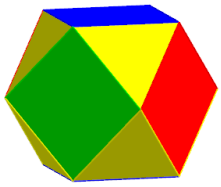
Skilful Schools

- **equipping today's learners with skills the nation needs**



This paper draws together some of the changes and challenges in education and skills which are happening very quickly. It proposes a national solution which can be implemented quickly and effectively by harnessing new opportunities without disrupting existing structures.

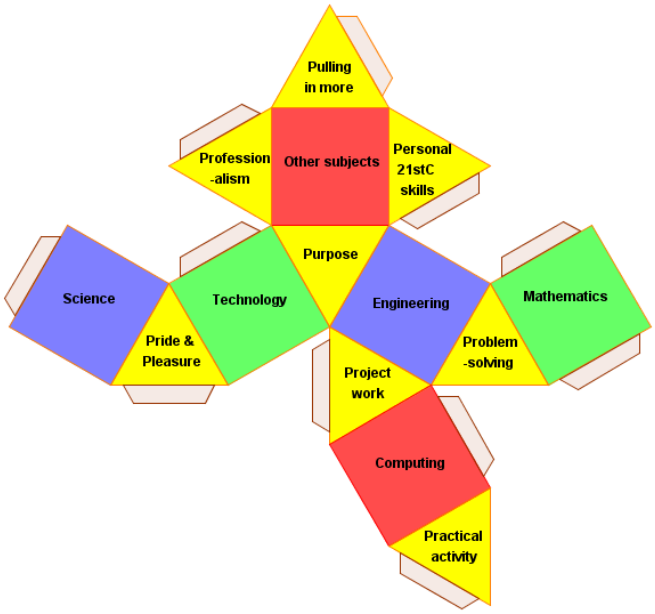
The starting point is the 4th leg of the government's `Plan for Growth': "*Creating a more educated workforce that is the most flexible in Europe*" – and the aim to replace "*Europe*" with "*the World*".

It is manifest that technological change is affecting all our lives and will increasingly do so in ways we cannot imagine. In terms of education, though, that change is much less manifest mainly due to the nature, organisation, governance and funding of existing institutions providing education in the 5-19 age range. These institutions are currently involved in many other changes, such as changes in structure and funding (academies, free schools, UTCs, Studio Schools), of inspection regimes by Ofsted, of content in the National Curriculum 5-16 in England, of more autonomy for school Heads and Governors, of examinations and qualifications, and of pay and conditions for teachers. To simplify the text we use the word `school' to stand for any institutional provider of education 5-19, including colleges and academies. Another complicating factor is that the `Plan for Growth' is for the whole of the UK while school education is devolved between England, Scotland, Wales and NI.

It is generally agreed that employers are already restrained by a shortage of skills in new entrants to the workforce, and that if we are to maintain an economically competitive edge internationally school-leavers will have to be much better equipped with the skills they need. So the issue we seek to address is how to enable schools, heads, teachers and governors to adapt the education they offer all students to ensure that skills are also embedded in the process. In simple terms, how can we avoid schools being solely `exam factories'? The general area of skills shortage is usually referred to in the UK as STEM – Science, Technology, Engineering and Mathematics. The previous "STEM cohesion strategy for schools" concentrated mainly on Science and on increasing entries for A-level. In the revised National Curriculum now being introduced in schools in England (5-16) the subjects generally considered most closely to align with STEM are Science, Design Technology, Computing and Mathematics. Certainly there is scope to attract more students, particularly women, to continue to study these subjects, to enliven their teaching and to make them more relevant and interesting. Other subjects on the curriculum also contain aspects which are relevant in a STEM context – such as Art & Design, Geography and PE/Sports. Other relevant aspects of school provision include Careers Guidance, Enterprise Education and Personal, Social, Health and Economic (PSHE) education. Students experience this wide range of subjects on a daily basis throughout their time in school, but delivered in discrete `packets' with no underlying sense of common purpose or cohesion. The exception is that in many primary schools students have the same class teacher for all subjects in each year, and that many schools organise at least part of the teaching day around topics, themes or projects which integrate at least some of the separate subjects. In 2008 all schools reviewed their curriculum following the QCA `Big Picture'.

One essential ingredient of any solution is greater cohesion between the various subjects and aspects of the school curriculum both in planning and delivery. That requires a shift in the habits of mind of those managing, planning and organising students' experiences on a daily basis. With the widespread abandonment of coursework at GCSE and reduction in provision for assessed practical work, students now have very few opportunities to experience practical applications of the subjects they are studying. They have even less opportunity to work with others in solving problems and in designing and making artefacts and thus to develop a range of skills sought by employers. So a second essential ingredient of any solution is to provide opportunities for students to work in groups on practical activities involving problem-solving and project work. These ingredients are encompassed in the acronym `iSTEM+' for `integrated STEM and more', where the `more' includes both more subjects and more skills.

The net of the coloured icon above provides a graphic illustration in which four of the six squares represent the existing STEM subjects of Science, DT, Computing and Maths and the other two represent Engineering and Other subjects. These are glued together with eight triangles representing the integrating factors (the 8 P's) of:



Practical activity	Problem-solving
Project work	Personal 21stC skills
Professionalism	Pride and pleasure
Purpose	Pulling-in the wider community

It should not be difficult for those managing schools to justify why their school should embrace an iSTEM+ approach on the grounds of Personal, Societal and Economic advantages. All of those concerned with education want to enable every student to achieve their maximal potential, which includes equipping them with the personal skills they need for employment. In order to maintain and improve our quality of life we need bright people to develop new and smarter ways to do so. In order to maintain national economic prosperity our industry must have the skilled workforce it needs. But to use the hackneyed `win-win' phrase, changing the habits of mind of schools to enhance and enrich the opportunities for their students to apply and extend their subject knowledge through interesting and relevant projects will also make them more motivated learners and hence more likely to do well in examinations. Engaging subject teachers in mentoring projects will up-date and enhance their subject knowledge and understanding as well as helping them to be more inspiring teachers. Involving a wider community in designing and supporting these projects (families, peers, employers, practitioners etc.) will break down the isolation between schools and the real-world their students inhabit as well as giving them the career advice and inspiration employers seek. With careful design these project will also help deliver particular aspects of the new DT and Computing programmes of study which schools are currently struggling to provide.

There have been many skills initiatives in the past, some of which have had considerable effect inside and outside schools, such as the Technical and Vocational Education Initiative in the 1980s which ran alongside the Microelectronics Education Programme. Such centralised approaches are no longer in favour. The current policy is give greater ownership of skills to employers. While this move is largely focussed on workplace skills and continued professional development, there should be scope for some ingenuity in using this opportunity to enhance the role of industry in supporting education along the lines of the CBI's `Ambition for all in schools' education campaign. Quite recently the Department for Business, Innovation and Skills, BIS, has announced support for a number of Industrial Partnerships in a variety of sectors, part of whose brief is to provide enhanced careers guidance for schools. Several of the UK Sector Skills Councils are involved such as:

- Cogent, the organisation for Science-based Industries, has recently set up the Science Industry Partnership to foster new and emerging science talent;
- e-skills, the organisation for Business and Information Technology, has recently established the new Tech Partnership for employers to bolster digital skills development;
- Semta, the organisation for Science, Engineering and Manufacturing Technologies, has recently established partnerships for the Aerospace and Automotive Industries.

Careers advice, while important, will not by itself attract students. So what we propose is that the Industrial Partnerships use this opportunity to collaborate with educators to produce inspiring projects for students across the 5-19 age range which can be used to support the iSTEM+ approach in schools while also focussing on realistic examples from their chosen sector which promote their industries. Primary schools can use such projects to sow the seeds with younger students of both sexes which can be built on at Key Stage 3 in secondary schools before students make their choices of options and pathways. Projects for students aged 14-19 can provide opportunities to practice and develop the subject skills they are acquiring in their GCSE, A-level and other courses. As an example the Tech Partnership website has as its first priority to attract `New talent':

> *We are inspiring young people about technology education and careers. . . . for example :*
> *Providing a motivational online careers portal for the sector. See www.bigambition.co.uk*
> *Helping schools and universities with industry-based curriculum resources and teacher support*
> *Leading a campaign to attract more females into technology-related education and careers.*

So, for example, we could identify c20 sectors from the industrial partnerships such as aerospace, automobiles, data security, digital entertainment, energy, telecoms etc. and establish development groups to produce 5 cross-curricular group projects, one at each Key Stage from 1 to 5, with a common format. Each project could be capable of being run in 2 hours per week for 5 weeks in the normal school timetable, supplemented by homework, leading to group presentations and an individual project report. The presentations could take a variety of forms – a slide-deck, some web-pages, a poster, a verbal pitch – and could include a competitive element. The project report would form part of an individual student's portfolio which could be accredited and shown to employers, college tutors etc. Each Industrial Partnership participating could provide supporting materials on their web-site and provide other offers of help to schools running their projects. This way we can

ensure that schools get a comprehensive, relevant, ready-to-go, up-to-date, professionally produced, well supported iSTEM+ toolkit with 20 projects available at each Key Stage – 100 in all. The Engineering & Technology Educational Partnership ETEP would coordinate the development process working with staff from the Partnerships and provide expertise from primary, secondary and FE sectors to the groups.

ETEP's partners include schools using project-based learning both across the curriculum and for STEM subjects, and others keen to get joined-up STEM embedded in their normal timetable – so it should easily be possible to have the projects trialled and adjusted. This development phase could be completed by September 2015 and funded by employers' contributions in terms of time and resources to support the development groups together with say 100 project sponsors each contributing c£2k to fund the field trials and their organisation estimated to cost £200k.

The next phase would be an educational iSTEM+ pilot in 2015/6 to develop clusters of mutually supportive schools and colleges in as many of the c40 Local Enterprise Partnerships as are interested in participating. Most LEPs have plans to boost skills provision in fields relevant to their plans for growth and interests of local employers – e.g. by increasing the availability of technological apprenticeships. But to meet the skills needs of employers and to ensure demand for the increased skills provision in the locality they will also need to encourage and support schools in pointing learners towards these opportunities. So, just as Industrial Partnerships need to be working with schools now, so do the LEPs. From next April they will also receive EU Social Funding. A pilot cluster would typically involve a post-16 institution offering technological apprenticeships together with two neighbouring secondary and two primary schools working closely with say three local employers from different sectors. Each such cluster would share a full-time iSTEM+ coordinator, as well as specialist resources, and engage in joint CPD activities. ETEP would provide support and coordination. The annual budget for each such pilot cluster would be of the order of £100k. A typical LEP might have 5 such clusters in different regions reflecting different employment sectors. The estimated cost of such a pilot is c£0.5m per LEP.

After the initial pilot there would be 25 schools/colleges and 5 change-agents ready to support a phased roll-out in each participating LEP over the next 3 years. Nationally there would be a pool of support from Heads' and teachers' professional associations (e.g. ASCL, ASE and Expansive Education), from employees such as STEM Ambassadors, from practitioners' associations (e.g. BCS, IET and IoP) and from educational organisations (e.g. Gatsby, Wellcome and WISE). The total budget could be of the order of £20m pa for 3-years – still a long way short of the £230m which the New Opportunities Fund spent on 30-hours of basic IT training for all teachers 10 years ago. It might be met by a mixture of LEP and EU funding, together with contributions from employers, charities and/or philanthropists. It is an ambitious scheme in a vital aspect of our education for future scientists, engineers, technologists, technicians, inventors and entrepreneurs.

Making materials, organisation and resources available will not be sufficient to have the desired effect. Heads, Governors and parents need to be persuaded by Government to embrace this important aspect of education for all their students which is fundamental to the `Plan for Growth'.