters for long-term engagement and dedication.

Figure 6: Exploratorium, San Francisco, an Explainer doing a live demonstration about chicken embryos on the exhibition floor

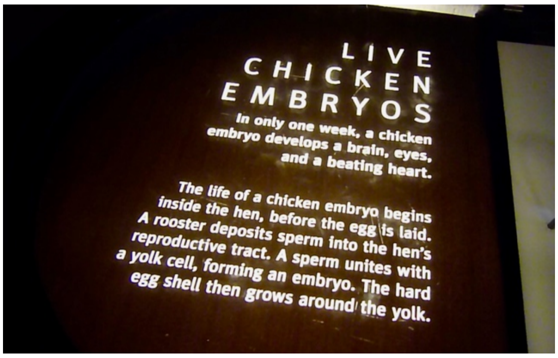

Figure 7: The information panel for the chicken embryo demonstration

This was one of the most consistent findings of my Fellowship. Across the USA, Canada, South Korea and Japan, across people of every age, gender, background and discipline, the origin story was almost always the same. A personal encounter with something extraordinary, and critically, an adult who responded to that moment, not by redirecting or managing or scheduling it into the curriculum, but by feeding it.

Figure 8: ASTC keynote by Jenn Gustetic, then Program Executive for NASA's Small Business Innovation Research Program, ASTC conference 2019, on "Grand Challenges"

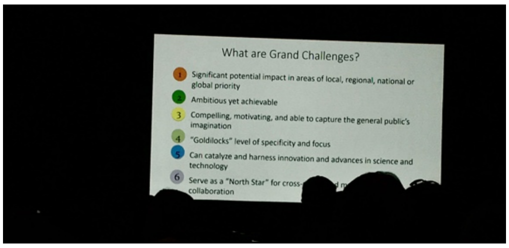

Figure 9: Explanation of what a "Grand Challenge" involves, ASTC conference 2019, Toronto Canada. This would have certainly sparked my interest at a young age, and did make me actively want to connect with the speaker.

Figure 10: Clare Meakin twitter comment on Jenn Gustetic key note speech and engagement response during ASTC 2019

And that is where I recognised a slightly uncomfortable truth: that exchange is not reliably available to every young person in the UK. Access to the people and experiences that can create those moments, and then sustain them, is…patchy, at best. It depends heavily on where you live, which school you attend, which adults happen to be in your life, and their interests and life experiences. For many young people, especially those from underrepresented groups, the spark never comes. Not because the curiosity isn't there, but often because the conditions for it aren't readily supported and provided.

So early investment and emotional engagement did appear to be a critical factor in many people pursuing careers in STEM, but a spark on its own, is not a strategy. The places that stood out during my Fellowship were not the ones that merely created sparks. They were the ones that had thought seriously about what comes next.

Figure 11: Contemporary STEM exhibition at American Museum of Natural History, New York, 2019

The clearest example was the *Lang Science Program* at the American Museum of Natural History in New York. This is a substantial multi-year programme where young people join at around age 11 and stay through to the end of secondary school. They meet 33 days a year and do real scientific inquiry using the museum's own collections, not a simplified version of the school curriculum. Family commitment is a big part of the selection process, because the programme understands that sustained participation needs support at home too. Students who are accepted on to the programme are encouraged to pursue what interests them, and small group sizes and high-quality tutors mean that curiosity can be sustained and nurtured over time. Additionally, students can earn credits that strengthen their university applications, and some go on to intern at the museum (with some eventually becoming staff).[1]

Figure 12: Dinosaur temporary exhibition, during a tour by Brian Levine to American Museum of Natural History, 2019

In 2019, after doorstepping the programme lead of the Lang Program, Brian Levine, after a fascinating session at ASTC, I asked if I could come visit when I was in New York the following week, and he very kindly said yes. So, the following week, after sitting in on a Saturday session for the Program, I was delighted to have the opportunity to ask the student group a few questions in the lunch break, including whether their parents worked in STEM. One young person, entirely at ease, said: *"Oh no, my parents are theatre people!"* which I admit, tickled me quite a lot. Here was a young person from a (professionally) non-science household (although maybe his parents did STEM theatre, I didn't get to ask), fully engaged and confident in a rigorous extra-curricular science programme. The students had arrived with curiosity and stuck with it, and the program had done the rest. That is what good infrastructure makes possible.

[1] American Museum of Natural History (n.d.) Lang Science Program. Available at: https://www.amnh.org/learn-teach/children-and-families/lang-science-program (Accessed: May 2026).

As someone who worked in national museums for a decade, this felt like a gold standard of delivery: a highly prestigious and clearly well-subscribed programme, that sustains curiosity and interest over time, is accessible and supported, and well funded. It was a pipeline, and a deliberate one, with every element designed to carry young people from that initial curiosity towards the threshold of a career, step by step, over years, and with proper support built in at each stage. And the museum clearly believes in bringing collections to life for both those students and their visitors, in an accessible way that many people may not think of i.e. both the preservation of historic collections, but also through the exploration of contemporary science and new ways of thinking. (see fig. 8 for an example diorama that I found fascinating as an example of preserving museum collections, but bringing them into the 21st Century).

Figure 13: Historic diorama at American Museum of Natural History, 2019

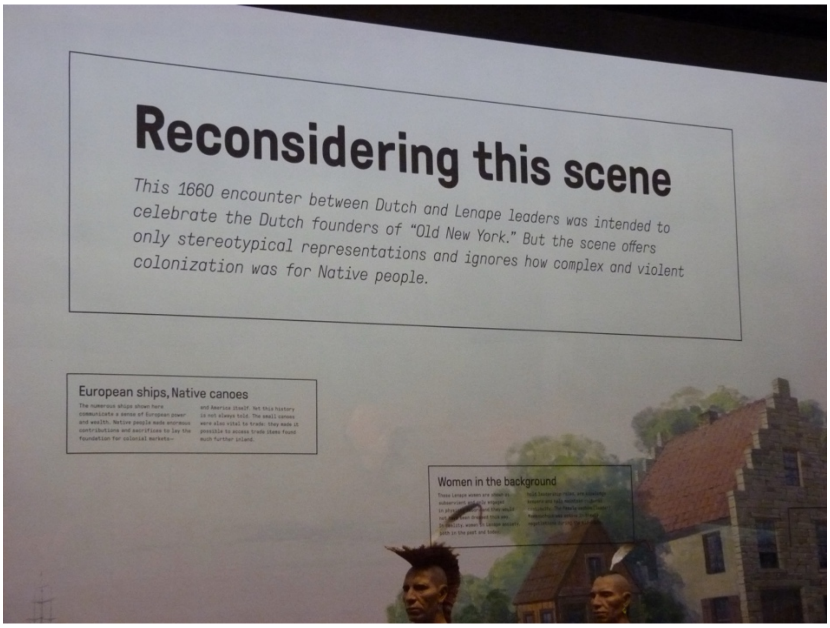

Figure 14: Additional interpretation at American Museum of Natural History, encouraging visitors to reconsider the scene with contemporary perspective, 2019

My reflection on this example is, that the UK is often really good at the first encounter or spark; I've seen many heritage and contemporary science organisations who know how to deliver great STEM experiences, festivals, workshops, programmes, and campaigns about STEM aspiration. What I think the UK is less good at, is building strong systems for what follows the spark. I think we treat too much STEM engagement as the spark itself, when what many young people need next to sustain that spark into a well fed fire, is consistent feeding of chunks of interesting, contextualised engagement to keep that fire going.

There is of course a harder truth about systemic funding priorities, and in fact evaluation, this is critical to acknowledge here. At one presentation at the ASTC conference, when an audience member asked about measuring the impact of a city-wide access programme, the response articulated a key tension very effectively: '*politicians want numbers, and programme-makers want experience'*. As an evaluator today, I fully understand that tension and try to model best practice on using 'reach' as a metric of success on its own. A headcount of young people who attended a science event tells you almost nothing about whether any of them will pursue a STEM career. But it is easy to count. *Depth of engagement*, *sustained relationships* and *self-led interest* over time are of course, harder to measure, but that is really where we can see long-term aspiration and perception change data.

In the UK, due to changes in how culture and heritage organisations have been funded (moving away from government support, increasingly towards project specific funding), STEM engagement programmes that engage people who might not have naturally engaged with STEM are critical, but funding is still often focused on 1-2 years delivery timetables, with contracted specialist staff who leave when the funding goes. My personal soap box as an evaluator, is that tracking impact during a project is great (it's critical to understand how effective the project funding has been in achieving its aims) but, *long-term impact data collection* is rarely resourced beyond the funding period. So how do we know that a year 7 student who attended a workshop 4 years and is now applying to university to study STEM as a result, did that? That longitudinal measurement gap is costing us (particularly in the informal learning sector) in understanding how spark engagement is sustained over time, which would enable us to make better recommendations at systems level, and would raise the question for funders around whether dedicated follow-on funding for successful programmes is an area for genuine research and support.

A note on mathematics


Figure 15: Contemporary architecture in Seoul, reminiscent of mathematical or geometric structures, 2024

There is one strand of STEM that I feel deserves its own moment here, because it sits slightly apart from the others and is rarely given the attention it warrants, which is: Maths. I'm a huge advocate for Maths engagement, I was involved in the early years of 'Maths Week Scotland' (a Scottish Government initiative) as Science Engagement Manager at National Museum of Scotland, and I retain my interest and fascination with Maths to this day.

When we talk about STEM, a lot of engagement focus and indeed media coverage, tends to be on research, innovation, engineering, renewables, new tech energy etc. But maths, is different. It underpins everything in STEM. It's the foundational language of research, of modelling, of the systems that make modern life possible. And it is, for most people, almost invisible, and often incomprehensible. Part of the reason is the nature of the beast itself: Maths is genuinely hard to communicate without either oversimplifying it or requiring significant 'technical scaffolding'. The everyday applications (budgeting, data literacy, financial planning) are real and important (and should be part of our financial education in the UK, in my opinion), but they are not what draws a person to spend a lifetime in the field. What draws the ones who pursue it long-term, is something closer to what the mathematician I interviewed described: the proof that felt like ‘magic’. The clean, neat explanation of why something does what it does. It sounds fascinating, but it can be difficult to show that to people who don’t have foundational mathematical grounding (which is me), in any kind of visual way. There is a strong argument for ensuring all young people have a much firmer grounding in the everyday application of maths, and many organisations including banks are taking the role of establishing that financial literacy going forward. But there is a gap that I would personally love to engage with, between that practical application, and the mathematical literacy needed to get to that ‘wonder’ stage, that might unlock something for someone who is interested.

The best maths communication I have seen in the informal learning sector leads with wonder, and context. It trusts that the feeling of something being extraordinary is itself enough of a reason to want to understand it, and shows how it underpins our everyday lives. Making the case for mathematics as a subject of beauty, not just function, is one of the harder challenges in STEM engagement, and one of the most worthwhile I believe. The informal learning sector, at its best, is already showing what is possible, but I would love to see this go further into connecting more young people with jobs that use mathematics, but don’t require a PhD to excel (spreadsheet pun, fully intended).

Teaching science for exams, not always for curiosity

Another thread running through my Fellowship was the importance of curiosity in developing a long-term engagement with STEM, and not treating STEM education as a body of facts to be memorised. We often measure success in STEM education by PISA scores, and I did in fact use that measure myself as a way of selecting which countries to visit. However, exams, and how science is taught in order to achieve high marks in those exams, is not always conducive to the fundamental principles of science: curiosity, creativity and innovative thinking. I want to be very clear before I move onto this next section: I think teachers do an incredibly hard job, increasingly demanding with fewer resources. I know how hard a job it is, and I know how many STEM teachers are sadly leaving the profession every year. What I did want to question as part of my Fellowship however, was: how and what are we teaching in science in the UK? Is the current curriculum the best use of teacher and student time and engagement? And (as the late great Ken Robinson once so articulately put it) ‘are schools killing creativity’? For me, understanding how different countries teach science, particularly at secondary level, and how pupils receive and experience that teaching, was an area I was very keen to explore.[2]

Figure 16: Mechanical baby exhibit at MIT museum, Boston USA, 2019

At MIT Museum in Boston, I was fortunate to meet some of the delivery staff involved in their outreach and engagement and had a very interesting discussion on scientific literacy. As part of a youth engagement programme, MIT educators had developed a delightfully simple exercise: read a research abstract three times, set it aside, and write a few sentences explaining what it means. Identify the terms you don’t recognise. Research them, and then build from there. This will not be a new activity in and of itself for many educators out there. But interestingly, I was told that when it was delivered to graduate students and high school students alike, when shown the same piece of research, each group came up with strikingly different views on what the research was about, and what they took away from it.

[2] Robinson, K. (2006) ‘Do schools kill creativity?’ TED2006. Available at: https://www.ted.com/talks/sir_ken_robinson_do_schools_kill_creativity (Accessed: July 2026).

Figure 17: Innovation and critical thinking exhibit, museum, Washington D.C.

I found two things particularly interesting there. The UK curriculum does address this. “Working scientifically” is a required element from Key Stage 3 onwards, and it goes further than practical method: it explicitly references understanding that science modifies its explanations in the light of new evidence, and that results are subject to peer review. But there is a difference between what a curriculum mentions and what a system actually teaches, and difference between scientific literacy and scientific enquiry skills (e.g. how big was the sample? What are your dependent and independent variables? Versus: does the conclusion actually follows from the data? Has anyone replicated it? Is a preprint the same thing as a peer-reviewed paper?) those feel like different competencies, and being able to do the first does not automatically mean you’re comfortable, capable or confident doing the second. Research into how scientific research is represented in the curriculum in England and Wales bears this out: pupils were noticeably less confident in understanding research as something that begins with a research question and often understood it instead as a means of confirming an opinion they already held.[3]

But the development of both scientific literacy and genuine public engagement does also make me want to reflect back on the research community. Outreach (what researchers do *for* the public) is already a familiar part of most people’s academic lives, and I have seen some excellent examples of outreach in universities, colleges and businesses across the UK. What I see less of is genuine two-way engagement; what researchers do *with* the public i.e. when people working with non-specialist audiences describe their work, they don't just do engagement *to* the public, they learn something themselves, which could in turn influence research thinking itself. Because where complicated research meets everyday context, understanding can improve on both sides.

That has made me think harder about what happens in the UK classroom in relation to STEM. As I said, this is not a criticism of teachers, nor of the many people working hard to make science engaging for young people. But it does feel as though our current education system too often prioritises exam performance, curriculum coverage and measurable outcomes for those who are most traditionally academically predisposed, in ways that leave curiosity, creativity and open-ended problem-solving squeezed to the margins.

In between my travels, I attended a conference in the tech sector, where one speaker asked why we are still teaching fractional distillation, and still telling students that renewable energy is "expensive". I am not a teacher and therefore can’t verify the specifics of what that speaker claimed, and I wouldn't want to build a recommendation on a single remark, but it did resonate with my own school experience, and questions I raised myself working in STEM engagement: what is STEM education (and more widely, ‘getting an education’), *for*? Are we trying to develop citizens with rounded scientific knowledge and interest, or train future STEM researchers and innovators as a long running pre-university training programme? Because if it's the former, the curriculum should surely reflect modern STEM research and practice and if it's the latter…it should also reflect modern STEM research and practice. For clarity: I am not arguing that I think the STEM curriculum should be updated every year with every new discovery or technology: I am fully aware that is both unachievable and would be deeply unpopular. I am, however, suggesting that if you are teaching students about a

---

[3] Yeoman, K., Bowater, L. and Nardi, E. (2016) ‘The representation of scientific research in the national curriculum and secondary school pupils’ perceptions of research, its function, usefulness and value to their lives’, F1000Research, 5:9. doi:10.12688/f1000research.7449.2.

scientific process that is no longer in use, that feels like information they might not value. Anyone who has ever had to answer 'but when am I going to use this? Why are we learning this?' from a student, will understand that context and application are as important as the content itself. And if we don't have an answer to that, it can be a clear demotivator for student engagement, especially over the course of a full UK STEM education.

On the topic of STEM education, Finland, and increasingly Estonia, are often held up as world-leading aspirational education systems. The reasons usually given (teaching treated as a high-value, autonomous profession, more room for student-led curiosity, less reliance on standardised testing) feel increasingly relevant as comparisons to the UK system.

There is a further piece of this question that is often left out of the conversation, and it concerns the exam boards themselves. The Institute of Physics has raised repeatedly with awarding bodies, that A Level physics papers were becoming harder year on year, which was having a knock-on impact on how many students were potentially seeing Physics as a viable subject choice. In 2024 the IOP urged AQA (exam board) to act after reports that students had been left in tears by a paper described as unreasonably difficult, having already raised concerns about the previous year's paper where students needed somewhere between 51% and 54% of the available marks to be awarded a grade A.[4] How many of us would be keen to study a subject when the top grade was expected to be awarded just over half of the total marks in an exam? I understand that grade boundaries are set after marking so that a grade means the same thing from one year to the next, and a harder paper should therefore produce a lower threshold. But the question is: if we genuinely want more people to study STEM: why is the paper set at such a difficult level in the first place? It is something that I understand is an ongoing discussion, but it is a critical factor if we want more students in the UK to see STEM subject choice and careers as accessible and achievable.

My perspective is, that scientific literacy is not only for future scientists. It shapes how people interpret evidence, question claims and navigate a world increasingly shaped by contested readings of health research, climate science, AI and misinformation. If the UK wants a stronger STEM pipeline, it should also want a more scientifically literate public. That means treating curiosity and critical thinking as central to science education, not as optional extras. It also means making better use of museums, science centres and informal learning environments as part of that wider ecosystem, not simply as occasional enrichment.

Student experience vs curriculum content

As I mentioned earlier, the one area I would like to explore further, having completed multiple (fascinating) interviews with school groups across the UK when evaluating several STEM engagement programmes: what do UK students themselves think of the existing STEM education system? And why do we still have staunchly entrenched hierarchies around which subjects are valued or complementary, and which aren't (shout out again to the wonderful Sir Ken Robinson for this perspective)?

---

[4] Institute of Physics (2024), reported in Tes, 'Anger over "unreasonably difficult" A-level paper'. Available at: https://www.tes.com/magazine/news/secondary/anger-over-difficult-a-level-exam-paper-aqa (Accessed: July 2026).

Figure 18: Government administration headquarters, where I met with several policy researchers, Sejong, South Korea 2024

In South Korea, I learned about an interesting comparison. Korea's national curriculum formally embedded an integrated STEAM approach in 2015, including the integration of arts and sciences (STEAM, where the A stands for Arts).[5] The goal is explicitly to remove boundaries between disciplines rather than reinforce them. Korean students can also delay choosing a major at undergraduate level, encouraging broader exploration before specialisation. Two-year degree routes into technical careers exist alongside traditional longer pathways.

Two things that stood out for me there: STEAM (STEM plus ‘Arts’) is also not a new concept in the UK, certainly within informal learning, however the UK education system does still completely separate teaching between STEM and Arts subjects. All those decades ago when I picked my GCSEs and A Levels, I personally found that even if I wanted to, I couldn’t have picked a combination of STEM and Arts subjects, because they were timetabled at the same time. So the flexibility and integration of STEM with other subjects, where South Korean students are not forced to choose between them, was particularly interesting to me, because flexibility matters. Not everyone knows at 16 (or 14) what they want to do for the rest of their life, and the rigidity of the current UK system can penalise those who don’t. I will talk later about the other side of the coin, the ability to change careers and move into STEM as an adult is almost non-existent without fully re-qualifying, but my main learning from this topic is that the way other countries avoid separating STEM and Arts subjects is a potential area for further research, to understand whether this separation is actively hurting pipelines like the UK’s, by forcing young people to choose, and possibly discount, STEM at a young age.

Should STEM look like it belongs to the exceptional?

In addition to subject choice, one of my core reflections in STEM education and engagement over the past decade is, that we still often present STEM (in engagement campaigns, media, film, tv) as if it mostly belongs to people at the very top of the tree: the obvious high achievers and the brilliant minds, the astronauts and the coders and the inventors, the scientists who arrive at the planet-saving breakthrough just by thinking differently at exactly the right moment for a good plot twist.

---

[5] Hong, O. (2022) 'STEM/STEAM education research in South Korea', in Teo, T.W., Tan, A.-L. and Teng, P. (eds.) STEM Education from Asia: Trends and Perspectives. London and New York: Routledge, pp. 211–227. doi:10.4324/9781003099888-16.

Figure 19: Film stills illustrating the lone-genius trope in STEM representation

[Clockwise from top left: Interstellar (2014, dir. Christopher Nolan, Paramount/Warner Bros.); The Imitation Game (2014, dir. Morten Tyldum, StudioCanal/Black Bear); Project Hail Mary 2026, (dir. Phil Lord and Christopher Miller, Amazon MGM); Hidden Figures *(2016, dir. Theodore Melfi, 20th Century Fox). Images sourced via TMDb. Reproduced under fair dealing for the purposes of criticism and review, s.30 Copyright, Designs and Patents Act 1988.]*

That can be compelling: innovation and ingenuity are interesting and exciting. But it can also be limiting. What if I don't consider myself to be a high achiever in STEM education? Can I still have a meaningful career in STEM? My next area of exploration was around: representation.

A lot of STEM engagement in the UK is often thoughtful, ambitious and well delivered. Almost all STEM aspiration campaigns now have clear visual representations of diversity, because we know that seeing people, who look and sound like you *is* very important, if you want something to seem relatable and achievable. It's something that exists in schools seemingly by default now and without quoting any one person directly, I have regularly heard teachers over multiple years say to students: *"if you can see it, you can be it".* The improvements in that area are not to be undervalued, but the harder question is: who do STEM aspiration campaigns reach consistently, who gets to access STEM opportunities in the first place, and do those opportunities connect clearly enough to longer-term pathways? STEM is still too often perceived as being for the already high-achieving or obviously "science-y", while awareness of technical, vocational and locally available roles remains thinner than it should be.

The risk is that if we lean too heavily on "be an astronaut, a researcher, an inventor" messaging, we miss the opportunity to communicate something more useful: that STEM sectors rely on many different kinds of work, and workers, that the UK already has real strength across many disciplines, and that people with different interests and skills can enter STEM careers through many different routes. Some of the biggest and most critical STEM skills shortages in the UK are at both academic, and vocational levels: both are needed, and both have value, that we are not currently showing effectively to young people who could fill the gaps. But aspiration is not built from admiration alone. It is built from recognition: young people need to be able to see something that feels both exciting *and* plausible. Something they could actually do. Something that exists not just in a distant city or an elite graduate scheme, but in the real economy around them. I've seen real progress in the UK in this area, but a genuinely stronger pipeline would show the full landscape: we need technicians and engineers, data specialists and lab staff, apprentices and operators, project managers, and the regional employers are already hiring. But how do you know what a STEM career would be like, just by hearing about it?

Access to work experience is still too dependent on luck and postcode

One of the other parts of the UK pipeline that I believe needs stronger support, is around how young people come to understand what jobs are even out there. That is not usually a question of talent, at all. It is a question of access and awareness. Exposure to real STEM workplaces is uneven: employer links vary wildly between schools and regions, some young people grow up surrounded by adults who can work the system for them while others are expected to navigate it almost blind, and without resources.

At ASTC 2019 I heard about a programme in Cleveland, Ohio, that gave young people a bus to a science centre venue, breakfast on arrival, gifts to take home, and free tickets for future visits. In Boston, a city fund existed specifically to support access for foster children and families in difficult circumstances. These were not afterthoughts, they were built into the programme model from the start, because the organisations involved understood that the most motivated young person in the world cannot get to a science centre if there's no transport and no money. And these programmes (after some researching) appear to still be going strong, 7 years later.

In the UK, transport is frequently cited as a barrier by schools and practitioners to both access jobs, and out of school engagement. We talk about aspiration and role models as key parts of the engagement landscape. But the practical reality is, that some young people simply cannot get to where opportunity is because the public transport is patchy, expensive or non-existent, and this goes largely unaddressed. I was told that in the USA, funders are often reluctant to pay for transport, citing liability reasons. But as many of their success stories noted: if a programme cannot solve the transport problem, it will systematically underrepresent the young people it most wants to reach. Many UK funders are now actively looking for projects that work in areas of IMD (indices of multiple deprivation), and that can be a support for informal learning and resources for schools, but that is only part of the picture, when considering STEM careers.

Figure 20: 'Faces' exhibit at Exploratorium, with warning sign, San Francisco USA (2019)

The reality is geography matters in another way too. Not everyone wants to move hundreds of miles for study or work, and not everyone can. If local employers, local colleges, local schools and local science institutions are not connected, then local aspiration has nowhere to go. And if aspiration has nowhere to go, the pipeline leak can become a burst pipe altogether.

A stronger UK approach would treat access to STEM engagement, careers and work experience opportunities as infrastructure. It would prioritise multiple meaningful opportunities for work experience, making it easier for young people to access and easier for employers to offer. It would prioritise awareness raising of not only broad career options, but local opportunities. It would build clearer local pathways and support stronger, easier links between the critical pipeline elements of education, industry and academia.

But access and aspiration are one element of the pipeline. The other critical element I was keen to explore during my travels, was around the role of diversity in STEM, particularly around how to encourage more women to see STEM as a viable, sustainable and worthwhile career. And it was the part of my travels that I found the most challenging.

Rethinking diversity: culture, power and who gets to progress

Diversity in STEM in the UK is still an issue, across industry, and academia. This is in part due to seemingly stubbornly entrenched A Level uptake (more young men take Physics, and more young women take Biology, with persistent gender gaps)[6]; if the same demographic groups are taking the STEM subjects as have always done so, it's unlikely you'll see much change to the diversity of the STEM pipeline. However stark the national level statistics are, I want to acknowledge that I know great work is being done at local level, and many schools are adopting 'whole school equity' approaches to really interrogate, challenge and change the diversity makeup of the students who are taking STEM subjects, which means schools look at all the contributing factors (governance, timetabling, messaging, teaching support, parental engagement etc.) that might impact on student choice.

But changing perceptions on STEM subjects and by association, future careers, is difficult, long-term work, and gender is the clearest-evidenced example for me of a wider structural pattern around who engages with STEM and who doesn't: who is seen, who is in the room, and whose path is treated as 'normal'.

Some of what I saw on my travels around gender was not always particularly enlightened. I recognise diversity can be a polarising topic in the UK, so I want to be honest about where I started my Fellowship as a person, because I think that matters in how I handle the following section. I'm a white woman in her 40s, who had a (relatively) middle class upbringing, writing from my own vantage point and experience. I fully recognise that my experience is privileged because of my ethnicity and background, that I (like all of us) carry unconscious bias, that gender identity is a spectrum, and that other people's stories are not mine to own; I do not pretend to write for everyone who identifies as underrepresented. What follows is my interpretation of my Fellowship, not a claim to objectivity. I recognise underrepresentation is intersectional: it cuts across gender, race, class, geography, disability and background, and those things can compound one another in ways a single lens can never fully capture. I focus on gender and on culture here because they are what I know best, but I am wary of anyone, on any side of this, who wants the question and the solution to be simple. It isn't. It is an incredibly complex topic, and I don't think we serve it well by pretending otherwise. So, to my main point.

We often talk as if the issue with gender diversity in STEM careers is getting more women interested in STEM, making them more confident, or helping them picture themselves in technical spaces. All of that matters, and some targeted initiatives do create much-needed safe spaces. But this framing often stops short of the harder question: why do these disparities exist in the first place, and what happens once those women enter the workplace? My own discomfort with some "girls in STEM" language is not that the intention is bad or poorly conceived. It's that the framing *can* feel patronising (given how few "boys in X" campaigns I have seen over the last decade), as though the answer lies in packaging STEM

---

[6] Institution of Engineering and Technology (2025) 'A Level uptake in STEM grows, but calls for greater gender equity'. Available at: https://www.theiet.org/media/press-releases/press-releases-2025/press-releases-2025-july-september/14-august-2025-a-level-uptake-in-stem-grows-but-calls-for-greater-gender-equity (Accessed: July 2026).

differently for young women, rather than asking more searching questions about the structures they are entering, or the classrooms they sit in. Safe spaces where different learning styles, confidence levels and approaches can prosper may be part of the answer, but they are not the whole answer.

Figure 21: Image showing Royal Society of Chemistry report on 'Breaking the Barriers' relating to gender equity in chemical sciences, conference Birmingham 2024

So why look so closely at gender? For me, diversity has never really been about campaigns or influence, or ticking a diversity box. It is about organisational strength and resilience, and *it is about power*: specifically, about who holds it, and who is trusted with it. There is now substantial evidence supporting a business case for diversity. Research on UK boards has found that gender and skill diversity are positively associated with financial performance[7], and a meta-analysis of the wider international evidence found a clear positive link between board diversity and innovation, one driven more by diversity of thought and experience than by demographic diversity alone[8]. That last finding is the one I keep returning to: the value of diversity was never in meeting demographic quotas for their own sake. It is that some groups have historically been excluded from these workplaces altogether, and that people who think alike can be most comfortable recruiting in their own likeness, which means organisations as a whole can keep arriving at the same answers. A leadership team drawn from generations of the same narrow group is, almost by definition, short on the range of thought that good decisions and real innovation depend on. Homogeneity at the top is not only a fairness problem, it is a commercial weakness.

And yet, after decades of effort, remarkably little has changed at the top of organisations in relation to gender diversity, within STEM and across most sectors in the UK. In 2024, women held just 12% of executive directorships in FTSE 250 companies, and more of those women were finance chiefs than chief executives[9]. This is not a pipeline that has run dry somewhere near the source. It is one that keeps delivering right up until it approaches real power… and then it leaks, or is blocked all together.

The most unsettling moment of my Fellowship came in an interview I can't directly quote, because the audio recording no longer exists. In a field where women now make up a large and academically high-performing part of the workforce, the senior man I was speaking with told me plainly, to my face, without a hint of irony or lack of belief, that he believed *'men are naturally better suited to subjects whose names end in '-ics' and women to those ending in '-ology'.'* This was not said in passing, with no recognition that this might be a problematic statement. It was said clearly, in English, repeated in Korean, and confirmed when I checked with my translator after the interview. The irony was that later in the same conversation, the individual did reference some of their strongest achievers were in fact female.

My work back in the UK in between my travels also shaped how I think about this part of the pipeline. At a conference in 2023, I heard from a female engineer who had recently returned from maternity leave and was applying for a more senior position within her organisation, when her manager asked her with a mixture of concern and challenge '*are you sure you want to take that leap so soon after having your child'*? Of course the next question raised at the conference was: would

---

[7] Hosny, K. and Elgharbawy, A. (2022) 'Board diversity and financial performance: empirical evidence from the United Kingdom', Accounting Research Journal, 35(4), pp. 561–580. doi:10.1108/ARJ-02-2020-0037.

[8] Makkonen, T. (2022) 'Board diversity and firm innovation: a meta-analysis', European Journal of Innovation Management, 25(6), pp. 941–960. doi:10.1108/EJIM-09-2021-0474.

[9] Vinnicombe, S. et al. (2024) The Female FTSE Board Report 2024. Cranfield School of Management. Available at: https://www.cranfield.ac.uk/femaleftseboardreport (Accessed: May 2026).

the same question have been asked of the father (where present)? And if not, why not? The cost of having children still often falls more heavily on women in the workplace, and their careers and lifetime earnings still suffer in comparison to their male equivalents. Encouragingly so, in the same conference, examples were provided that some organisations are really walking the walk on this particular issue by providing onsite childcare, training managers in bias, and introducing flexible working not as an initiative, but as a genuine way of working. Many of the organisations were large companies, with headquarters in specialist business parks, but that does not mean other smaller organisations are not doing similarly positive things to support women with childcare responsibilities.

As I said at the start of this report, I wasn't able to have many meetings in Japan, but I did do some research back in the UK in relation to their gender diversity statistics in STEM which was quite illuminating. In PISA 2022, Japan was among the highest-performing of the 81 participating countries and economies in both mathematics and science, with a gender gap in mathematics of around nine score points (boys outperforming girls), in line with the OECD average.[10] And yet Japan has the lowest proportion of women among tertiary STEM graduates in the OECD: only around 7% of female university students in Japan major in STEM, against 36% of male students.[11] That's a common theme that I see across nations and cultures: it's not a gap in ability, it is a gap between ability and opportunity. When a country produces some of the strongest science and maths education results in the world and then converts almost none of that into women entering STEM careers, the loss must be happening somewhere other than the classroom.

Figure 22: Shinjuku crossing, Tokyo Japan, 2024

So, I researched this a bit further and where it is happening is not especially surprising. A 2025 Tokyo public opinion poll found that around 83% of adults believed certain jobs were *better suited to men or to women*. Among children, 47% of boys and 40% of girls thought some jobs were gender-specific; among their parents, 70% of fathers and 57% of mothers did. Children who had been told things like "because you're a boy" or "because you're a girl" were more likely to hold fixed

---

[10] OECD (2023) PISA 2022 Results (Volume I): The State of Learning and Equity in Education. Paris: OECD Publishing. doi:10.1787/53f23881-en.

[11] OECD (2023) Education at a Glance 2023: OECD Indicators. Paris: OECD Publishing. doi:10.1787/e13bef63-en. See also International Monetary Fund (2023) 'Japan's Economy Would Gain With More Women in Science and Technology'. Available at: https://www.imf.org (Accessed: July 2026).

views about gender roles.[12] And where the bias has been made explicit it was quite startling: a 2018 investigation found that several Japanese medical schools had manipulated entrance examination scores to disadvantage female applicants. Even after the reforms that followed, medicine remained the only academic discipline where men were significantly more likely than women to be admitted, despite women consistently outperforming men when it came to actually passing their medical licensing exams.[13] I include that not to single Japan out in any way, but for the opposite reason: it illustrates something that thematically concerned me across my Fellowship and UK experience: a key barrier for getting women interested in STEM is rarely capability, and it is rarely visible in the exam results. It sits in what people believe about who a subject or career is for. If you believe that you will struggle in a job because of something that you cannot change, why would you choose that as a career, unless you had the resilience and passion to really see it through? Here is where I throw back to the importance of the “spark”. If you don’t have that emotionally deep connection to going into STEM, it feels like considering it as a viable option amongst many would be a stretch, and if when you arrive in the career, you’re treated poorly, why would you stay?

So, what are countries doing about that? Well, my research reviewed a few different approaches, how they have been received, and how successful they have been. Kyushu University in Japan announced a women’s quota in its mathematics department in 2012, against a backdrop of mounting pressure on Japanese universities to address an OECD-low share of women in science, but later withdrew it after public criticism that it amounted to what we would call in the UK, positive discrimination. When several universities, including the Tokyo Institute of Technology, proposed similar quotas in engineering just over a decade later in 2023, the criticism came again, but with noticeably less force.[14] Whilst that is somewhat reassuring, what strikes me most about the Japanese case is what it removes from the argument. Japan is comparatively ethnically homogeneous, so its diversity debate is in practice almost entirely about gender.[15] Because Japan is so ethnically homogeneous, its diversity debate is in practice almost entirely about gender, with little of the racial or ethnic dimension present elsewhere. That makes it a useful place to look closely at how gender alone affects experience. The UK’s context is more complex and more intersectional, as I have said, and I would not want to ignore that. But it does mean we should look at this example carefully.

Before going further, I wanted to make the distinction between two key terms: *positive discrimination* and *positive action*. Positive discrimination means selecting or promoting someone on the basis of a protected characteristic, and that is unlawful in the UK. Positive action, however, means taking steps to remove barriers so that an underrepresented group can compete on equal terms. That is lawful under the Equality Act 2010, and where two prospective employees are equally qualified, an employer may lawfully choose (although they are not obliged to) the candidate from an underrepresented group.[16] The quotas proposed in Japan, and the statutory recruitment targets used in South Korea, I believe would fall under positive discrimination in the UK. My argument isn’t that the UK should adopt quotas, I personally fully believe in meritocracy as a core value, but to enable a true meritocracy, the playing field needs to be equitable upon point of entry in the first place.

---

[12] Tokyo Metropolitan Government (2025) Public Opinion Poll on Gender Equality. See also Tokyo Metropolitan Government (2022) Survey of fifth- and sixth-grade students, parents and teachers at Tokyo public elementary schools.

[13] Ministry of Education, Culture, Sports, Science and Technology (MEXT) (2018) Investigation into entrance examination practices at medical schools. Tokyo: MEXT.

[14] Yokoyama, H.M. et al. (2024) 'Can affirmative action overcome STEM gender inequality in Japan? Expectations and concerns', Asia Pacific Business Review, 30, pp. 1–17. doi:10.1080/13602381.2024.2320547.

[15] Minding the Campus (2025) ‘Japanese Universities Are Importing DEI, Female Quotas in STEM’. Available at: https://www.mindingthecampus.org (Accessed: July 2026). Cited as commentary rather than as a neutral source. Underlying enrolment figures: Gender Equality Bureau, Cabinet Office (2024) White Paper on Gender Equality. Tokyo: Cabinet Office.

[16] Equality Act 2010, ss.158–159. Available at: https://www.legislation.gov.uk/ukpga/2010/15/contents (Accessed: July 2026).

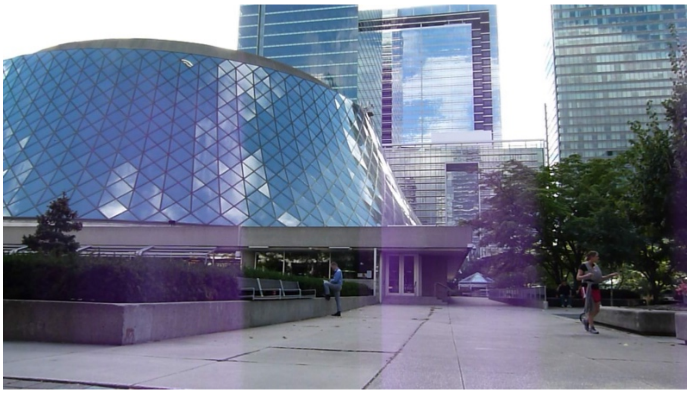

Figure 23: District of Toronto near ASTC conference, Toronto Canada 2019

In terms of gender diversity opportunities, Canada offers the mechanism I find most transferable to the UK, mostly because it doesn't include potentially politically unpopular quotas. Under the "*Canada Research Chairs Programme*", universities and research institutions set equity targets calibrated to their own context and to the availability of qualified candidates, publish an action plan, and critically, are held to it by the federal research funding agencies that administer the programme. Institutions with five or more Chairs have had to publish equity action plans since 2017, and all participating institutions submitted 2021-29 target plans, with larger institutions required to set targets by tier so that representation is not achieved only at junior level.[17] The "stick" is on funding, with the message that: if you fail to demonstrate progress, your eligibility for future funding will be at risk. This, unsurprisingly, isn't by any means a universally popular political policy. But it is a different tool from a quota, and it's one the UK doesn't currently use in any scaled capacity (to my knowledge). Currently, we attach equity expectations to almost nothing that carries economic consequences, and that is a question I hold: do we need more "sticks" in the UK in relation to broadening gender diversity in STEM?

I think many of the examples of gender discrimination I either experienced or heard about were concerning, but I recognise these were small sample sizes, and therefore I'm cautious about drawing too many strong conclusions. I am left feeling, however, that some of the core barriers to retaining women in workplaces, particularly those in STEM industry and academia, are more persistent than we sometimes want to admit: childcare costs, workplace culture, and promotion systems that still reward visibility, confidence and a narrow reading of leadership still exist in the UK, and across the countries visited. Even family-friendly policies can look pretty different in practice when they're shaped by people who don't have primary caring responsibilities themselves. In reality, they can actively shape who feels able to continue, who is able to progress, and who quietly opts out of the careers altogether.

If I were to be generous with my analysis, the comments from the managers/senior leaders above suggest the gap around gender equity in the workplace may be more unconscious than deliberate: leaders who would sincerely tell you to your face that they believe in diversity and mean it, but who have never had to examine how they actually interact with people (for example, whose contributions they rate, who reads to them as leadership material, who gets the stretch opportunity and who doesn't) and may not even realise they are quietly sustaining a culture where the same people keep progressing and others are left out. Because in the end, that is what culture inside an organisation is: it's not a policy, or a poster, or a training programme, but a group of individuals and how they collective think, act and talk, day after day. It's highly subjective, it's hard to measure because it is about how people perceive other people, and it is set, more than anywhere else, by the people at the top of organisations and lived downwards through management structures and personal interactions.

[17] Government of Canada (2021) Canada Research Chairs Program: Equity, Diversity and Inclusion Requirements and Practices. Available at: https://www.chairs-chaires.gc.ca (Accessed: July 2026).

Which is why I think the honest question I'm left with around why we still have a lack of diversity in STEM in the UK with respect to gender, is the one I should've been bold enough to ask during my early career working in corporate HR: does the senior leadership *genuinely* believe in diversity? Not just in principle, but when staff feedback shows change is needed, are they willing to recognise their own role in setting the culture, and to consciously change their behaviour as a result? Because there's very little point running training for mid-level managers and below if the people who set the culture won't look hard at their own role in building and living it. Some leaders, when asked directly, will find they do believe in diversity, but may never have understood what it would mean for them personally, or how it connects to real cultural change beyond a set of statistics. That conversation: authentic, uncomfortable, and had *with* people in power rather than *about* them, is where I feel the actual work needs to be focused.

The gap between intention and lived experience of women in STEM is where careers can quietly slow and eventually end. A pipeline with active and well-meaning recruitment campaigns, but an inflexible, dispiriting or even hostile culture in reality, will keep losing people. And it will keep losing women disproportionately, because the pressures that cause people to opt-out of STEM careers are not evenly distributed across genders.

No second chances: what about career changers?

As a brief aside, I now want to focus on whether any countries have successful mechanisms for supporting experienced professionals to move into STEM career in later life. As someone who has changed careers three times in 20 years, this is a personal interest of mine, because my route always required me starting at the bottom again, and work my way back up. It required significant time, effort and salary sacrifice, which made me wonder if any of the countries I visited, had a strong career change strategy, particularly into STEM careers.

Within the context of my Fellowship, the UK still tends to imagine a STEM career as something that is decided early and pursued linearly through an academic route. But is that the only option? Whilst I was travelling I didn't find that many examples on this topic through my interviews, but in researching my report when I returned to UK, I have since found some interesting examples for consideration.

There are strong career programmes in some of the countries I visited, but almost all of them focus on *re-entry* for those who have taken a *career break* rather than those wanting a *career change*. South Korea's *"R&D Career Re-Entry Programme"*, run by WISET, supports women whose careers were interrupted by childbirth or childcare to return to research: participating institutes receive funding to support their employment.[18] Canadian employers run comparable returnships, but equally they require a prior STEM qualification or prior STEM employment. The area for growth that I think is rich but untapped in the UK is for individual who have years of corporate or academic experience under their belt, but want to apply it to a new area, or new sector. One thing I wanted to mention: I fully understand that many STEM careers have academic requirements that are necessary to gain the basic knowledge required to do the job, but that isn't always the case. What I am suggesting, is that going back to university to do an undergraduate and then graduate degree, should not be the only route for gaining that knowledge. Many people couldn't afford the time or cost of both doing the degrees and losing the income stream to retrain, even if they wanted to. So my question is: is there another way of retraining experienced individuals, in the same vein as modern apprenticeships, that values their work experience to date?

One feature of the Korean scheme that I thought was interesting, because it answers the objection that any UK version of this would immediately run into: who funds the training? The answer in South Korea is that the state does, and crucially it

---

[18] Korea Foundation for Women in Science, Engineering and Technology (WISET) (n.d.) R&D Career Re-Entry Program. Available at: https://www.wiset.or.kr/eng (Accessed: July 2026).

pays the employer rather than the individual. A research institute taking on a returner receives around KRW 21 million a year for a researcher at master's level and KRW 23 million for one at doctoral level, for up to three years, reviewed annually, alongside mentoring and career development support for the returner themselves.[19] The barrier to hiring someone with a decade of experience in another field is almost never their willingness, it is a combination of an employer's calculation of risk: the dip in productivity while they learn, the cost of training them etc. The only comparable scheme I could think of in the UK (and if there are other schemes, I would be very interested to hear about them) are schemes like "Teach First".[20] The benefit of this fast-track route into teaching is that it pays the individual, through bursaries, which helps with the cost of living, but wouldn't address the employer's risk.

There are tangible benefits for those with professional experience being able to move into STEM careers that have skill shortages. But if we want experienced apprenticeships to be more than a new idea, funding is the lever I would look at first. One caution, though, and it comes from what I heard, rather than from a paper or report: a funded scheme is not the same thing as a functioning one. The policy architecture for returners in Korea is genuinely impressive on paper, and yet what I heard on the ground was that the experience of it varied depending on the organisation, and personal experience. Funding makes a scheme viable, but without a decent change management plan, it won't make the manager willing, the team welcoming, or the promotion realistic. If this idea is to be genuinely viable, all of those aspects would need to be considered. But from this research, I take heart that the question is less "is this impossible?" and more "how could this work in the UK?"

There is one route of this kind in the UK, which I found a cause for optimism, but it is still quite narrow. Skills Development Scotland's "Oil and Gas Transition Training Fund" pays for mid-career workers to retrain into clean energy, and latterly into advanced manufacturing, life sciences and defence: an Aberdeen pilot supported over 400 North Sea workers, and the scheme was expanded across Scotland in 2026 with £6 million of UK and Scottish government funding.[21] It exists, though, because of a very specific and visible issue: a fossil fuel sector which is shedding jobs and is unlikely to be sustainable long-term (much like the UK coal mining industry in the 1980s), sits alongside a destination renewable energy sector seeing immense growth and needing skilled workers (over 90% of oil and gas roles were assessed as having medium to high transferability into closely related energy sectors).[22] This element of taking the transferable skills of experienced individuals where work is decreasing, and moving them to in demand growth jobs through targeted training and development, is exactly what I'm advocating for, but much more widely. It also touches on a reality of flexibility and choice I mentioned earlier: the world of STEM changes so rapidly, jobs that you didn't know were options (or even existed) when you were choosing your subjects/career at 14-18 at school, are now desperate for experienced skilled workers, but there isn't currently a way of making that leap for experienced people, without starting all over again. But I think there are opportunities to change that using apprenticeship models as a foundation, and for the UK to lead the way in this area, if the interest and funding is available.

---

[19] Korea Foundation for Women in Science, Engineering and Technology (WISET) (n.d.) R&D Career Re-Entry Program. Available at: https://www.wiset.or.kr/eng/sub03_02_01.do (Accessed: July 2026)

[20] Teach First (n.d.) Available at: https://www.teachfirst.org.uk (Accessed: July 2026).

[21] Skills Development Scotland (n.d.) Oil and Gas Transition Training Fund. See also HM Government (2026) 'More oil and gas workers to be supported into jobs', 24 June. Available at: https://www.gov.uk/government/news/more-oil-and-gas-workers-to-be-supported-into-jobs (Accessed: July 2026).

[22] Robert Gordon University (2021) UK Offshore Energy Workforce Transferability Review. Aberdeen: RGU Energy Transition Institute. Available at: https://www.rgueti.com/wp-content/uploads/2021/05/workforce-transferability-report.pdf (Accessed: July 2026).See also IPPR (2025) 'Skills passports: an essential part of a fair transition'. London: IPPR.

That concludes my broad findings across the 4 countries I visited, and I will now move into the key recommendations I believe could be implemented within the UK, to redress some of the leaks I perceive within the current STEM pipeline from early years to extended meaningful careers.

In summary

What I learned during my travels, in between and afterwards, has been extremely useful in helping me to solidify my thoughts around what I think the issues are in the STEM pipeline in the UK, and what the potential solutions might be. Having used the pipeline metaphor throughout my report, I therefore wanted to utilise it once more, to summarise the critical points in a person's journey where we could make concerted changes or implement new programmes to stem the leak, and move towards how a successful pipeline might look in the UK.

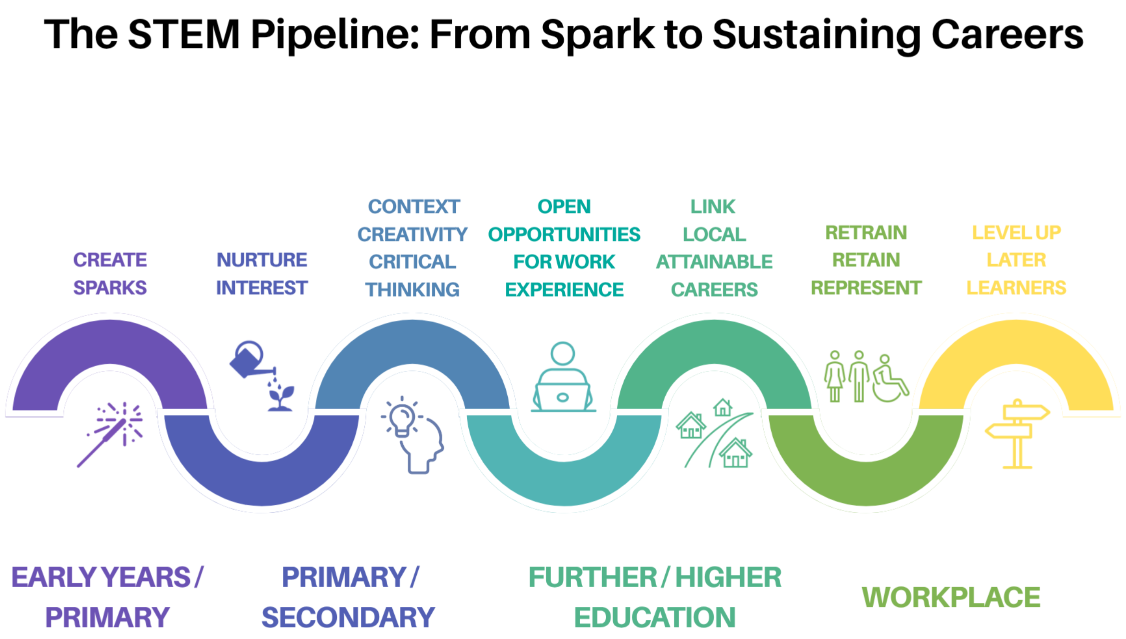

Figure 24: 'Patching the Pipeline' model for supporting more young people to see STEM careers in their future, Clare Meakin, Churchill Fellowship 2019

For each of the areas cited above, I have also provided recommendations below of how I see each of these areas being practically implemented in the UK.

Recommendations

The following conclusions emerged from 6 years of thinking about what I saw, heard and experienced across four countries. They are offered in that spirit: not as a critique of any single organisation or sector, but as a set of practical possibilities for people who want to act.

The thread running through all of my learning is that aspiration is not just about whether someone is motivated or interested enough in STEM to want to pursue a career in it. It is about whether they can see a route, recognise themselves within it, access meaningful opportunities, and imagine a future at the other end. My main premise is: build the system for that, and aspiration will follow.

Recommendation 1: Invest in long-term programmes, not one-off events

A workshop, a careers fair and good role modelling are all valuable elements of creating engagement with a strong STEM pipeline. The evidence from this Fellowship is that they are not, on their own, enough to shift anything structurally. The Lang Science Program at AMNH is the clearest illustration of what that looks like and what could be adopted in the UK.

The UK needs more high-quality, regionally rooted programmes built on that logic. A comparative option in the UK is Multi-Academy Trusts (MATs) and school clusters, who could (with the right support), be enabled to make more joined up or long-term/larger scale STEM engagement and education programmes. They already hold relationships with large school cohorts, existing employer networks, and the collective capacity to manage something that a single school could find difficult to sustain. A MAT working with a regional STEM employer or science institution to co-design a sustained programme, properly evaluated over several years, is a model worth piloting now.

Local Skills Improvement Plans (LSIPs) are also showing early and encouraging results in making and sustaining these connections between industry, and local education providers, with evidence that young people who are shown local, achievable STEM careers through both academic and vocational routes, will make choices to go into those fields where skills are really needed.[23]

So funding collaborations of institutions who sit around formal STEM education and *can do* long term programming like AMNH (science centres, museums, visitor attractions), would create clearer more joined up pipelines for young people to experience and sustain their interest in STEM over the long term, is a policy decision.

I see regional targeted and well-funded longitudinal campaigns and programmes led by LSIPs, MATs, informal science engagement and industry as a key solution that could meaningfully connect local opportunity, with interesting work experience, that would directly impact young people's aspiration and interest to go into STEM careers on their doorstep.

Recommendation 2: Measure what actually matters, over the long term

Long-term evaluation does not require enormous budgets, but if we really want to understand how to engage young people with STEM over the long-term, we need to provide resources and funding to enable organisations and individuals to track impact over years and decades, not months. It requires intention and continuity. Even modest evaluation frameworks, sustained beyond the end of a funding period, can tell us whether STEM engagement is actually changing trajectories over time. It is something that could be effectively resourced either using consultants or in-house staff, if funded properly.

I'd like to see funders recognise that evaluation is a critical part of the work both during *and* after large funding grants, and whilst many projects have great legacy plans, they can't often access follow-on funding for projects that work, and have

---

[23] Department for Education (2025) Guidance for developing a Local Skills Improvement Plan (LSIP). Available at: https://www.gov.uk/government/publications/local-skills-improvement-plans (Accessed: May 2026).

long-term slow burn impact. Follow-on funding doesn't have to be extensive, it does however need resource and organisation. That is a practical and achievable next step, and I would welcome collaboration on it.

Recommendation 3: Take scientific literacy seriously, not just as exam or career preparation

Scientific literacy is not only for future scientists. It shapes how people interpret evidence, question claims and navigate a world increasingly shaped by contested readings of health research, climate science, AI and misinformation. Treating curiosity and critical thinking as central to science education, not as optional extras squeezed out by curriculum coverage and exam preparation, is one of the most important things the UK could do.

This also means recognising what public engagement gives back to researchers. Researchers who work with diverse, non-specialist audiences often learn something in the process. That exchange should be designed in, not treated as a one-way act of knowledge transfer and outreach. My challenge to academic and research colleagues: how might the communities you work with, meaningfully engage with your research in ways that could actually shape it? And my challenge to media: what role can you play in representing who 'scientists' actually are, what they do, rather than hero centring the elite stereotypes that can put many young people off pursuing careers in STEM?

Recommendation 4: Broaden how STEM is represented, and which careers are seen by young people

Aside from media and film, STEM engagement campaigns that showcase "astronaut, inventor, genius" framing of STEM careers is inspiring, but it should not be the whole focus. A fuller picture would show the whole landscape: technicians, data specialists, lab staff, operators, apprentices, project managers, digital and practical roles, and the regional employers who are already hiring and cannot find the people they need. Many excellent engagement projects are beginning to do this well, particularly around more vocational pathways. The task now is to do much more of it, targeted deliberately at the young people who most need to see themselves reflected in it.

Aspiration needs to feel plausible and not merely admirable, because recognition (seeing something you could actually picture yourself doing) does far more to build a sense of belonging than admiration from a distance ever will. STEM aspiration campaigns can spearhead this by showcasing more widely not only who does science, but what STEM jobs actually involve at an accessible, achievable level and for the many, not the academic few.

Recommendation 5: Make access to STEM work and work experience genuinely equitable and accessible

Connecting young people to realistic local opportunities, showing a clear pipeline between where they are, what they are learning and what job they could do close to home, is showing real promise at regional level. That approach deserves continued investment and expansion.

But the specific challenge of equity of access to work experience, who gets it, who misses out, and why, remains largely unsolved.

A properly resourced national matching platform, connecting young people to employers across regions based on interest and aptitude rather than family contacts, could make a significant difference to equity of access. Not another database that schools cannot navigate, but a genuinely user-friendly, accessible resource for parents, students and employers that enables both in-person and virtual work experience opportunities to be accessed, across the UK. There are many excellent careers organisations already working in their local communities, supported with experienced and capable staff who can provide assistance to employers, young people and parents, giving employers the practical guidance they need to host young people safely and well.

But that does not address the patchy nature of access to work experience: funding a national, workable matching programme feels both achievable (particularly with the rise of AI-assistance) but also necessary if we want to seriously move the needle on who engages with STEM careers.

I also believe a national bursary or grant scheme to support transport and subsistence and reduce barriers to participation would be critical, as well as online/telephone support for both students and employers *during* the experience. Whilst this recommendation is ambitious in scope and scale, it would not be impossible to implement, with the right funding and support, particularly working on smaller pilot schemes first to provide proof of concept.

Recommendation 6: Take workplace culture as seriously as recruitment, and work with those who hold power

If we are serious about diversity, about people not just entering STEM careers but staying and thriving in them, we have to stop aiming diversity schemes only at the people trying to get in, and start working directly with the people who hold power. Culture is set at the top of organisations and institutions and lived downwards, and no initiative below senior level will hold unless the people at the top genuinely see diversity as valuable, and are willing to change the system as it stands. (I set out the reasoning behind this in *Rethinking diversity: culture, power and who gets to progress*, above.)

I see gender diversity as a multi-faceted issue, which therefore would a require multifaceted solution: providing funded opportunities for genuine engagement with STEM at a young age, a more relevant and contextual school curriculum (with less overall content to be learned, allowing for more curiosity, excitement and contemporary science exploration), stronger representation of who STEM careers are for, what opportunities are available locally, whole school equity approaches to subject choice and availability, equitable and achievable exams, and finally, “carrot” and “stick” approaches for industry and academia to genuinely engage on who progresses in STEM, whether change is actually wanted by those in power, and if so, collaborative discussion on how to achieve it.

I understand this is my biggest recommendation. But I also feel I wouldn’t be doing my Fellowship justice, if I didn’t connect those threads together, to show what is really needed when we talk about action to improve diversity, and also why stand alone engagement and aspiration campaigns often do not work in isolation.

Recommendation 7: Strengthen local pathways and treat informal learning as infrastructure

We should stop treating informal science learning establishments as enrichment, and start treating it as infrastructure. Science centres, museums, galleries and other cultural and community institutions are not just “days out”, they can actively and effectively support formal education in a variety of ways, but critically: the organisations need to be effectively funded, over the long term. As has been the focus of much research in recent years around science capital and what genuinely sustains young people’s engagement over time (the ASPIRES study being the best-known example), a great deal of what determines whether a young person stays with science, and comes to see it as “for me”, is built in precisely the informal, out-of-classroom settings we tend to treat as peripheral, and it is unequally distributed along exactly the lines of disadvantage you would expect.[24]

The problem here is structural, and many recent campaigns within the STEM engagement sector have highlighted this exact issue. In written evidence to Parliament, the Science Museum Group noted that the funding available to informal STEM learning is overwhelmingly for short-term projects, which actively discourages the longitudinal projects and relationships that are key to lasting change.[25] More pointedly still, the "*Science Centres For Our Future*" campaign, led by the Association for Science and Discovery Centres and debated in Parliament in early 2026, has drawn attention to the fact that science and discovery centres are largely excluded from the capital and infrastructure funding streams routinely available to museums, libraries and arts organisations.[26] The sector is already making this case for itself, I would simply add the structural point: we have built a funding model that makes it very hard for informal learning to do the one thing it is best placed to do, which is to hold a relationship with a young person over years through delivering interesting contextual and contemporary STEM engagement, but we compound it by employing many skilled people on short, insecure and low-paid contracts, then wonder why the connective tissue keeps fraying.

The US model of city-level partnership between museums, schools and municipal government, including funded teacher professional development, offers a direction worth exploring. In South Korea, government investment in teacher training for new technologies demonstrates the same principle at national scale. The UK has the institutions, and the expertise in highly skilled and motivated informal learning providers, who too often work in increasingly unstable and low-paid jobs. What is missing is the infrastructure that connects them, and the funding model that sustains that connection over time. Philanthropy alone will not solve this in the UK in the way it does in the United States.

That means government and sector bodies need to treat informal learning institutions as part of the STEM infrastructure conversation, not as a pleasant addition to it.

Recommendation 8: Create genuine second chances

STEM participation cannot only work for people who made the right decisions in early adulthood. Late engagers, career changers and adults who want to redirect into STEM without starting from scratch are not fringe cases, they are a significant and largely untapped resource.

South Korea's two-year technical degree routes, flexible major choices and retraining programmes for career returners all point towards a system that treats STEM participation as a lifelong possibility, not an early selection event. The UK has some of this, but the dominant model still assumes a linear path decided early and pursued without interruption.

I believe "Experienced apprenticeships" are worth exploration. Routes like Teach First have shown that fast-tracked but properly structured alternative entry can work in the teaching sector. That logic could be applied more widely across other sectors, and opportunities for career change programmes with colleges and universities without going back to full-time study are real (many sectors offer 'micro-qualifications' now) but could be leveraged far more to support those with

---

[24] Archer, L., DeWitt, J., Osborne, J., Dillon, J., Wong, B. and Willis, B. (2013) ASPIRES: Young people's science and career aspirations, age 10–14. London: King's College London; and Archer, L., Moote, J., MacLeod, E., Francis, B. and DeWitt, J. (2020) ASPIRES 2: Young people's science and career aspirations, age 10–19. London: UCL Institute of Education.

[25] Science Museum Group (2023) Written evidence submitted to the House of Commons Science, Innovation and Technology Committee. Available at: https://committees.parliament.uk (Accessed: July 2026).

[26] Association for Science and Discovery Centres (2025–26) Science Centres For Our Future campaign. See also House of Commons (2026) Westminster Hall debate: Science and Discovery Centres, 14 January. Hansard.

experience and transferable skills moving into the new and emerging careers, where the UK needs the talent and expertise. I say this having seen how industry and the FE sector work together to build apprenticeship programmes that work for young people; my challenge is - can we do the same for those who want to move into STEM later in life too?

Conclusion

What I learned across this Fellowship was not that another country has completely solved STEM participation from start to finish.

What those systems do, and what the UK does far less reliably, is refuse to leave the journey to chance. Rather than simply hoping a young person will be inspired and trusting the rest to sort itself out, they take some care to show them where an early interest might actually lead, and then to connect that curiosity to institutions, and those institutions to real opportunities, and those opportunities, in turn, to careers that a person can genuinely enter and stay in. What they understand, in other words, is that participation is not really a question of talent, or even of confidence, but of whether people can see a future for themselves, and whether the structures around them make that future realistic.

The UK's STEM challenge is not a gap in ambition alone. It is a gap between interest and opportunity, between encouragement and access, and between recruitment and retention.

We have world-leading STEM industries and academia right here, with genuine skill shortages and real opportunities, and yet we still struggle to build the pipeline that connects young people to them. The harder question left to answer is this: what would it take to build a system that makes that aspiration realistic, and what are we losing by not changing the current one?

The frustrating thing, and also, I think, the rather hopeful thing, is that most of the answers already exist. They are scattered across the countries I visited, and in real pockets of good practice here at home, which means the task ahead isn't really one of invention at all. It is one of assembly: bringing what already works into something coherent, resourcing it properly, evaluating it honestly, and finally treating the pipeline as something we build, rather than something we go on leaving to luck.

Figure 25: Golden gate bridge, San Francisco, USA 2019

What I plan to do next

Many of the recommendations above are not possible for me to deliver alone and I fully recognise future work is likely dependent on influencing sectors, public bodies and policy makers. But as first steps, below is a summary of the actions or ambitions I have that would enable me to continue my learning beyond my Fellowship.

Immediate steps:

- Share this report with STEM organisations, UK sector bodies, and across education, informal learning, industry and academia.
- Publish a series of shorter communication pieces drawn from the report, which summarise 1-2 key findings and encourage further feedback and engagement on any of my recommendations.
- Submit to the ASTC conference for 2027, where the call for papers opens this autumn, to return to the conference where my Fellowship began, to share my findings and explore international opportunities for future learning (subject to conference acceptance and funding for travel).
- Continue to publicly support campaigns that supports people rather than short-term projects, the value and growth of science centres and museums, and greater access to follow-on funding for programmes which are effective over time.

Short-term (small grant funding required):

- Seek funding for a pilot longitudinal evaluation service: offer to a small cohort of STEM engagement organisations, a longitudinal multi-year impact service that could either retrospectively or prospectively track the impact of programmes over multiple years.
- Research the experienced apprenticeship model, and approach employers in a single region and STEM sector to establish whether the concept had potential for growth.

Medium-term (larger funding, or partners):

- Research partners and pitch opportunities to scope a regional trial of a work experience matching platform, to test the technology and the coordination before any case is made for national database, which would likely need to be led by the Department for Education or a body of comparable standing.
- Seek funding to research how UK students themselves experience STEM education now, and with recent school leavers to see what lessons could be learned for curriculum, work experience and engagement.
- Seek funding to visit Finland and Estonia’s STEM education systems, to extend my understanding of different education systems and explore further opportunities for the UK.

Long-term:

- Establish, with a university or research council partner, a longitudinal study that follows young people from an early "spark" through to career, so that we can move towards sector level knowledge of what works, what students think and aspire to, and what practical steps we can take to support more young people to go into STEM careers in future.

Acknowledgements

I would like to thank the teams at the American Museum of Natural History, Boston Museum of Science, MIT Museum, Exploratorium, the ASTC conference, the embassy team in South Korea, and the many experts, practitioners and individuals who shared their valuable time and insight during my travels and throughout my work in the UK. I felt privileged to have meet you, and you were all deeply fascinating! I would also like to thank the Churchill staff, my many friends and colleagues who listened and helped me mould my ideas, and copyediting support from Adrian Holliday whose expert advice helped to shape this report.

Figure 26: Clare Meakin, self-portrait photo, Japan 2024

This piece is a reflection on my travels, which were both informative, and life-changing. Travelling abroad to learn as part of a Churchill Fellowship was a privilege, and I fully intend to use my learning in any and all areas of my practice going forward. I would be delighted to discuss any of the questions or opportunities raised in the report in further detail.

clare@curiousrootsconsulting.com

This report is part of a Churchill Fellowship. The Churchill Fellowship is a UK charity which supports individual UK citizens to follow their passion for change through learning from the world and bringing that knowledge back to the UK.

Glossary and abbreviations

The following terms and abbreviations are used throughout this report:

STEM: Science, Technology, Engineering and Maths.

STEAM: STEM with the addition of Arts (Science, Technology, Engineering, Arts and Maths); an approach that integrates arts and sciences rather than separating them.

Science capital: A concept from the ASPIRES research describing the science-related knowledge, attitudes, experiences and social contacts a young person accumulates (broadly, what you know, who you know, and the opportunities you are exposed to), which shapes how likely they are to engage with science.

ASPIRES: A long-term study led by King's College London and UCL tracking young people's science and career aspirations from age 10 to 19.

PISA: Programme for International Student Assessment; an international measure of educational performance used to compare school systems.

IMD: Indices of Multiple Deprivation; the official measure of relative deprivation across areas of the UK.

LSIP: Local Skills Improvement Plan; an employer-led plan for aligning local education and training with regional skills needs.

MAT: Multi-Academy Trust; a body running a group of academy schools in England.

FE: Further Education; the post-16 education sector outside universities.

AMNH: American Museum of Natural History, New York (USA).

ASTC: Association of Science and Technology Centers (USA).

ASDC:Association for Science and Discovery Centres (UK).

MIT: Massachusetts Institute of Technology (USA)

FTSE 250: An index of large companies listed on the London Stock Exchange, often used as a measure of senior business representation.

HR: Human Resources.

AI: Artificial Intelligence.

GCSEs / A Levels: English, Northern Ireland and Welsh secondary school qualifications, typically taken at ages 16 and 18. The Scottish equivalent is National 5s taken age 15/16, Highers taken age 16/17 (and Advanced Highers which are optional qualifications taken age 17/18).

UCL: University College London (UK).

ESRC: Economic and Social Research Council; a UK public research funder.

Positive action: Lawful under the Equality Act 2010. Steps taken to remove barriers or address underrepresentation so that a disadvantaged group can compete on equal terms, for example targeted outreach, mentoring or encouragement to apply. Where two candidates are equally qualified, an employer may lawfully select the one from an underrepresented group.

Positive discrimination: Unlawful in the UK. Selecting or promoting someone on the basis of a protected characteristic rather than on merit, including the use of quotas or reserved places. The distinction from positive action is the difference between helping someone reach the start line and moving the finish line.

IOP: Institute of Physics; the professional body and learned society for physics in the UK and Ireland.

WISET: Korea Foundation for Women in Science, Engineering and Technology; the body delivering South Korea's national programmes to recruit, retain and support women in STEM.

Ofqual: The Office of Qualifications and Examinations Regulation; the body regulating exams and qualifications in England.

Awarding body / exam board: The organisations that design, set and mark GCSE and A Level qualifications (for example AQA, Pearson Edexcel, OCR, WJEC, SQA in Scotland).

Returnship: A structured, usually paid programme supporting people back into a sector after an extended career break, typically including retraining and a route to permanent employment.