

RCSU SCIENCE CHALLENGE 2015

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"How do we get the next generation **interested** in STEM (Science, Technology, Engineering, Maths)?"

At present there is a reported shortage of school pupils studying STEM subjects and the few that do are more likely to come from better-off families. This has implications for **educational disadvantage, scientific research and industry** as well as on future generations who will face a further **shortage of high quality science teachers**.

Imperial Hub is keen to hear your solutions for tackling these problems in an **inclusive** way that will ensure that the next generation is equipped with the STEM education that will allow them to tackle the world's greatest problems.

The answer to this question is not simply a billion dollar solution - it is key to our better future. Science, Technology, Engineering and Maths (STEM) empower us with methods, the scientific process, the innovation and the freedom to build this future. STEM has clothed us, housed us, fed us, healed us, and literally taken humanity beyond our solar system and into the stars. If our incoming generation is to forge its own future, to be contributing stakeholders in the world and its knowledge economy, then our youth urgently need to know how to do so.

The numbers unfortunately do not lie. Statistics on the national STEM shortfall¹, especially across gender, ethnic, social class and disability lines²⁻⁶, have been done to the death. The writing is on the wall - being inclusive is an economic priority if nations are to meet the demand for STEM innovators. Focusing on the UK, I make the case that the solutions need to be further reaching and at a more fundamental level.

It used to take a village to raise a child. Now it is nothing short of a nation. Implementing short-term programmes at the end of a STEM employee's training does not necessarily improve STEM recruitment⁷⁻⁹. The bottleneck is further downstream. We first need to engage children far younger, at the very least in primary school. The role models we speak of should not just be high-flying scientists, but a child's primary ones – parents. Educate and expose both parents, entire families and provide support to children outside school. Include parents in a child's education from the get go, providing resources, and opportunities to inspire their own children with increased exposure to science. Parents that value and are excited about the role of STEM are far more likely to pass that very spark on to their offspring.

Reinforcing this grassroots push with a compulsory national programme that is delivered through schools and granularly complements the science curriculum is crucial. In Singapore, secondary schools work with major institutions such as the Institute of

Molecular and Cell Biology, the Science Museum, and A*STAR to provide an integrated curriculum. A student translates classroom knowledge of the polymerase chain reaction, western blotting and restriction enzymes immediately to actual scientific projects alongside researchers.

The UK has world-beating scientific resources which are the envy of other nations. The government should generously invest in outreach programmes, bringing schools closer to scientific institutions and industry. Imagine the impact of visiting the immense Rolls Royce jet turbines, F1 cars at McLaren or the pioneers at the Bloodhound SSC project. Biology teachers should have students walk amongst the specimens at the Hunterian Museum at the Royal College of Surgeons, or tune in to live webcasts from the Science Museum and Francis Crick Institute. These are all low hanging fruit. This complements the other necessary paradigm shift from rote learning ($f=ma$) to high-level application (building a racing car). By coupling a respect of students as young adult learners with consistent inspiration over the years through great teachers, exciting material, and having the world as a classroom does far more to drive students in independently pursuing subjects in depth. Even if students do not end up in STEM, their exposure will still be useful when raising their own children in turn.

Next, prioritise fundamental platforms. Any long-term national investment in education has to be founded upon equality, economic stability and explicit meritocracy. A better-educated populace increases GDP, and invests more money back into education. Every child's developmental years are critical to nurturing his curiosity, value system, grit, aptitude and life trajectory. Finland, Israel and Singapore have recognised this. They are examples of meritocratic countries which have gone from nothing to world-beating education systems with high STEM engagement and innovation in several decades. Some of the lessons that could be transplanted to the UK include:

- Students are pushed to a higher standard, focusing on applying to solving higher level and real world problems.
- Teachers are exceptionally valued, well remunerated, and trained to a higher level, often requiring graduate degrees.
- Collaboration and collaborative environments are strongly emphasised.
- Values and ethics are a key focus from an early age.
- There is a national culture which values education, and promotes openness and the asking of questions.
- Students are exposed early on in secondary school to industry, science laboratories, startups and entrepreneurial activities.

An essay is not enough. Our team of like-minded STEM students founded Bioversity, the UK's first accelerator for young innovators. We are hothousing the most driven preuniversity students with industry and academic experts, in short-circuiting the development of solutions to the world's biggest problems. We are taking the immense STEM resources available locally, bringing together the major UK universities, Harvard,

MIT, the leading scientific bodies, industry and the City of London and focusing this on our young innovators. Our team superconnects minorities, the underprivileged, and female innovators with resources and people they would otherwise never meet. We are a united, national response to Stanford's StartX and MIT's Hacking Medicine.

We are all in this gutter together, but you too can help others reach for the stars.

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