make.more

STEM REPORT

2025

February

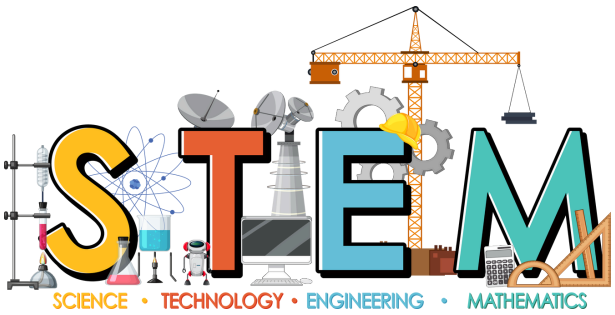
What are the benefits of opening up STEM opportunities to underrepresented communities?

By Dr Kristine Lennie - Head of Writing and Research at Make More Community CIC

1.0 INTRODUCTION

"IT MAKES ME PROUD TO BE ABLE TO SUPPORT YOUNG PEOPLE AND THEIR FAMILIIES WITH THE STEM EXPERIENCES THAT WE PROVIDE"

Simone Stone - Director & Head of Community Engagement



Science, Technology, Engineering, and Mathematics (STEM) are the driving forces behind innovation and progress in today's rapidly evolving world. From ground-breaking medical advancements to cutting-edge artificial intelligence, STEM fields shape the future, improve quality of life, and promise to solve some of the most pressing global challenges.
Unsurprisingly then, the importance of STEM education and research cannot be overstated. Moreover, as industries become increasingly reliant on technology, the demand for skilled professionals continues to grow. Governments, businesses, and educational institutions worldwide are prioritising STEM initiatives to prepare the next generation for a technologically advanced workforce.
Yet, as we explore throughout this report, many people from disadvantaged backgrounds face reduced access to the opportunities that STEM careers and skills can provide.

Our Head of Research and Writing, Dr Kristine Lennie explores this topic further and provides insight into the barriers faced by those from underserved communities and disadvantaged groups whilst diving into the benefits of promoting diversity and inclusion in STEM.

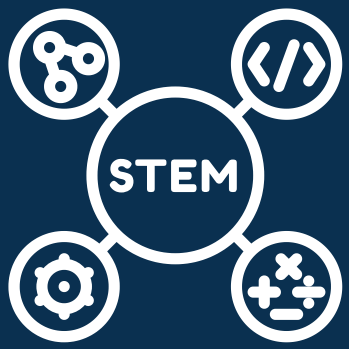
2. 0 Methodology

This report has taken a single-method research approach and is based solely on credible secondary sources from websites, journals and online newspapers/magazines. The benefits of using secondary research are: it is free, quick to access, updated regularly and relevant. Limitations of the research are that the writer could have a biased opinion and the quality of the information may not be checked.

Context really is... everything

3.0 DEFINING STEM

In the UK, STEM stands for Science, Technology, Engineering, and Mathematics - an umbrella term for a wide range of subjects, which at a post-school level can include a variety of roles in research and development, IT, pharmaceutical, finance, education, entertainment and many more sectors.



Over the last few years, UK employment figures have revealed a growing shortage of workers in STEM, at an estimated cost to the economy of £1.5 billion annually (through 'recruitment, temporary staffing, training and inflated salaries'), according to STEM Learning, using data collected from the independent research agency PCP and the Office of National Statistics (STEM Skills Indicator, 2018; Taylor, 2024).

Governmental reports show a particular deficit of skills in engineering, manufacturing, digital and cyber fields, among others (Department for Education, 2022), with these shortfalls of expertise posing significant risks for national plans and economic growth.

Meanwhile, the 2021 'Inquiry into Equity in the STEM Workforce' report by All-Party Parliamentary Groups (APPGs) discovered that the STEM workforce is significantly less diverse than the wider workforce, with this trend worsening with increase in seniority (British Science Association, 2021).

Engineering, which is seen as one of the top fields with high demand for workers, is also one of the least diverse, with 90% of the workforce being white, and only 14.5% female - compared to just over 50% white men in the total workforce and 48% female (Powell, Francis-Devine and Murray, 2020; Powell and Francis-Devine, 2023; Francis-Devine and Hutton, 2024).

The UK's goal to increase production of nuclear energy from 15% to 25% by 2050 requires double the current workforce which is at present consisting of rapidly retiring skilled workers, with 39% over the age of 50, and 15% under 30 (Eal.org.uk, 2024;World Nuclear Association, 2024).

Underrepresentation in STEM - What does this actually look like?

Underrepresented communities within STEM include minority ethnic groups, women (who make up only 25% of STEM employees, individuals who are economically disadvantaged, and those with disabilities(GOV.UK, 2024)). At a school level, many of these groups fall in the category of EAL (English as an Additional Language) students, pupils on free school meals, or pupils with special needs. The government data from 2024 states that of the 9.1 million students currently, nearly a quarter (24.6%) are eligible for free school meals country-wise, with the vast majority of these students situated in the West Midlands (where 28.9% of pupils are eligible for free school meals) and the North East (where the number is 31.2% (GOV.UK, 2024)).

A fifth of all students in the UK (20.8%) are recorded as not having English as a first language, while 37% of students belong to ethnic groups (GOV.UK, 2024).

Girls represent approximately half of the students in primary and secondary schools (Tradingeconomics.com, 2025).

5.0 BARRIERS TO STEM IN OUR COMMUNITIES

Young people from underrepresented communities face barriers at different stages of their education and career, which can impact their participation in elective STEM activities, courses and professions. Addressing these challenges requires a multifaceted and collaborative approach that engages not just the individual, but families, teachers, institutions, government bodies and and the communities around us.

Stereotypes of gender

The landscape of the barriers faced by underrepresented young people when it comes to pursuing STEM are complex. Stereotypes in STEM have continued to impact society's perception of what a STEM individual should be, or look like. Generations of children that have completed the Draw-a-Scientist test (Chambers, 1983; Emvalotis and Koutsianou, 2017; Finson, Beaver and Cramond, 1995) have replicated what we know to be true: that the image kids hold of what constitutes a scientist is rather standard and inflexible, and it emerges at a very young age as 'mostly white' and 'mostly male' (Fort and Varney, 1989).

In the US, school girls (and non-white school girls in particular) were consistently found to not identify with science regardless of their grades/scores: e.g. viewing it as opposing traditional female traits (Archer et al., 2013).

Gender stereotypes in STEM are so remarkably pervasive because they affect how identity fit is formed.

A 2002 study found that when bringing female scientists into an elementary classroom to explain their work, lead activities and challenge pre-conceptions, students disregarded the newcomers' introduction as STEM professionals, insisting that the women were teachers and not scientists(Buck, Leslie-Pelecky and Kirby, 2002).

A more recent study from 2017 by Hand et al. showed that classroom biases attributing more 'masculine' traits to STEM subjects can perpetuate the unsupported belief of boys as inherently better at science than girls (Hand et al., 2017; O'Dea et al., 2018; Griselda, 2024).

In a 1983 variation of the 'Draw-a-Scientist' experiment, the girls that partook in the study were the only ones to draw female scientists (Chambers, 1983).

Role Models, Confidence & Stereotypes

One reason for the continued endurance of stereotypes is considered to be the scarcity of STEM role models (within the family or external) from underrepresented backgrounds, which exacerbates the difficulty faced by young people in these communities in seeing science as a viable path for themselves (Nsf.gov, 2017).

A 2017 study assessing data of 4000 English students looked at how family background, gender and ethnicity may impact choice in pursuing STEM at post-compulsory level. In line with the argument for role models, the study suggested that parents' social class and education were a key factor in encouraging STEM participation, including carrying greater importance than family income. This was especially true for girls, who were more likely to choose science or Maths over other high-paying jobs if the socio-economic status of the family was higher (Codiroli Mcmaster, 2017).

Outside of home, another deciding factor for students' is the school environment, where young people spend the majority of their day. A 2013 report by the Welcome Trust found that teachers are the most commonly mentioned factor in what encourages or discourages a student to pursue science, with nearly 50% of the students asked also sharing that they consulted their teachers with regards to future career advice(Clemence et al., 2013).

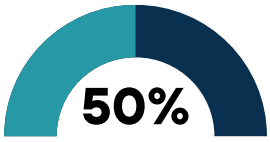
A 2015 study by Cambell looked at reading and Math scores of students and teacher's perception of students' level together with data on the students' family income, gender, ethnicity, to try and understand how sterotypes might impact teacher perception of skills (Campbell, 2015).

Concerningly, the study revealed that teachers perceived low-income pupils, special education needs students, Pakistani, Bangladeshi, Black African and Black Caribbean pupils as well as students who spoke languages in addition to English as worse performers at reading than their peers of equal reading scores.

Meanwhile, teachers were more likely to indicate that boys were better performers at maths compared to their equally-scoring female counterparts, and Black Caribbean students of any gender were perceived as

less good at Maths compared to white peers (Cambell, 2015).

Given evidence of the role teachers play in inspiring pursuit of science for young individuals, this data is deeply worrying. Moreover, in the UK, school perception of students can be the 'make or break' of who gets steered towards STEM at A levels, especially in less affluent districts (see: next section).



of students consulted teachers about their future career.

Why 'Belonging Matters'

Many of the above concerns are also present at post-school level, where underrepresented communities continue to be most at risk of not completing higher education (UCL, 2023).

Sense of isolation, cultural differences and the feelings of 'not belonging' have been suggested to be a significant factor in the higher drop out rate of ethnic minority students, alongside other barriers such as financial difficulties (needing to balance work with studies), cultural differences, academic issues and a lack of support (Connor et al., 2004; Read, Archer and Leathwood, 2010; Osler, 2011; Stuart, Lido and Morgan, 2011; Higher Education Academy, 2012; Davies and Garrett, 2013; Bunce et al., 2019; Kauser et al., 2021).

In fact, struggling with feelings of 'not belonging' has been shown to hold a significant weight in determining engagement, scores, self-efficacy and persistence in school and at higher education level (Hausmann, Schofield and Woods, 2007; Hurtado et al., 2007; Wolf-Wendel, Ward and Kinzie, 2009; Pittman and Richmond, 2010; Ahn and Davis, 2020). Multiple studies found that this is particularly true in STEM and can have detrimental effects on student well-being and decision to continue in a science field (Meaders et al., 2020; DiBartolo et al., 2017).

However, a comprehensive meta-analysis concluded that, at university, female and ethnic minority students showed lower self-efficacy and more negative experiences associated with STEM activities (Sheu et al., 2018; Ahn and Davis, 2020).

Women show higher levels of anxiety when pursuing STEM subjects at university, regardless of their grades (Meaders et al., 2020)

Exposure and Opportunities

The problems of accessability detailed in the UK Government's 'Diversity and inclusion in STEM' report from 2023 remains largely unresolved (GOV.UK, 2023; House of Commons, 2022; Parliament Committee, 2022). For example, schools from less advantaged areas do not always offer - or offer *limited* - Triple Science (i.e. Biology, Chemistry, and Physics as separate GCSE subjects), due to constraints such as lack of teachers, resources or time.

Triple Science is a common precursor to further progression in STEM, meaning lack of offering can significantly impact pupils' prospects of continued STEM engagement or self-belief.

Limitations on Triple Science supply mean that unconscious biases can amplify who is encouraged to take up the subject. The ASPIRES Project (which aims to understand 'young people's science and career aspirations') found that when it came to which option to pursue, schools were much more likely to make the choice for the students, with this being the case explicitly or indirectly through 'steering' students (London: UCL Institute of Education., 2018).

Did you know? **Only 14.6% of Double Science students pursue science A levels.**

Clubs and Activities

Lower school funding in less privileged areas impacts more than resources for regular teaching: it can have a detrimental effect on what activities are available outside the classroom.
Here, we talk about Informal Science Learning (ISL), which can span clubs and societies, family outings and engagements in STEM, as well as school-led day trips, such as museum visits, aquariums, STEM institutes, observatories, science centres, etc., all of which are complementary to STEM education as they can can inspire, develop skills and support science identity in students. Research has repeatedly shown that participation in ISL is highest among socioeconomically affluent young individuals but is low in low-income communities to due unequal access and resources (Dawson, 2014; DeWitt and Archer, 2017; Godec, Archer and Dawson, 2021).

What about School Trips?

A 2023 article published by the Guardian, and which surveyed UK school leaders, found that governmental cuts have forced more than half of the schools in England to limit their school trips, with schools from disadvantaged areas likely to be hardest hit by the squeeze.

These lack of opportunities have ripple effects, even in those who have continued on studying STEM in higher education. A 2022 study with first year students at university, discovered that a key factor impacting STEM minority students was the absence of prior experience in a lab setting as well as concerns in working with others - partly due to lack of exposure and reportedly feeling less confident / not belonging.

The scientists concluded that pre-higher education introduction to lab exercises and improving inclusivity in those environments can help address the problem, but at present this continues to be a question of resources for many schools and underrepresented communities (Batty and Reilly, 2022).

Some Key Numbers

60%

Female students in STEM fields have also reported hostile environments, with one 2018 study finding that over 60% of the participants having experienced gender bias(Leaper and Starr, 2018).

70%

Fundera study showed that diverse teams are 70% more likely to penetrate new markets and 35% more likely to perform better than their counterparts (Perry, 2023).

16%

16% of students who did Double Science said they would have preferred the more involved Triple Science course if they had been given the option(London: UCL Institute of Education., 2018).

Benefits to tackling STEM inequalities

The barriers we have discussed do not provide an exhaustive list of all the reasons for limited diversity in STEM, but they offer a broad picture of the challenges faced by certain demographics in choosing and following a science route. Addressing these barriers would have a profound impact on communities, businesses and individuals, in terms of not only social and economic mobility, productivity and collaboration but also quality of life and inclusion. Below, we explore some of the key benefits of fostering inclusivity in STEM.

Driving Economic Growth

A 2023 paper by Standsbury et al. suggested that one of the key reasons for lower economic growth outside of London and the greater South East can be attributed to shortages in STEM degrees (Stansbury, Turner and Balls, 2023). This is an important consideration, because in regions such as the West Midlands and the North East, students belonging to underrepresented groups in science make up significant proportion of pupils (e.g. over a quarter qualify for free school meals (GOV.UK, 2024)). So, what does that mean?

The effects of science skill shortages take on many forms. On the one hand, insufficient experts in specific science fields results in limited output and thus less economic prosperity altogether. On the other hand, lack of engagement in STEM also misses out on opportunities for social mobility for less advantaged groups.

What is more, as the UK continues to experience deficits in science expertise on a national scale, loss of talent in STEM, regardless of regionality, is already a major cost to the economy.

DID YOU KNOW?

STEM Skills Are in High Demand - and They Pay Off Big Time!

While wage premiums for many degrees are shrinking, STEM careers continue to offer rising pay and soaring opportunities! (Stansbury, Turner and Balls, 2023)

INTERESTING FACT

Creating an environment where science careers become more attractive to young people, irrespective of their background, ethnicity and disability status, would address the growing gap in science skills, empower communities and drive innovation.

Innovation and Creativity

Improving inclusivity at every level of society can have a tremendous impact not just on the economy, but also on the quality of ideas being generated. In business, diversity has been repeatedly shown to promote performance. For instance, a McKinsey Diversity Matters report revealed that companies that score in the top quartile for diversity improve their chances to overperform by more than a third compared to those in the bottom quartile (McKinsey & Company, 2023).

In academia, where new ideas are needed to promote discovery and innovation, boosting inclusion has been thought to be especially beneficial. In fact, in Nature study covering 9 million papers and 6 million authors, it was discovered that highly diverse teams publish papers with up to over 10% higher impact than their counterparts, and award their authors nearly 50% better impact scores (AlShebli et al. 2018).

Promoting Social Equity

Beyond economic and creative benefits, removing barriers to STEM for underrepresented groups is also about social equity, where individuals are given fair resources and opportunities to pursue the paths that they choose. (Lutkevich, 2022)

Moreover, amplifying diverse voices at expert level will give better insight into the varied issues faced by communities, thus improving policymaking
and governance, addressing problems of inequality and social injustice.

By improving diversity at each step along the STEM pathway, the coming generations will not be constrained by the absence of science role models that look like them. Instead, young people will have access to the appropriate advice and mentorship needed to help them grow and achieve their education and career goals (Hillman et al., 2014; Aish, Asare and Miskioglu, 2017; Gladstone and Cimpian, 2021; Engendering Success in STEM, 2022).

Underrepresented communities are an underutilised resource not just in STEM but in all areas of life. Promoting inclusivity can have a tremendous impact on productivity, innovation and progress whether in research or in the industry.

WRITER'S CORNER

WHY CHOOSING YOUR SUBJECTS TOO EARLY CAN STOP YOU FROM PURSUING YOUR PASSION

I decided to pursue a STEM subject in higher education no sooner than a month before I actually started applying to universities. Up to that point, I'd spent the previous 2-3 years bouncing between thinking about a degree in marketing, business, something to do with graphic design and even some half-baked ideas about media and communications. Nothing felt right. I'd read the descriptions of the courses, the modules, testimonies from graduates, but could not shake that uncomfortable niggle in my chest that these topics just weren't what I wanted to do for the next 3 to 4 years.

When I finally decided to do Maths, I felt a sudden sense of relief: I was at peace. I suddenly even struggled to explain to myself why it had taken me so long to arrive at this decision when it should've been totally obvious from the start. Perhaps the answer is semi-hidden in a comment one of my male classmates made when I shared my news - 'You? Maths? *Really?*'. At the time this upset and frustrated me. You would think, based on his incredulity, that I was not good, or at least only an average student when it came to the subject. That was far from the truth - I got excellent marks and was always diligent and studious about my work: I just didn't go to competitions or attend math-focused extracurriculars. Looking back, the reason my classmate's words stung so much was because they were a reflection of the little voice inside my head that felt exactly like he did.....Maths? Really?

> "You? ... Maths?.. Really?"

> "In many ways, what the school system in my country (though imperfect) had given me, was time.

In theory, the idea of choosing what you're really passionate about early on is great. What is the point, for example, in labouring over maths equations if what you really care about is art, literature of history? You can argue the same, also, in reverse. That if you are a science-minded individual, spending hours trying to memorise capital cities, famous composers or lines from 'Hamlet' just isn't the best use of your time.

No Going Back

The trouble with this, however, is that there is 'no going back'. I'm looking at you, GCSEs!

My story has a happy ending. Despite my self-doubt, I'd go on, years later, to do a PhD, fully funded based on my grades from a Red Brick university.

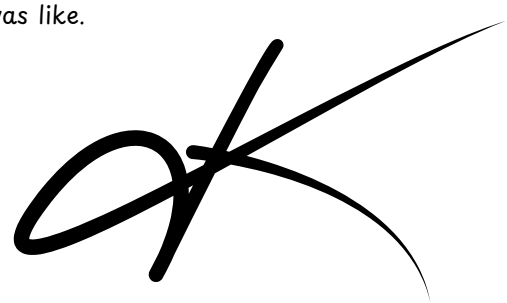
But, in different world, happy ending doesn't happen. At 16, I would've chosen what my female friends and peers did, and let the 'you're not smart enough' voice win. At 19, I had at least some self-awareness to fight the voice back.

Dear Diary...

It's crazy to think about how teenagers' brains are still so underdeveloped when it comes to understanding future consequences. Scientifically, they just don't have the wiring yet. But then, when I think about it, it makes so much sense. Every year as a teen feels like a whirlwind of changes. Awkward hair phases, weird hobbies, random obsessions (remember that rock band phase?), or maybe even your first crush. And yet, somehow, at 16, we're expected to make these huge, life-changing decisions about what we want to do for the next five, ten, or even more years. How does that even make sense?
I mean, one dramatic break-up at that age can send your grades into a total nosedive. Friendships fall apart faster than you can finish watching that TikTok, and peer pressure is practically the boss of everything. Every single thing feels like it's the end of the world, and if an adult tries to tell you otherwise, it's like, "You don't understand!!" But now I wonder... do they actually understand? Maybe they've just forgotten what it was like.

Ugh, it's wild. Sound familiar?

- Diary of a Teenage Scientist



Then why do we perceive young people's performance, interests and futures, as: either a function of the last couple of years at school, or as a complete static?

I had a classmate who got C'd and D's every year until he hit late teens, then did a one-eighty and is now an incredible finance analyst, with a real knack for numbers (back home, we graduate school at 19 rather than 18). I have a female friend who was determined to pursue journalism, but in her last year of high school switched over to IT (she was good at both!). Peers who went from daydreaming about being doctors, to starting careers in literature. A friend who, I kid you not, went from interest in STEM, to pursuing puppeteering in acting school.

It's sometimes ironic to me that messaging all around is that you can be 'anything you want to be' provided you work hard enough. Yet the British education system seems hell-bent on, very early, putting young people in a box. You take all of that, chuck in a healthy spoonful of unconscious bias, lack of opportunity, pre-existing models of what different individuals are 'a good fit for', and you have yourself the perfect storm for excluding underserved communities from participating in STEM. I will be the first to say I did not love the education system in my country. It was exhausting to keep doing subjects I didn't like. And though I can say that I did okay in the vast majority of them regardless and - as a result - had options, that is not to say everyone would flourish in that kind of structure.

What can be said, however, is that in the last 10+ years since I graduated from my school, I have seen no attempt to address either:

A) the system back home, or;

B) the 'leaky pipeline' that is so intrinsic to British schools.

The problems are raised, the discussions are had, the counter-points are brought up in retaliation, but very little is accomplished.
Like adults and, arguably in preparation for life, young people should both be allowed to choose, but also encouraged to challenge themselves beyond their comfort zones, and to make mistakes, to go back, and to progress.

Current Programmes and Initiatives

Various projects and organisations that are already working towards addressing the lack of diversity in STEM have shown remarkable positive outcomes for the young individuals being targeted as well as their local communities. From increased participation, confidence and retention, to improved career skills and support systems, these schemes have demonstrated that they can make all the difference between facing barriers at multiple stages of pursuing science, and thriving.

Millennium Point

Based in Birmingham's Millennium Point building, this charity trust supports STEM education in the West Midlands. It awards university scholarships, funding for school programmes and organises the STEM roundtable where education institutions and providers work together with the industry to support STEM careers in the West Midlands. The goal is to stimulate STEM education for the public good, support young people and fight negative trends in STEM.

The Millennium Trust invests £4.9mil per year to supporting STEM in local communities but is also committed to inspiring passion for science and technology through exciting initiatives and showcases. For example, activities at the Millenium Point include the annual STEM Festival and the Christmas festival for school children which features a film held at the auditorium and a Santa visit with gifts. Previous projects have also centred on climate change awareness and the launch of Generation Earthshot, as well as two recently held events related to celebrating sport (SciSPORT) and medicine (SciMED) which were attended by 1,000 students from the region and included workshops, hands-on activities and talks.

Other Programmes

Other programmes with similar goals include Imperial College's ' for year 10 through 12 Black heritage students who are interested in STEM. The scheme consists of about 5 campus-based events, such as lectures, workshops, career and guidance sessions, as well as masterclasses on STEM topics - with applications to participate available online.

WIZARDS SCHOOL OF STEM

heart of england COMMUNITY FOUNDATION

Location: Tipton

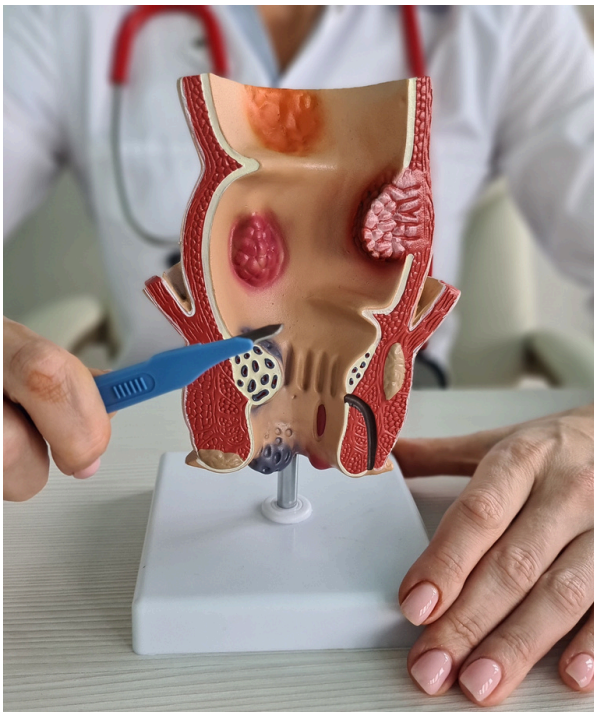
What We'll Be Doing

Working with schools in Tipton, West Midlands to deliver engaging children's workshops where they'll be exploring magic through the wonderful world of science.

Kids will be joining the esteemed Professor Archimedes as children embark on an extraordinary journey through the realms of wizardry and STEM. This immersive and interactive workshop transforms the wonders of science into spellbinding adventures. From brewing bubbling potions to crafting mystical materials like troll bogeys, students will engage in hands-on experiments that reveal the real-world magic behind chemistry, physics, and engineering.

With wands in hand and minds ready to explore, young wizards will uncover the secrets of STEM through exciting challenges, enchanting discoveries, and magical mayhem. Prepare for a session that is filled with mystery, wonder, and scientific sorcery!

MEDICAL HELP WORKSHOP



abbvie

Location: Midlands

What We'll Be Doing

Inspire the next generation of healthcare professionals with our immersive Medical Workshop, designed to introduce students to the exciting and vital world of healthcare. Developed alongside real healthcare professionals, this interactive experience offers a unique glimpse into medical practice, allowing students to explore essential skills used in the industry.

From phlebotomy training and drawing blood from a realistic medical arm, to examining blood cells under a microscope and through VR, students will engage in hands-on activities that bring medical science to life. They'll also learn how to check blood pressure using professional equipment, gaining practical insights into patient care and diagnostics.

This workshop is the perfect opportunity for students to step into the shoes of a healthcare professional, spark their curiosity, and consider a future in medical and health care industry.

Interested in booking or would like to know more? Reach out to us... info@make-more.org

MEET THE TEAM

JUST SOME OF THE PEOPLE WORKING TIRELESSLY TO BRIDGE THE INEQUALITY GAP

SIMEON DOUGLAS
STRATEGIC DIRECTOR

SIMONE STONE
DIRECTOR OF COMMUNITY

DR KRISTINE LENNIE
HEAD OF WRITING & RESEARCH

NASHAI WATKIS
ACCOUNTING ADMINISTRATOR

ABOUT MAKE MORE

Make More is a dedicated organisation specialising in STEM and digital services, as well as community wellbeing programmes, committed to bridging the gap for individuals from underrepresented backgrounds and low-income households. We take a holistic approach, understanding that true empowerment extends beyond education alone.

Our initiatives encompass mental and physical wellbeing, recognising the importance of overall health in achieving success. By focusing on these key areas, we aim to create a supportive environment where individuals can thrive. Our projects are designed to bring people together, fostering a sense of community and working towards a more equitable society.

We believe in the power of collaboration and inclusivity, ensuring that everyone, regardless of their background, has access to the resources and opportunities they need to succeed. Our diverse and representative team, who share lived experiences with those we support, allows us to connect deeply and address the unique needs of our community.

Through our comprehensive support and inclusive opportunities, Make More aims to inspire and uplift individuals, helping them to reach their full potential in today's rapidly evolving world. We are passionate about creating lasting change and are dedicated to making a meaningful impact in the lives of those we serve. Together, we strive to build a more inclusive and equitable society for all.

A special thanks to Dr Alison Triggs, our STEM Consultant who continues to support and help us drive innovative projects.

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