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Broadening the curriculum symposium

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In order to flourish the UK needs a workforce that is the envy of the world in terms of the competencies and skills that people possess. We need to be prepared for a rapidly changing and increasingly interconnected and technology rich world, a world where there will be many new opportunities but where there will also be disruption across many industries that could impact peoples livelihoods. All of this creates a need for greater career flexibility. It would be easy to look at our world leading universities and the strength of our science base and assume that all is well but that is only part of the picture and the rest is not so rosy.

The future of our education system, just like the future of the workplace, lies in its ability to embrace change. All young people need access to an education that allows them to realise their potential, otherwise we are simply wasting talent.

A-levels have been around since 1951 and other than the occasional brief flirtation with broadening their scope they have maintained a focus on a small number of subjects. The A-level model in England is one of the narrowest upper secondary systems in the world, and it is becoming even narrower.

Research commissioned by the Royal Society has shown that students are taking fewer A-levels, with less students opting to take 4 or more A-levels. The average number of A-level qualifications per student is now just 2.7[1].

Students are also taking a narrower mix of subjects, with, for example, more students taking exclusively STEM subjects, without any learning in other subject

[1] Post delivery correction from 2.5

areas seen as key for a broader and more flexible skill set. And this concentration of STEM learning is seeing the size of the pool of young people with good scientific thinking and skills shrink; less young people overall are studying a science at A-level.

The UK risks falling behind its global competitors as a result of maintaining a narrow, outdated model of post-16 education.

There are growing expectations that the labour market is heading for significant change as a result of technological innovations, and that the way we work will change considerably in a technology-rich economy and society. Many traditional career pathways are likely to disappear and growth in other areas will be fuelled by highly-skilled talent.

A Royal Society report on machine learning pointed to how an increasing range of tasks and functions currently performed by humans, including in sectors such as medicine and the law, are either already, or soon to be, performable by machines.

The report states:

“While not necessarily replacing jobs or functions outright, machine learning will force us to think about our occupations, and the skills necessary to function in a world where these systems are ubiquitous.”

And that brings us back to our education system. It must develop the skills necessary to ensure resilience to complex and rapid change - creative, communication, scientific, quantitative and digital skills.

Our narrow education system which encourages early specialisation, is no longer fit for purpose in an increasingly interdisciplinary world.

Many countries have moved, or are moving, towards a broader and more diverse curriculum in order to equip the next generation with a skillset they will need.

I lived in the US for many years where alongside the academic subjects everyone also had to take 'shop' classes where they learn to work with their hands. That approach even pervades at university.

I mentioned earlier that the narrowing of the curriculum is forcing young people down narrow routes. Some argue that specialisation has certain advantages such as greater depth and thoroughness. However, it also has its downsides.

A 2010 report by the Nuffield Foundation on upper-secondary mathematics education revealed that England, Wales and Northern Ireland recorded the lowest levels of participation in upper secondary mathematics out of a survey of 24 countries. Just over 9% of students are taking physics at A-Level and shockingly it is less than 4% of female students. For chemistry, it is just over 13% and for biology 16%. There are a lot of young people doing no science from the age of 16 onwards.

Computing is currently the fastest growing subject at A-level, but still only 2.3% of A-level students are studying it. Only 12% study computing at GCSE.

But it is not just science, mathematics and computing skills we should be worried about. We are seeing a rapid decline in students continuing to study English with more than a 40% drop in the number of students studying the subject at A-level. Young people need to expand their language skills so that they can, in the future, express the complex ideas of their field of study or work. It is also said that those who know little of history are doomed to repeat it.

A narrow approach to education is producing students who are entering Higher Education without the necessary skills required for independent learning and research, or the ability to write and communicate.

So what do we do about it?

We are not going to overhaul our education system overnight. A move to a properly structured, coherent, broader based curriculum is a long-term solution. In the meantime, we can encourage, and learn from, alternatives to A levels that are already in play within the English system, and elsewhere

The International Baccalaureate has offered an alternative to A-levels, but this has not happened at any substantial scale in the UK despite the fact that a study by the University of Leeds in 2015 found that IB students have better mathematical skills than those who took A-level maths and they were more likely to obtain a first class degree. A more hybrid attempt at broadening the curriculum is the National Baccalaureate for England offers, which offers a mixture of A-levels, vocational qualifications, an extended project qualification and supplementary courses in professional development. There are also less formal approaches, with schools offering extra-curricular ways of broadening students' experiences, but outside of the independent sector, this is harder to find.

Pockets of good practice that have largely only benefitted the lucky and the rich are not the basis of an education system fit for the future.

The government have launched T-Levels and that is a welcome step but we must overcome the snobbery that has blighted past attempts to raise the standing of vocational qualifications. High quality science depends on technicians: the Laboratory of Molecular Biology, home to Britain's most recent Nobel Laureate, has

its own workshop. We could learn from Germany in this regard where technicians work and, indeed, live side by side, in the same community, with university professors.

Delivering any of these incremental improvements, let alone delivering a long term solution cannot be done on the cheap. The current level of resources and the way they are deployed will not allow us to make the changes we need. The Royal Society is going to be doing some work to assess the cost of making the necessary changes but we also need to consider the cost of not making those changes.

Cost is not the only barrier to success. Inertia and prejudice must also be overcome. But they can be. We are only seeking to do things that other countries have done already. Singapore and Hong Kong are examples of places where narrow A-level systems have been successfully transformed. Their success was underpinned by a strong vision, long-term planning, and close links between policymakers and the key stakeholders.

Any change will require consensus. Top-down implementation is unlikely to work. Rather, we need teachers, employers, governments and the education community to work together to design and introduce a broader and more balanced post-16 curriculum that is properly resourced.

In particular, any move towards breadth would require the support and expertise of the teaching profession, but also from employers and higher education providers, and of course parents, all of whom exert pressures on schools to provide what they believe to be suitable qualifications. And trying to do it on the cheap would be a false economy.

Without more teaching capacity, particularly those in subjects like physics, chemistry, mathematics and computing, we cannot tackle the narrowness of the curriculum. And we also need to consider the resources that teachers will require to support their role: I'm thinking here about the new technologies available to enhance learning, which can support digital skills while enabling teachers to use their time more effectively.

The Migration Advisory Committee consultation on teacher supply highlighted that there are still serious shortages in the supply of STEM subject teachers. The MAC determined that physics and maths teachers should remain on the Shortage Occupation List.

Initial Teacher Training figures for 2016/17 showed a decrease in recruitment on the previous year. Nearly 2,000 secondary teacher training places were left unfilled.

But even if we can recruit trainees, so many leave the profession within a few years. 30% of newly qualified teachers who started their careers in an English state school in 2010 had left the profession by 2015.

There must also be a willingness from government to address wider issues around teacher recruitment and retention.

Changing what we teach is one part of the solution but we also need to look at how we assess achievement.

We must ensure examinations are effectively testing the level of breadth and depth of knowledge. We need to assess competencies, not the ability to remember facts. You can look up the amount of amount of energy needed to boil a beaker of water, but understanding and being able to demonstrate the process of evaporation

requires a student to think scientifically: develop skills in theory, research and experimentation, enquiry, and communication.

And we must not forget the impact on a young person's wellbeing. Whilst our case study of Hong Kong shows high performance in a broader new curriculum, there are clear warnings about the impact of high-stakes exams and over testing. The impact on a young person's mental and physical health can be devastating, and we are seeing more and more instances of mental illness in teenagers in the UK, with the pressure of A-level exam results a well-cited cause.

Earlier on I mentioned the case for depth and I want to return briefly to that. Breadth does not have to mean we sacrifice depth

In the case studies shown today, we look at Belarus, a former communist country which has chosen to reform its education in order to develop economically and socially. Despite criticism from traditionalists that its strict and narrow focus was essential for deep learning and excellence in science and maths, moving to a broader and more balanced curriculum with an increased role for the languages and humanities, as well as emerging subjects like computing and technology, has not seen the country lose its high performance in maths and science.

Finding ways to ensure all young people have a minimum level of broad interdisciplinary skills and competencies whilst still allowing a diversity of choice and the ability to deep dive into particular subject areas is entirely possible.

In evolving our education system to ensure we give young people the best start in life we also need to address questions of class, ethnicity, and gender which sadly still play a significant role in determining educational choices and outcomes. The

Government's recently launched 'Ethnicity: facts and figures website has highlighted some of these entrenched problems.

We must ensure that breadth also means education reflecting the increasingly diverse needs of our society and ensuring that everyone has equal access to learning.

There also remain regional disparities in participation and attainment at post-16, meaning breadth is not distributed evenly across the country.

The percentage of pupils achieving at least ABB at A-level is almost 7 points lower in the north east than it is in the south east.

The government has taken positive steps in reforming technical and vocational education through its industrial strategy and the post-16 skills plan, but now we need to review the academic routes.

There is some promise in the increase of students taking vocational qualifications alongside A-levels, offering a mix of academic and vocational experience.

As I previously mentioned, the implementation of T-levels is an opportunity to generate further breadth in post-16 study. The Society is working to ensure that the right expertise is on the panels that will set out the content of these new technical qualifications.

However, we must ensure that these changes create greater parity of esteem between different routes. There is much to be learnt from the failures in other countries. Sweden had to go through two major reforms in 6 years, because they didn't get breadth right the first time round. They learnt that simply increasing the academic content of vocational routes was not necessarily the best way to broaden

the curriculum or improve the status of technical education. You'll hear more on this interesting case later today.

Our education system is too focused on producing narrow specialists. It cannot make sense to focus on equipping students only for specialised careers, including becoming academics themselves. Career paths are becoming more flexible and we need to change expectations of what a person's 'career' - or perhaps 'careers' is more accurate - will look like. Of course we need specialists and academics but businesses need employees with a broad range of skills and experience that can help them to creatively adapt to technology-rich environments. And young people need that range of skills so that they can move between careers.

This is a difficult journey, which requires careful coordination. We must make it step-by-step, building wide consensus over the role of education both now and in the future, to ensure that young people can thrive in an ever increasingly complex and interconnected world. We must build on the great strengths of our education system, our remarkably talented and hard-working teaching workforce, garner expertise from across disciplines, so that our future generations can face major technological, demographic and social challenges with growing confidence, creativity and talent.