Making Education Work

A report from an Independent Advisory Group chaired by Professor Sir Roy Anderson

January 2014

Content

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Preface

In 1987, Professor Sir Gordon Higginson was invited by the then prime minister, Margaret Thatcher, to review the A level (advanced level) system. His reviewing committee, taking evidence from industry, commerce and education, recommended increased breadth in the subjects taught and suggested a move to at least five subjects. The report won wide support from professionals. However, the government could not countenance tampering with the 'gold standard' of A level. Higginson predicted that it might take another 15 years to broaden the subject range taught to 16-to 18-year-olds.

A casual observer from another country might conclude that little has changed in education policy for 16-to 18-year-old students within the English school system over the past 60 years. The A level was introduced in 1951 with first examination in 1953. It could be taken on a subject–by subject basis according to the strengths and interests of the student. Today, students typically take three to four subjects that are taken of the 'gold standard' qualification, resulting in a high degree of specialisation when students leave school for employment or further/higher education.

With respect to detail, however, a great deal has changed in content, the range of subjects that can be taken, and assessment (including grading). Over the past few decades students, teachers and parents have experienced very – perhaps too – frequent changes in all three factors, as governments and Secretaries of State for Education have changed.

Over this time period the world has changed significantly with globalisation in, for example, trade, communication, technology and employment. In the words of Thomas Friedman, in his book *The World is Flat: A Brief History of the Twenty-First Century*, globalisation has created a level playing field in commerce and trade. Increasingly, advances in technology also create equal access to information for all who can connect to the World Wide Web and hence influence in a substantial way educational opportunities. What is much debated, however, is how best to prepare young people to enter this world and have a productive and enjoyable life. Do they need different skills from those offered by our specialised A level system?

When I was asked by Rod Bristow at Pearson to put together an independent Advisory Group of senior figures from business and higher education to consider these issues, the puzzle of why the A level system I experienced as a student had changed so little, and yet the world had changed a great deal, made me quickly accept this chance to explore what global changes implied for the English educational system and educational policy designed to support economic growth. I have been privileged in this task to have the skills and experience of an Advisory Group consisting of senior figures from business and universities.

The content of this report aims to contribute to the debate of whether the 'gold standard' of A level be broadened to include both more academic disciplines and teaching on the so called softer skills, such as communication and team work, which are so important in employment and university.

Professor Sir Roy Anderson
Imperial College
January 2014

The Advisory Group

Chair: Sir Roy Anderson FRS, FMedSci

Sir Roy is Professor of Infectious Disease Epidemiology in the School of Public Health, Faculty of Medicine, Imperial College London and Director of the Centre for Neglected Tropical Disease Research. His recent appointments include Rector of Imperial College London and Chief Scientist at the Ministry of Defence, UK. His research interests are in interdisciplinary studies at the interface between medicine, biology, mathematics and computation.

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Executive summary

In recent years, surveys by employers and higher education institutions in the UK have suggested that students are not as well prepared as they should be by age 18 for the transition from secondary education to employment and/or to university. Concomitantly, international surveys of educational attainment in different countries in core competences such as reading and mathematics suggest that our performance is standing still while other countries, with fast growing economies, are moving forward to meet the educational needs in a fast changing world.

This report records the deliberations of an independent Advisory Group, consisting of senior figures from the worlds of higher education and industry, on identifying the skills and knowledge required by 18-year-olds to support successful transition to the next stage in their lives and, in so doing, address the 'skills gap' identified by the Confederation of British Industry (CBI) and others.

Our work specifically focused on a number of key issues:

- the setting and governance of education policy in England to meet the country's long term economic and social needs

and, more specifically:

- whether a broader curriculum than that offered by A levels is desirable
- whether the teaching of the so called 'softer' skills alongside academic skills is essential and
- articulating the skills in terms of the needs of employers and universities.

In writing this report we are very aware of the many changes to post-16 education that have taken place over the past few decades and the burden this has imposed on the teaching profession. In suggesting further change, we do this in the hope that education policy in the UK can be formulated via cross-party agreement to develop long term strategic education planning to better prepare learners with the skills for success in the future while supporting the country's economic growth and social well being.

The report represents the outcomes of phase 1 of the work of the Advisory Group.

It articulates a shared vision from employers and higher education on skills needs and both sets out recommendations for stakeholders and identifies the need for further research in partnership with schools, students, industry and higher education institutions.

Our discussions were augmented by the views of focus groups of employees and higher education representatives. These conclusions are presented below as eight recommendations for change and a further five recommendations for enhanced action.

Recommendations

Recommendation 1

The secondary curriculum must support the economic strategy of the country. To ensure long term planning for the secondary curriculum linked to this strategy, the creation of an independent body is recommended representing all key stakeholders (the teaching profession, the employers, higher education and political parties). Responsibility for the secondary curriculum, its delivery, and assessment should remain vested in government. The role of the independent body would be to provide wide representation and consistency, and mitigate disruption associated with the frequency of change in the role of the Secretary of State for Education, an appointment that has changed regularly over the past 25 years with an average time in post of just over two years. Advice from the independent body should be strategic, for the long term, and must reflect the social and economic ambitions of the country.

Recommendation 2

The A level system should be slowly changed to a baccalaureate type system in which a broader curriculum (including core English, mathematics and the Extended Project qualification) which meets the requirements of a designed framework for key competences as outlined in recommendation 3, is provided for all post-16 learners.

Recommendation 3

England must, as soon as possible, formally adopt a framework for key competences guided by recent international developments (such as the European Framework), which includes: communication in English and in foreign languages, competence in mathematics, science and technology and digital competence, learning to learn individually and as part of a team, personal, interpersonal and intercultural competence, including an understanding of codes of conduct and the importance of business ethics, a sense of initiative and entrepreneurship, creativity and cultural awareness. These competencies must fall under the inspection framework and should be embedded throughout the curriculum and associated qualifications.

Recommendation 4

Project work evidenced by the Extended Project and other qualifications should become a key requirement for university entrance.

Recommendation 5

Non-cognitive skills and attributes such as team working, emotional maturity, empathy, and other interpersonal skills are as important as proficiency in English and mathematics in ensuring young people's employment prospects. Assessment should reflect this reality and so investment is needed to support assessment experts in finding ways of reliably evidencing these skills.

Recommendation 6

A national careers service should be created and its advice aligned with the areas of the government's growth strategy, to gear the education system more clearly towards the areas that support the country's economic strategy and ambitions.

Recommendation 7
An exchange of staff between schools and employers is essential to enhance teachers' engagement with the worlds of business and industry. Employers and employer representative groups must collaborate with school and college leadership groups to design and implement a national scheme to promote this exchange.

Recommendation 8
Access to high quality teaching and learning is currently unequal – technology offers a way to resolve this – at least in part. Government should investigate virtual learning as a way to improve the quality of provision and make it more consistent for all students in public and private sectors.

Recommendation 9
The roles of BIS and DfE should be reviewed by government to ensure much closer working relationships, and a shared set of objectives for the education system as a whole. The case for placing all education responsibilities, including apprenticeships, within one department should be examined.

Recommendation 10
We should learn from curriculum design and content initiatives in high performing countries, as judged by international rankings (e.g. PISA), commission further research to investigate why England's performance has stagnated and other countries have improved, and implement policies to increase our performance relative to other countries.

Recommendation 11
Greater focus on the quality and recognition of vocational learning for all students is necessary to increase understanding and acceptance of the diversity of routes available to learners, and to enable them to acquire the skills necessary to support progression to further or higher education and employment.

Recommendation 12
In association with our second recommendation for a broader curriculum, the cognitive skills of application, analysis and evaluation should be delivered and assessed in all qualifications, in line with the methodology adopted for mathematics in the current A level reform programme.

Recommendation 13
Government should continue the development and promotion of programmes to encourage the most highly qualified graduates to enter the teaching profession.

Chapter 1:
Aims and objectives

Why the project was initiated

For many years, repeated surveys by employers and higher-education institutions have suggested that students are not as well prepared as they should be by age 18 for the transition from secondary-level education to employment or to university.[1]

In autumn 2012, in advance of both the reform of both national suites of qualifications – GCSE and A level – scheduled to be introduced from September 2015, Pearson invited Sir Roy Anderson to set up and chair an independent advisory group to investigate this concern. The Advisory Group, consisting of key figures from the worlds of higher education and industry, was asked to identify the skills and knowledge required by well educated 18-year-olds to support successful transition to the next stage in their lives and, in so doing, address the 'skills gap' identified by the CBI and others. The results of the Group's deliberations would be publicly available in time to contribute to the qualification-reform agenda.

The work of the Advisory Group was structured in two phases:

Phase 1

- Identification of the skills and knowledge required by 18-year-olds for progression to higher education and/or employment, primarily through secondary research.

- Agreement about the evidence learners would need to provide to assure HE and employers that they had acquired these skills.

This Report signals the end of the first phase. Its intention is to articulate a shared vision from employers and higher education on skills needs. It sets out recommendations for stakeholders and identifies the need for further research with schools and students.

Phase 2

The next step will be to consult more widely on the implications and practical steps for executing the Report recommendations, and to bring together the partnerships and expertise necessary to develop higher quality skills learning for young people.

Phase 2 will be longer term and require the support and involvement of a wider range of key stakeholders: from policy makers whose support is essential to embedding skills securely in the curriculum, from employers and higher education institutions who will need to identify and select students with the appropriate set of transferable skills, from awarding bodies

1 'Changing the pace', CBI/Pearson education and skills survey (2013). http://www.cbi.org.uk/media/2119176/education_and_skills_survey_2013.pdf.

who may develop qualifications and/or other materials to support skills development, from teachers who will need to deliver the skill set and, most importantly, from the students who will need to develop and apply the skills.

The gap in skills is not unique to the UK. In many countries there is a shortage of individuals with appropriate skills to meet the demands of increasing globalisation with its dependence on cutting-edge technology and communication. Governments in all major economic centres report a need to improve and expand education strategies to address the need for 21st century skills.[2] England needs to address this gap in skills to ensure that it is not left behind in the global economy.

Global mobility is creating demand for a more flexible, adaptable employee. Creativity and innovation are increasingly relevant to the modern business environment where a 'job for life' is unlikely and working life is likely to represent a series of consecutive specialisms, with focus on the acquisition and development of transferable skills.[3]

Ministers, the Department for Education (DfE) and agencies including Ofsted and Ofqual have created a new educational landscape which could provide an opportunity for employers and universities to have some input into qualification development. Ministers, for example, have indicated their wish for higher education to have a new role in setting the content of A levels.[4] This has been realised through the creation of the A level Content Advisory Board (ALCAB) by the Russell Group of universities.[5]

Similarly, there is potential for employers to engage with the development of vocational qualifications.[6] While the opportunity exists for both employers and higher education to help shape the skills, knowledge and personal attributes needed by learners for their future success, the opportunity is dependent on the interest and goodwill of government and may not survive a change in administration.

The OECD notes that 'To improve the transition from school to work, regardless of the economic climate, education systems should work to ensure that individuals have the skills that are needed in the labour market, and reduce the proportion of young adults who are neither in school nor in work.'[7] The current educational context creates an opportunity to try again to address this issue, to produce young people with the skills they need to succeed in the very competitive global market of today and the coming decades.

2 http://www.p21.org/

3 Pearson employer focus group on skills needs.

4 http://ofqual.gov.uk/files/2013-09-06-letter-to-SoS-GCSE-and-alevel-reform.pdf

5 https://education.gov.uk/childrenandyoungpeople/youngpeople/qandlearning/alevels/b00220415/changes-a-levels/sos-russell-group

6 http://www.ukces.org.uk/assets/ukces/docs/publications/review-of-adult-vocational-qualifications-in-england-final.pdf

7 OECD (2013), *Education at a Glance 2013: OECD Indicators*, OECD Publishing. http://dx.doi.org/10.1787/eag-2013-en

Chapter 2: Education policy in England

Background

England, Wales, Scotland and Northern Ireland operate devolved education systems with each country's government having overall responsibility for national education policy. In England, education is overseen by two government departments: the Department for Education (DfE) and the Department for Business, Innovation and Skills (BIS). Full-time education is compulsory for all students aged between 5 and 16, although from 2013, those aged 16–17 must be in education or if employed, in training; this requirement extends to age 18 from 2015. While the system is transparent in that most information is in the public domain, decision-making processes are often complex and difficult to understand.

The senior years of secondary education (Years 12 and 13) allow learners aged 16 and above to specialise, either by taking typically three or four A level qualifications or other academic qualifications such as the Pre-U, or by following a vocational programme or a mixture of vocational and academic qualifications.

The National Curriculum

A national curriculum sets out the knowledge, understanding and skills that society wishes its children to acquire. National curricula generally specify aims and values, content and skills in varying levels of detail. The concept of a national curriculum is not unique to the UK; it exists in some form in most countries. Where England differs from a number of other countries is in the degree of prescription. The Coalition Government indicates its intention to reduce the level of prescription[1], but this is balanced by the high degree of specificity of content in the national suites of qualifications (GCSEs and GCEs)[2] – a specificity which, it is proposed, will be retained and/or enhanced in the current reform of A level.[3]

Significantly however, the major difference between the National Curriculum in England and national curricula in other countries is in terms of 'ownership'. The Education Reform Act 1944 vested power for the education system including 'matters connected with educational theory and practice'[4] in the 'minister', and proposed setting up a Central Advisory Council for Education in England (with a parallel council in Wales) to advise the minister 'on ... matters connected with educational theory and practice'. Membership of the councils was solely the responsibility of the minister however, meaning that the advice could not be wholly independent.

1 http://www.education.gov.uk/schools/teachingandlearning/curriculum/nationalcurriculum2014/nationalcurriculum

2 http://www2.ofqual.gov.uk/downloads/category/191-gce-as-and-a-level-subject-criteria

3 https://www.education.gov.uk/consultations/index.cfm?action=consultationDetails&consultationId=1934&external=no&menu=1

4 1944 Education Reform Act.

In England, successive education legislation, including the Education Reform Act of 1988 which established the National Curriculum, has permitted ministers, and later successive Secretaries of State for Education, to retain overall ownership of, and responsibility for, the curriculum, unlike other countries where the responsibility tends to sit more broadly within government.[5]

Managing the education system

The DfE is responsible for teaching and learning for children in primary schools and for young people under the age of 19 years in secondary schools and in further education.[6] The Secretary of State for Education's responsibilities include setting education policy in relation to the structure of national qualification suites, i.e. GCSEs and A level. The DfE also influences vocational qualifications through the requirements performance tables.

Changes in government on a five-year electoral cycle can lead to significant modifications in policy. This, perhaps inevitably, makes it difficult for new developments to become successful, particularly those new qualifications which require a long lead-in time. John Bangs, formerly Assistant Secretary, Education and Equal Opportunities and Professional Development at the National Union of Teachers, said 'that schools were at the whim of new governments, which can pick apart years of work within days of taking office. Qualifications have become utterly politicised.'[7] This theme was echoed by Stephen Twigg, then Shadow Secretary for Education and Skills, in a speech to the Policy Exchange in January 2013: 'We can only achieve lasting and sustainable reform if there is a coalition of support across politics…'.[8] The recognition of the need for consensus, however, has yet to achieve political support.

5 1988 Education Reform Act

6 Further education is funded by SFA, which reports to BIS.

7 *The Guardian*, 26 August 2009.

8 http://www.labour.org.uk/a-blueprint-for-one-nation-education-vocational-education,2013-01-23

Coalition Government education policy

Significant changes to educational policy are being introduced by the Coalition Government, which is strongly supportive of a predominantly academic curriculum until at least age 16.

One of the early changes in policy was the removal of the additional support available to the 14–19 Diploma which was introduced by the previous administration.[9] This ultimately led to the demise of the Diploma. In January 2013, the Secretary of State wrote to Ofqual to outline the changes to the A level structure from September 2015.[10] Later policy announcements include changes to GCSE qualifications from September 2015, a revised National Curriculum in the core subjects and restrictions on the range of vocational qualifications that will be reported on performance tables for use both pre- and post-16.

These planned reforms have resulted in some criticism that education policy was overly focused on academic learning and that insufficient was being done to address the concerns raised by the CBI and others that students lacked the broader skills needed for transition to employment at 18. In response, on 22 April 2013, Matthew Hancock, Minister for Skills, announced the introduction of a Technical Baccalaureate (the TechBacc) from September 2014.[11] This is not intended as a qualification; rather it is a performance table measure that records the achievement of some students taking advanced (Level 3) vocational programmes. The programme must include a DfE approved Technical Level qualification, a core mathematics qualification and an extended project.

Opposition policy

The Labour Party has yet to formally publish its education policy, and has been almost silent on its proposals for A level. However, some indications of its thinking may be inferred from the speeches of the former Shadow Secretary of State for Education, Stephen Twigg. For example, Mr Twigg has described current government policy as an attempt to 'recreate the past' and suggested that the central question that needs to be addressed is 'how do we reform our education system so that it equips young people with the skills, knowledge, resilience and character that they need to play their part both as active citizens and as future business leaders and entrepreneurs?'[12]

9 http://media.education.gov.uk/assets/files/pdf/t/the%20departments%20letter%20to%20ofqual%206%20april%202011.pdf

10 http://media.education.gov.uk/assets/files/pdf/l/ofqual%20letter%20alevels%20v2.pdf

11 https://www.gov.uk/government/news/new-techbacc-will-give-vocational-education-the-high-status-it-deserves

12 http://www.labour.org.uk/a-blueprint-for-one-nation-education-vocational-education,2013-01-23

A TechBacc remains a central part of Labour's education policy, *One Nation Education*. The initial thinking is broadly similar to the model proposed by the coalition government, but final details are yet to be published. This proposal, which may be a qualification or a performance measure only, would include: a requirement to study English and mathematics to age 18, compulsory work experience and vocational programmes accredited by business. As part of its drive to improve the status and quality of practical and technical skills, the Labour Party also intends to increase the number and quality of apprenticeships to support students towards successful careers.[13]

Labour proposes engaging employers in designing high-quality apprenticeships, creating a new 'Fast Track' for apprentices into the civil service, matching the Fast Stream for graduates, making it a requirement for all large firms with government contracts to provide apprenticeships and ensuring that businesses are involved in the design of the curriculum.

Labour's One Nation Skills Taskforce, led by Professor Chris Husbands from the Institute of Education, aims to address the vocational versus academic dichotomy by developing rigorous academic and vocational routes in order to improve the confidence of young people, parents, education providers and universities.

13 http://www.labour.org.uk/a-blueprint-for-one-nation-education-vocational-education,2013-01-23

Chapter 3:
International developments

Background

Globally, education systems typically operate in much the same way as they did at the start of the 20th century. However, reforms are now taking place in many countries in order to respond to and shape economic and social developments in the 21st century.[1]

There is growing awareness of the need to move from an industry-based to an information-based economy because of the progressive development of the information sector. New ways of living and working require new skills, and education systems are beginning to respond to the changes.[2]

'Anticipating the evolution of social demand for skills must be the basis for improving the quality of learning outcomes. We then need to put the premium on skills-oriented learning throughout life instead of qualifications-focused education upfront. That's about fostering demand-sensitive and relevant learning.' **Andreas Scheicher, Deputy Director for Education and Skills and Special Advisor on Education Policy, OECD**

International education projects

Given the importance of the skills agenda, it is perhaps unsurprising that a number of high profile, internationally focused projects have emerged. Some of the best-known are described below.

Partnership for 21st Century Skills (P21)

This is a national organisation in the United States that advocates 21st century readiness for every student. The organisation proposes aligning classroom environments with real work environments and suggests that, to face the demands of higher education, career challenges and a globally competitive workforce, every student needs 21st century knowledge and skills defined as the 3Rs and 4Cs.

- The 3Rs include standard academic subjects: English, reading or language arts; mathematics; science; foreign languages; civics; government; economics; arts; history and geography.
- The 4Cs include: critical thinking and problem-solving, communication, collaboration, and creativity and innovation.

1 Transforming Education: Assessing and teaching 21st-Century Skills (2009) – Call to action: Launch of ATC21S Project in London. http://atc21s.org/wp-content/uploads/2011/04/Cisco-Intel-Microsoft-Assessment-Call-to-Action.pdf

2 *Assessment and Teaching of 21st Century Skills* – Editors: Patrick Griffin, Barry McGraw and Esther Care (Springer) – page 2.

P21 aims to position 21st century readiness at the centre of the US education programme by building collaborative partnerships between education, business, and community and government leaders.

Assessment and Teaching of 21st Century Skills (ATC21S)[3] is an international research project led by the University of Melbourne, that is trialling ways of assessing these 21st century skills.

OECD Programme for International Student Development (PISA)

PISA has become the international benchmark for measuring educational outcomes in reading, mathematics and science since its foundation in 1999 and through its three-yearly surveys of skills in over 70 countries. It focuses on the application of knowledge in reading, mathematics and science to problems with a real-life context. The critical thinking and problem-solving skills that PISA measures are the sorts of skills that many nations now believe are important to their economic well-being.

The European Commission's strategic framework for education and training

Politicians at European level have long recognised that education and training are essential to the development of today's knowledge society and economy. The EU's strategy emphasises countries working together and learning from each other. While each EU member state is responsible for its own education and training systems, EU policies are designed to help address common challenges.

There are several related EU initiatives to help make qualifications, experiences and skills better appreciated and easier to recognise throughout the EU for individuals, businesses and other organisations. These give greater access to learning or employment opportunities in different countries and encourage greater mobility. Recommendation 2006/962/EC of the European Parliament of December 2006 sets out the key competences in the shape of knowledge, skills and attitudes fundamental for each individual in a knowledge-based society. This recommendation proposes a reference tool for European Union (EU) countries to ensure that these key competences are fully integrated into their strategies and infrastructures, particularly in the context of lifelong learning.[4]

The framework defines eight key competences and the essential knowledge, skills and attitudes related to each of them.

1. **Communication in the mother tongue**, which is the ability to express and interpret concepts, thoughts, feelings, facts and opinions in both oral and written form (listening, speaking, reading and writing) and to interact linguistically in an appropriate and creative way in a full range of societal and cultural contexts.

3 Consortium based at University of Melbourne (Cisco/Intel/Microsoft-funded – includes collaboration between founder countries Australia, Finland, Singapore, USA). http://atc21s.org/

4 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006H0962:EN:NOT

2. **Communication in foreign languages** which involves, in addition to the main skill dimensions of communication in the mother tongue, mediation and intercultural understanding. The level of proficiency depends on several factors and the capacity for listening, speaking, reading and writing.

3. **Mathematical competence and basic competences in science and technology**. Mathematical competence is the ability to develop and apply mathematical thinking in order to solve a range of problems in everyday situations, with the emphasis being placed on process, activity and knowledge. Basic competences in science and technology refer to the mastery, use and application of knowledge and methodologies that explain the natural world. These involve an understanding of the changes caused by human activity and the responsibility of each individual as a citizen.

4. **Digital competence** involves the confident and critical use of information society technology (IST) and thus basic skills in information and communication technology (ICT).

5. **Learning to learn** is related to learning, the ability to pursue and organise one's own learning, either individually or in groups, in accordance with one's own needs and awareness of methods and opportunities.

6. **Social competence** refers to personal, interpersonal and intercultural competence and all forms of behaviour that equip individuals to participate in an effective and constructive way in social and working life. It is linked to personal and social well-being. An understanding of codes of conduct and customs in the different environments in which individuals operate is essential.

   Civic competence, particularly knowledge of social and political concepts and structures (democracy, justice, equality, citizenship and civil rights), equips individuals to engage in active and democratic participation.

7. **Sense of initiative and entrepreneurship** is the ability to turn ideas into action. It involves creativity, innovation and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives. The individual is aware of the context of his/her work and is able to seize opportunities that arise. It is the foundation for acquiring more specific skills and knowledge needed by those establishing or contributing to social or commercial activity. This should include awareness of ethical values and promote good governance.

8. **Cultural awareness and expression** which involves appreciation of the importance of the creative expression of ideas, experiences and emotions in a range of media (music, performing arts, literature and the visual arts).

These key competences are intended to be interdependent, with an emphasis in each case on critical thinking, creativity, initiative, problem-solving, risk-assessment, decision-taking and constructive management of feelings.

Developments in international education

Significant secondary education reforms are taking place around the world. This chapter summarises the reforms taking place in a sample of countries:

- Hong Kong
- Singapore
- USA
- Germany
- Finland.

These countries were selected for a number of reasons: their success in international benchmarking tests, for example PISA and TIMSS, and/or the timing of their educational reform programmes, including an increased emphasis on skills development. The increased emphasis on skills and resulting changes to the curricula reflect the importance national governments place on skills acquisition and development. Although ahead of the UK in terms of development, it is important to recognise that the emphasis on skills is still relatively new in these countries. While an increased emphasis on skills development is evident, it is too early to evaluate its impact in many cases.

Hong Kong

Hong Kong has been experiencing many challenges, both because of the fast changing and competitive economic environment in the Asia-Pacific Region and the transition in July 1997 from being a British colony to a Special Administrative Region (SAR) of China.[5]

In 2000, the government of Hong Kong Special Administrative Region (HKSAR) agreed to adopt a 3-year senior secondary and 4-year undergraduate academic system to enable a more flexible, coherent and diversified senior secondary curriculum.[6] Students take the Hong Kong Diploma of Secondary Education (HKDSE) at the end of their secondary education.[7] The first cycle was completed in 2012. There are four core subjects: English, mathematics, Chinese and liberal studies. Students then choose two or three elective subjects from a choice of 20. There are also some applied learning subjects, modelled on the idea of the BTEC, and six other modern foreign languages which can also form part of the students' choices.

5 *Hong Kong educational reforms in the last decade: reform syndrome and new developments*, Yin Cheong Cheng, Hong Kong Institute of Education, HKSAR, China – page 66.

6 *The New Academic Structure for Senior Secondary Education and Higher Education: Action Plan for investing in the future of Hong Kong* – Education and Manpower Bureau (May 2005) – page 1. http://334.edb.hkedcity.net/doc/eng/report_e.pdf

7 http://www.itseducation.asia/education-system.htm

The extensive education reform has placed great emphasis on the whole-person development of students, lifelong learning capabilities and a global outlook.[8] 'Learning is the key to one's future, and Education is the gateway to our society's tomorrow.'[9] The curriculum aims to broaden students' knowledge base by enhancing their social, national and global awareness, as well as developing their multi-perspective and critical thinking skills through the study of a wide range of issues using a multi-disciplinary enquiry approach.

The introduction of these reforms has not been without problems, particularly as teachers have needed to adopt a different approach to delivery of the new, more integrated curriculum. However, these issues were mitigated by the relatively long lead-in time.

Singapore

During the last decade, Singapore's education system has remained consistently at or near the top of most major world education ranking systems.[10] Its key success factors are the close working relationship between the Ministry of Education, the National Institute of Education, responsible for teacher education, and teachers, as well as the relatively long timelines allowed for implementation to ensure that all stakeholders are fully engaged with the changes.

A wide range of initiatives designed to tailor education to students' abilities and interests, to provide more flexibility and choice, and to transform the structures of education have been put in place over a number of years. Career paths and incentives for teachers were revamped and teacher education upgraded. Curricula and assessment changes put greater emphasis on project work and creative thinking,[11] and educators are focusing their classroom teaching on 21st century competencies that include managing information, solving problems, contributing socially, thinking globally and acting ethically.

The curriculum emphasis is less on covering content and more on stimulating students' understanding while supporting their interests and aspirations: teaching delivers a holistic curriculum across different domains of learning rather than focusing on subjects. Students are expected to engage with the processes of learning, building confidence, and encouraging curiosity and critical thinking rather than concentrating on the product. Singapore's current focus is on implementing 21st century skills through project-based learning, more differentiated teaching and with greater emphasis on formative and qualitative assessment.

8 HKSAR, China website.

9 *Reform Proposal for the Education System in Hong Kong* – Education Commission (EC) submitted to the Hong Kong Government – (September 2000) – Foreword. http://www.e-c.edu.hk/eng/reform/annex/Edu-reform-eng.pdf

10 *Strong Performers and Successful Reformers in Education: Lessons from PISA for the United States* – OECD 2010. http://www.oecd.org/pisa/46623978.pdf

11 *Strong Performers and Successful Reformers in Education: Lessons from PISA for the United States* – OECD 2010. http://www.oecd.org/pisa/46623978.pdf

USA

The USA does not have a national education system and school policy is set by each state. There is no national high-school graduation examination and the curriculum is set at district level.

The Common Core Standards (in English language arts and mathematics) are the result of a state-led effort that established a single set of clear education standards, from kindergarten to 12th grade. They have been adopted by 45 states, the District of Columbia, four territories, and the Department of Defense Education Activity. They are evidence based and incorporate the knowledge and skills young people need in order to succeed at college and in careers, so that fully prepared students are able to compete successfully in the global economy.[12] In surveys, teachers have embraced these higher standards, and say that a greater emphasis on critical thinking, literature and real-world problem-solving speaks to what they love about teaching.[13]

Currently there is inter-state collaboration to develop common assessments that will be aligned to the *Common Core Standards*. These will replace the existing end-of-year state assessments and should be available in at least some states from the 2014/2015 academic year.

Germany

The education system in Germany leads to early selection at age 12, when young people are divided between grammar schools (*gymnasium*) leading to the Abitur (for entry to higher education), lower-level academic secondary schools (*Realschule*) and the English equivalent of secondary modern schools (Hauptschule). While the German system of early selection has been subject to some criticism, its vocational training system, with its combination of classroom and business, theory and practice, learning and working, is recognised worldwide as a highly effective model for vocational training and is as a major contributor to the country's economic success.

In Germany, '... half of all youngsters in upper secondary school are in vocational training, and half of these are in apprenticeships.'[14] There is strong support for vocational training in Germany, where apprentices aged 15–16 spend more time in the workplace receiving on-the-job training than they do in school, and after three to four years are almost guaranteed a full-time job.

12 www.corestandards.org

13 http://www.ed.gov/blog/2013/06/new-flexibility-for-states-implementing-fast-moving-reforms-laying-out-our-thinking/

14 Andreas Woergoetter – Head of country studies at OECD's economic department (2012) http://www.bbc.co.uk/news/business-18868704

Many companies participate voluntarily in vocational training, often at their own expense, because they believe that this is the best way to meet their own need for skilled staff. Businesses that take part in the practice consider training their own new employees the best form of personnel recruitment, saving on recruitment costs and the cost of new-employee training. Trainees benefit by receiving market-relevant training that improves their chances in the labour market.

In 2012, the German Embassy brought together German and American businesses and local education and training providers, with the aim of developing training programs best suited to businesses' needs. This Skills Initiative was developed to identify and spread best practices in sustainable workforce development from Germany in the USA.[15]

Finland

The Finnish education system is similar to the German system, comprising pre-primary education, basic education, and general upper secondary education leading to one of two pathways: vocational education and training or higher education provided by polytechnics and universities. Finnish educators enjoy broad autonomy over curriculum and instruction, and schools are largely self-governed.

The transformation of the Finns' education system began some 40 years ago as the key propellant of the country's economic recovery plan. Educators had little idea it was so successful until 2000, when the first results from PISA revealed Finnish youth to be the best young readers in the world. Three years later, they led in mathematics. By 2006, Finland was first out of 57 countries in science. In the 2009 PISA scores released last year, the nation came second in science, third in reading and sixth in maths among nearly half a million students worldwide.[16] (It should however be noted that Finland's performance in the 2012 PISA tests saw it slip to 12th place overall).

Teachers are highly qualified (a Master's degree is a requirement) and the teaching profession is highly regarded, which means that the most talented and highly motivated individuals apply to train as teachers. The assessment of schools and students is undertaken to produce information to support learning rather than for school ranking, and school inspections do not exist.

Activities at all levels of the education system are built on interaction and partnerships, and Finnish school authorities cooperate with subject and teacher associations, and as a result there is strong support for and engagement with curriculum development.

15 www.germany.info/Vertretung/usa/en/07_Climate_Business_Science/02_Bus_w_Germany/skills-initiative.html

16 http://www.smithsonianmag.com/people-places/Why-Are-Finlands-Schools-Successful.html#ixzz2dAgGKUri

The senior years of secondary education allow students to follow either academic or vocational pathways. Teaching of general subjects is organised into modules which are flexibly delivered – not necessarily in year groups. The provision of vocational education is based on quantitative analysis of long-term national needs with the expectation that future skills needs will be met by a supply of suitably qualified young people. Vocational learning is delivered through either schools-based vocational learning or apprenticeships. Each vocational qualification requires at least three years of study and includes a minimum of half a year's work experience.

A number of issues arise from these international comparisons. First, the degree to which England should align with these developments in countries that perform well in the PISA assessments and whose economies are also performing well. The Advisory Group believes that England should take careful note of these developments to broaden the 16- to 18-year-old curriculum, given our current position on the PISA rankings.

An emphasis on vocational learning would be a major change in direction for the England educational system, but we believe that it would be a sensible change to help improve the countries' economic performance as well as enhance the employment prospects for our students. Third, the emphasis on the 'softer skills' captured in the country programmes outlined above is one we believe should be adopted in England.

Chapter 4:
Changing education and skills needs: the view from HEIs and employers

Background

Over the past 100 years, significant changes have taken place in every phase of education, including that at universities. The most significant of these is the increasing numbers of learners completing secondary education and graduating with a first degree. This expanding trend is summarised in the table below (Bolton, 2012):

Year	Numbers taking school-leaving examinations	Numbers graduating with a first degree
c.1900	In 1919, 28,800 pupils were entered for one or more school certificate examinations in England and Wales. In 1920, 3,200 were entered for one or more Higher School Certificate examinations.	In 1922–23, 9,200 students were awarded first degrees.
1950s	In 1953–54, 10.7% of the relevant age group passed five or more GCE O levels at schools in England and Wales; 5.5% of the relevant age group passed one or more GCE A level.	In 1950, 17,300 students were awarded first degrees.
2010s	In 2010–11, 79.6% of pupils in their last year of compulsory education in the UK achieved five or more GCSE grades A*–C or equivalent. In 2002–04, 39.2% of the relevant age group passed one or more GCE A level.	In 2010–11, 331,000 full-time students were awarded first degrees.

Figure 1: Undergraduate students in the UK[1]

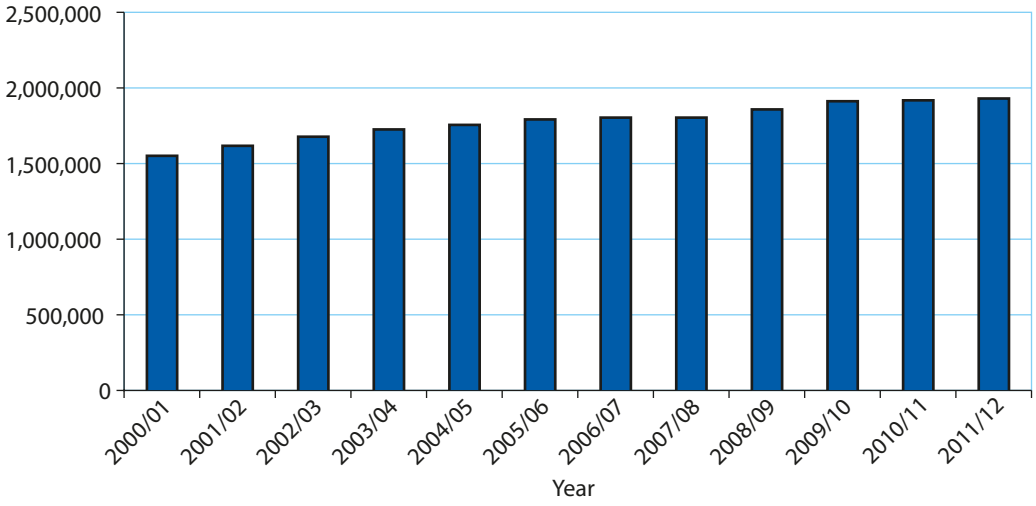
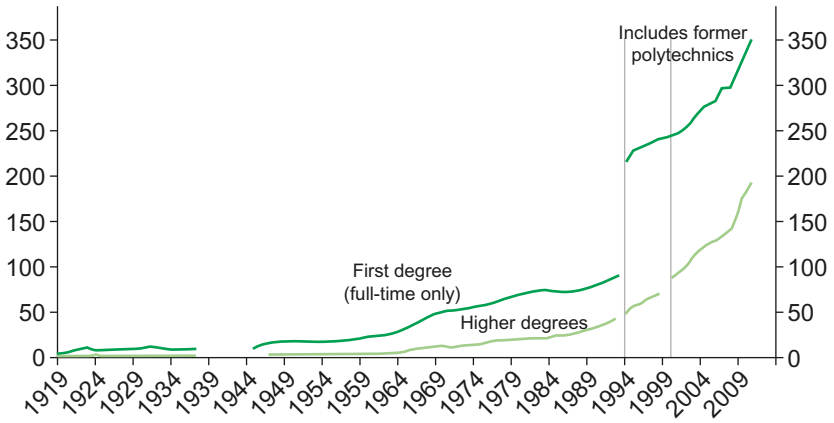


Figure 2: Students obtaining university degrees in the UK (thousands)[2]



Overall participation in higher education increased from 3.4% in 1950, to 8.4% in 1970, 19.3% in 1990 and 33% in 2000.

1 House of Commons Report, SN/SG/4252

2 House of Commons Report, SN/SG/4252

Driven by successive governments' commitment to widening participation in higher education, the variety of pathways taken into HE study has become broader, with students following purely academic, purely vocational or a mixture of academic and vocational routes. In addition, students increasingly represent a wider range of social, educational and economic backgrounds. Inevitably perhaps, students are entering university with a range of skills, some better developed than others.

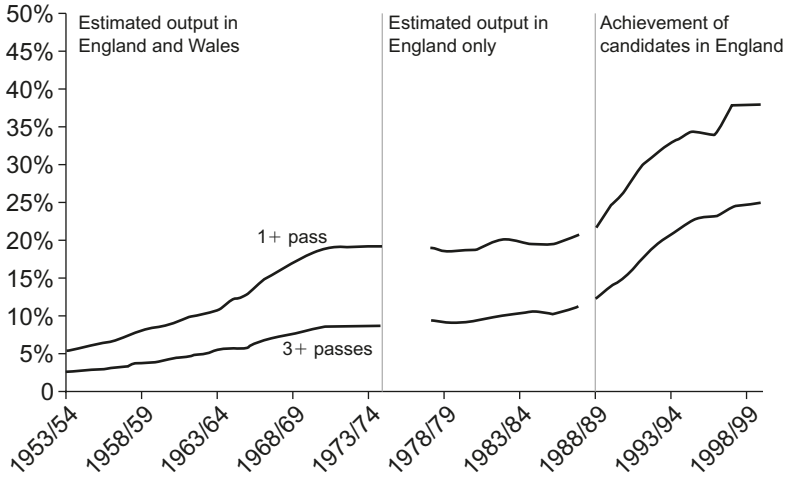
With academic routes frequently viewed as the 'gold standard' route into HE study, there has long been concern that the academic focus of A level is too narrow for progression to university (Roberts and Higgins, 1992). Similar concerns continue to be expressed: Professor Don Nutbeam, Vice Chancellor at the University of Southampton, writing in the *Guardian* in 2009, set out his concerns about the structural problem in the English education system: that we channel young people into narrow pathways for learning.

We share this concern. At 14 and 15, young people make choices in education in preparation for A level or vocational study and subsequent university entry. Many will abandon study of a foreign language, and by 16, large numbers will also drop English and/or mathematics. By 16, most students will focus on a relatively limited combination of subjects. Recent reform, including the Extended Project, has gone some way to addressing the perceived narrowness of A level, but significant challenges remain and young people continue to learn more and more about less and less.

First-degree attainment numbers in the late 1940s were boosted by government schemes to support those who had served in the armed forces. The 1960s also saw a major expansion as numbers doubled in seven years to more than 50,000. The only downturn in numbers in recent times was in the number of first degrees awarded in the mid-1980s. This in part reflected earlier trends in staying-on rates, A level performance and demographics. It was also magnified by the early 1980s peak which, as with staying-on rates, may have been affected by the economic recession.

The data include degrees awarded at former polytechnics from 1994 onwards. This extension of what constituted a university meant that the number of university degrees awarded more than doubled. There was much less impact on the number of higher degrees awarded. A change in the treatment of students qualifying from a 'dormant' status in 2000 had a much greater impact. The sharp growth in the number of degrees awarded in the last three years reflects earlier increases in student numbers. These figures cover all students regardless of their home country. In 2011/12, 84 per cent of full-time first-degree and 41 per cent of higher-degree awards were to home students.

Figure 3: A level achievement at schools and colleges
% of the relevant age group[3]



As a result, university departments with high numbers of applications, i.e. highly selective departments, indicate that they have less faith that the current post-16 curricula successfully develop the skills and knowledge needed for successful transition to undergraduate programmes. In their view, A levels are less effective tools to form the basis of selection than they were in the past. This was principally because students who were diligent about learning for the test were able to get high marks and the skills that were most valuable in higher education are not tested. While the introduction of the A* had some impact in helping selection procedures, concerns were raised about the breadth of the overall assessment methods used in A level.[4]

Employers have long recognised the importance of education to business performance. Previously, their focus had been students leaving the education system and moving into employment at age 16 or 18. More recently, employers have adopted a wider vision, recognising that different approaches are needed throughout the education system to ensure that learners transitioning to employment have had the time to develop key employability skills. As the focus of employer concerns has shifted from 'work readiness' to a focus on the well rounded individual, with the CBI claiming in November 2012 that 'As well as academic rigour, we need schools to produce rounded and grounded young people who have the skills and behaviours that businesses want.'[5]

An emphasis on rounded and grounded individuals permeates employer surveys that focus on the needs of all learners, not only the most able. *In First steps: a new approach for our schools*, published in 2012, the CBI noted that 'the current education system fosters a cult

3 House of Commons Report, SN/SG/4252

4 Ipsos MORI 'Fit for Purpose' report Ofqual/12/5145 April 2012. http://ofqual.gov.uk/ofdoc_categories/changes-to-qualifications/

5 http://www.cbi.org.uk/media/1845483/cbi_education_report_191112.pdf

of the average; too often failing to stretch the most able or support those that need most help' and suggests that this might be an unintended consequence of the use of school and college performance measures.[6]

In the UK there are skills shortages, for example in medicine, engineering, science and computing, alongside high, though falling, youth unemployment. In engineering and manufacturing, skills needs are changing as technology impacts on ways of working. Employers regularly voice concerns about the potential gap in expertise as new technologies emerge and as the workforce ages.

This situation needs to be urgently addressed if our economy is to sustain the green shoots of recovery.

Students' lack of basic skills

John Cridland, the CBI's Director General, noted that 'skills are at the heart of our ability to sustain economic growth. It is essential that our schools equip every young person with the attitudes and competencies they need to lead fulfilling and productive lives.'[7] The OECD notes that 'the most promising solution … is investing effectively in skills throughout the life cycle; from early childhood, through compulsory education, and throughout a working life.'[8] This focus on the importance of skills development, and its intrinsic links with the country's economic future, permeate employers' thinking.

Similar concerns exist in higher education. A survey of UK deans of science in 2003 shows that an overwhelming majority believe the elementary knowledge and mathematical and practical skills of first-year undergraduates are worse than those of their peers a decade previously.[9] Many believe that little has changed today and express concern that remedial action has not taken place to counter the effects of 'spoon-feeding' at school. The most problematic situation was found in the physical sciences, where 70 per cent of deans reported that less than half of new students had the appropriate or necessary skills. Overall, just under half the students on 58 per cent of courses lacked the necessary mathematical skills; just under half of students on 47 per cent of courses lacked the necessary practical skills; and under half the students on 34 per cent of courses lacked the elementary knowledge appropriate for their studies.

The Institute of Directors (IoD) surveyed more than 100 university admissions tutors and found that 41 per cent thought the quality of first-years had declined. Just 28 per cent thought standards among students had risen.[10] Universities have responded to this 'skill gap' by providing a range of additional support for students – particularly in their first year. This remedial activity is normally focused on enhancing students' generic, transferable skills.

6 http://www.cbi.org.uk/media/1845483/cbi_education_report_191112.pdf

7 2012 CBI Survey *Learning to grow*. http://www.cbi.org.uk/media/1514978/cbi_education_and_skills_survey_2012.pdf

8 OECD Report *Better Skills Better Jobs Better Lives* (2012). http://skills.oecd.org/documents/OECDSkillsStrategyFINALENG.pdf

9 THES. 2 May 2003.

10 http://press.iod.com/2008/08/11/iod-warns-of-credibility-gap-in-education/

Written skills

Many sources indicate that the general level of literacy of students entering higher education[11] is a cause of concern. Concerns focus particularly on[12] essay-writing skills, the ability to structure an argument, and poor knowledge of grammar. A significant majority of university lecturers[13] identified academic writing as a weakness of first-year undergraduates. In another research project, 49 per cent of those surveyed reported that students with vocational qualifications had weaker written communication skills.[14]

Mathematics and practical numeracy

Universities have consistently expressed concerns about the general level of mathematics skills demonstrated by students entering higher education. While the mathematics skills required differ by subject, some skills are considered essential across almost all subjects. For example, statistical skills are essential to support quantitative and qualitative academic research. Mathematical modelling and problem-solving skills are valued across a range of STEM and humanities subjects.[15]

Social scientists have expressed concerns about the marginalisation of quantitative methods and students' lack of understanding of mathematically based arguments. Lecturers consistently report that students find it difficult to apply their mathematical knowledge in new contexts.[16]

An additional issue is that many HE courses have significant mathematics content but mainly recruit students with GCSE mathematics. These students may have achieved the minimum entry requirement of grade 'C' at GCSE and may not have studied mathematics for at least two years. This issue is exacerbated by the lack of emphasis on mathematical skills in some A level subjects. As a result, tutors have concerns about the mathematical preparation of their students. They also expressed concern about the inappropriateness of using GCSE as a predictor of mathematical competence.[17] While many university courses require mathematical knowledge, insufficient numbers of students study the subject post-16.[18] ACME recommended that 'there should be an emphasis on building students' confidence in mathematics, and their ability to use mathematics in a range of familiar and unfamiliar contexts.'

There is considerable anecdotal evidence that A level mathematics and physics do not adequately support students' mathematical skills for related degrees. This view is supported by research from the Institute of Physics[19], which indicates that the majority of academics felt that students were not at all well prepared for the mathematical content they would meet as

11 Ipsos MORI 'Fit for Purpose' Report – page 74. http://ofqual.gov.uk/ofdoc_categories/changes-to-qualifications/

12 Pearson Edexcel Universities Research internal report – page 2.

13 Cambridge Assessment Lecturer Survey: Executive Summary – page 2. http://www.cambridgeassessment.org.uk/images/116010-cambridge-assessment-he-research-survey-of-lecturers-executive-summary.pdf

14 Pearson's Exploration of University Admissions – page 100.

15 Ipsos MORI 'Fit for Purpose' Report – page 64. http://ofqual.gov.uk/ofdoc_categories/changes-to-qualifications/

16 Pearson Edexcel Universities Research: Overview Report – page 2.

17 ACME: Mathematical Needs report – page 15. http://www.acme-uk.org/media/7627/acme_theme_b_final.pdf

18 ACME: Mathematical Needs report – page 15. http://www.acme-uk.org/media/7627/acme_theme_b_final.pdf

19 Institute of Physics report July 2011 – *Mind the Gap: Mathematics and the transition from A-Levels to physics and engineering degrees* – page 12. http://www.iop.org/publications/iop/2011/file_51933.pdf

undergraduates. Even students with GCE mathematics lacked sufficient mathematical fluency. A different issue exists with bioscience programmes, as students began with a wide variety of mathematical backgrounds from A level to grade C at GCSE. Increasingly, mathematical skills are as important in biology and medicine as they are in physics and engineering. Research commissioned by the UK Centre for Bioscience and the Higher Education Academy[20] reported poor confidence which prevented students from attempting quantitative problems. Specific areas for inclusion were identified as rearranging simple equations and the use of ratio and proportion.

Higher-order thinking skills

One of the top three areas in which university lecturers thought undergraduates were least prepared is higher-order thinking skills.[21]

Problem-solving and reasoning

Employers indicated that young people with A levels have more evident skills in problem-solving and reasoning than those with other comparable qualifications, but reported a weakness in graduates' problem-solving skills.[22] This conflicts with the view from HE, where course assessors believed that students with vocational qualifications had stronger team-working and problem-solving skills than those with academic qualifications, because the skills were engrained in the vocational qualifications and the work experience that often came with them.[23]

Lateral thinking

In addition to the skills listed earlier, there is a need to improve students' ability to link knowledge across topics[24], as this was identified as a weakness in first-year undergraduate.[25] Constructing balanced arguments from evidence and assessing the validity and soundness of arguments are also essential for successful transition to undergraduate programmes.[26] Students have a tendency to accept arguments and information uncritically, so are able to recall factual information, but sometimes lack the ability to critically assess or really understand the materials they read.

Independent enquiry

It has been noted in a variety of studies that students in higher education are struggling to work independently and to manage their own time: they want to be told exactly how to do

20 A survey of the mathematical landscape within bioscience undergraduate and postgraduate Uk education – page 6. http://www.heacademy.ac.uk/assets/documents/stem-conference/BioSciences2/Jennifer_Koenig.pdf

21 Cambridge Assessment: A review of the literature examining the pedagogical differences between A level and university: Executive Summary – page 7. http://www.cambridgeassessment.org.uk/Images/116018-cambridge-assessment-he-research-literature-review-executive-summary.pdf

22 CBI Report: Education and Skills Survey 2012 – page 34. http://www.cbi.org.uk/media/1514978/cbi_education_and_skills_survey_2012.pdf

23 Pearson Edexcel's Universities Research – page 11.

24 Pearson Edexcel's Universities Research – page 2.

25 Cambridge Assessment Lecturers Survey: Executive Summary – page 2. http://www.cambridgeassessment.org.uk/images/116010-cambridge-assessment-he-research-survey-of-lecturers-executive-summary.pdf

26 Ipsos MORI 'Fit for Purpose' report – page 76. http://ofqual.gov.uk/ofdoc_categories/changes-to-qualifications/

their work.[27] In addition, many students seem to experience a culture shock in the change of teaching and learning styles at university as compared with school.

Another of the top three areas in which lecturers thought undergraduates were least prepared is independent enquiry.[28] HEIs also expressed concern about students' lack of research skills, including: finding legitimate and trustworthy sources; extended writing; referencing; and building arguments from evidence.[29]

Cambridge Assessment reports that HE lecturers sense gaps in students' intellectual curiosity and motivation. This was reiterated in the Ipsos MORI 'Fit for Purpose' report which stated that, while not a skill in its own right, one of the key perceived gaps in some students' outlook when arriving at higher education is intellectual curiosity or a 'love of their subject'.[30]

Current first year undergraduate students are considered to be better prepared for university study in a number of skill domains: ICT skills, teamwork and collaboration.[31] In addition, 49 per cent of course assessors indicated that students with vocational qualifications had stronger team-working skills than students with academic qualifications[32].

Employer–school and HE–school links

Employers and universities are keen to address the skills gap by working directly with schools and colleges. Recent years have seen an increase in the number of employer- and HE-led initiatives designed to better prepare students for progression.

A significant number of employers are already working with schools and colleges and many are considering deepening their relationships. One of the key advantages of closer relations between employers and schools is in increasing motivation for students by providing opportunities for them to engage directly with employers and with real life and relevant contexts. Employers also benefit from this relationship, by cutting recruitment costs, by nurturing the interests of talented young people, by identifying opportunities for staff engagement and motivation and, ultimately, by raising brand awareness.

Employer representative groups are increasingly reaching out to schools and colleges. For example, the CBI has called on business leaders to become local champions in schools and colleges across the UK, to enthuse and inspire young people about the world of work from an early age, and the British Chambers of Commerce (BCC) president noted in 2013 that businesses she speaks to, up and down the country, want to work with young people, and are happy to train and employ them.

27 Pearson Edexcel's Universities Research – page 2.

28 Cambridge Assessment Lecturers Survey: Executive Summary – page 2. http://www.cambridgeassessment.org.uk/images/116010-cambridge-assessment-he-research-survey-of-lecturers-executive-summary.pdf

29 Ipsos MORI 'Fit for Purpose' report – page 76 / Pearson Edexcel's Universities Research – page 2.

30 Cambridge Assessment Lecturer Survey – page 2 / Ipsos MORI 'Fit for Purpose' report – page 79.

31 Cambridge Assessment Report: A review of the literature examining pedagogical differences between A level and university: Executive Summary – page 2. http://www.cambridgeassessment.org.uk/Images/116018-cambridge-assessment-he-research-literature-review-executive-summary.pdf

32 Pearson's Exploration of University Admissions – page 11.

In addition, links between universities and schools have become common practice. These adopt many forms, from HE-sponsored academy schools (examples include Aston Academy, The Merchants' Academy sponsored by the University of Bristol, and UCL Academy School) to the University of Cambridge Area Links Scheme set up in 2000 to enable Cambridge to build relationships with schools and colleges across the country. School–HE liaison can involve a range of outreach programmes, for example, King's College, London offers, through its 'King's visits you' programme, student support in a range of areas from help with the UCAS application process to guidance on student finance and living in London, alongside academic support.

School–HE links are widely regarded as critical to the success of national strategies designed to raise learners' attainment, widen participation and promote learner progression to the full range of higher education available.[33] HEFCE has funded a number of projects designed to evaluate HE–school links with a specific focus on support for learners, curriculum development, and shared governance and strategic planning arrangements.

Apprenticeships

Apprenticeships play a key role in boosting skill levels across the economy. They provide young people and existing workforce with technical skills, knowledge and on-the-job training and create a ladder into meaningful employment.

The current government has expanded the Apprenticeship Framework and the proportion of employers involved in apprenticeships has risen significantly.[34]

In part, the economic downturn has created a need to expand alternative routes to higher skills alongside traditional university courses. However, the apprenticeship route has a long and valued history. In his review of apprenticeships, Doug Richard notes: 'In a dynamic and changing economy, people need to be ready and able to apply their skills in new jobs and sectors. So while we must ensure that apprenticeships are training people for real and specific skilled occupations, we must also ensure that an apprenticeship is broad enough to equip someone with genuinely transferable skills: skills which they will need and use in any job, and skills which enable them to be competent and confident beyond the confines of their current job, both in their sector as a whole, and beyond it.'[35]

Many businesses anticipated increasing the number of jobs requiring leadership and management skills with a parallel reduction in the number of low-skilled jobs. While employers anticipated few difficulties in filling lower-skilled vacancies, they were less confident of being able to fill the higher-skilled vacancies.[36]

33 http://www.hefce.ac.uk/whatwedo/

34 CBI Report: Education and Skills Survey 2012. http://www.cbi.org.uk/business-issues/education-and-skills/in-focus/education-and-skills-survey/

35 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/34708/richard-review-full.pdf

36 OECD (2012), *Better Skills, Better Jobs, Better Lives* (2012). http://skills.oecd.org/documents/OECDSkillsStrategyFINALENG.pdf

In developed economies there is an ever-diminishing number of jobs that require basic skills, and there is an increasing demand for higher-order cognitive skills, collaborative ways of working, expert thinking, ability to solve complex interdisciplinary problems and achieve effective communication.

The education system

The BIS report *Skills for sustainable growth* sets a clear agenda: proposing that the UK should have a world-class skills base to provide a consistent source of competitive advantage.[37] The skill base, in employers' views, should be, at least in part, delivered through the education system.

The best educational systems globally start with a clear idea of what their systems should deliver, and then devote all of their focus on meeting that objective. England needs to learn from this, by setting out the core knowledge and skills young people are expected to master alongside the behaviours and attitudes the education system should foster.[38] Historically, the UK has devised a plethora of new skills-based initiatives, without allowing any time to fully develop.[39]

The argument for a stable, long-term approach is consistent with views expressed by other key stakeholders, but would be a new departure for England. The Advisory Group is unanimous in its view that the design of changes in our current educational system should be both independent of political orientation and should be planned for the long term to give a sense of stability for both students and teachers.

Increasing globalisation, coupled with rapid technological change, makes it likely that the skills required both now and in the short term will be different from the skills required in the future. This is particularly true in STEM subjects, where in order to keep its position as a global leader, England needs not only to focus on short-term needs but also to recognise that we must change our approach to skills acquisition to enable young people to prepare for technologies, and for jobs, that do not yet exist.

The skills of individuals within a nation are vital for the economic success of that nation, and England is not producing enough people with the right skills for a quickly changing labour market. As we move out of the recession, many businesses are unable to recruit highly-skilled workers, in particular those in high-growth sectors which should be leading the economic recovery. The workforce, now and in the future, needs to be knowledgeable and skilled, as well as confident and innovative, in order to make a positive contribution to their employers' competitiveness, as well as their own professional development and fulfilling lives and careers.[40]

37 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32368/10-1274-skills-for-sustainable-growth-strategy.pdf

38 http://www.cbi.org.uk/campaigns/education-campaign-ambition-for-all/first-steps-read-the-report-online/

39 Diagram on page 4 of http://www.iod.com/influencing/policy-papers/education-and-skills/reforming-the-skills-system-lessons-learned-the-hard-way

40 'Changing the pace', CBI/Pearson education and skills survey (2013). http://www.cbi.org.uk/media/2119176/education_and_skills_survey_2013.pdf

Future workforce

Skills for Jobs: Today and Tomorrow, published by UKCES in 2010, provides an insight into current and future skills needs in England. It highlights potential economic growth areas and identifies the skills needed to support these. Areas of the economy that are predicted to grow include the following:

- advanced manufacturing
- low-carbon economy
- digital economy
- life sciences and pharmaceuticals
- engineering/construction.

The UKCES Report concluded that, while low-skilled jobs are likely to persist, it is fundamentally important to increase skill levels to ensure economic growth over the longer term.[41]

In addition to the retention of low-skilled jobs, their nature is likely to change substantially in the future, reflecting the increased impact of technology in manufacturing. As a result, a different kind of worker is needed.

The STEM agenda

There is much competition in science and technology output and discovery, emerging from both traditional scientific leaders and growing economies around the world. Supporting STEM subjects is critical to the UK's future economic prosperity. Recent research highlights the shortfall in the number of people choosing to study STEM subjects, as well as the need to double the supply of skilled workers in STEM-related jobs in the next 7 to 10 years.

STEM skills are valued by employers across different sectors, with almost three-quarters (72 per cent) of firms employing STEM-skilled staff. In particular, STEM skills are vital to areas of future growth and employment, including advanced manufacturing and low carbon industries. Yet 45 per cent of employers are currently having difficulty recruiting STEM-skilled staff, with almost 6 in 10 (59 per cent) of firms expecting difficulty in the next three years.[42]

Government STEM policy

Successive UK governments have supported long-term strategies for science. For example, the previous government's publication *Science and Innovation Investment Framework 2004–2014*, published in 2007, set out a long-term strategy to secure and sustain a supply

41 http://www.ukces.org.uk/publications/nssa-vol-2.

42 CBI Report: Education and Skills Survey 2012. http://www.cbi.org.uk/business-issues/education-and-skills/in-focus/education-and-skills-survey/

of scientists, engineers, technologists and mathematicians (STEM) to support the science base. Under the Coalition Government, funding levels have been maintained, recognising the central importance of science to the UK economy, though issues remain about the importance of mechanisms for ensuring improved innovation.

However, while funding remains in place, and there is broad agreement about the need for additional workers with science skills in response both to the projected growth in STEM sectors and the increasing impact of an ageing workforce, there is still a broad gap in essential skills for workers in this sector.

Technicians

Technical support is critical to work in science, engineering and technology, and training for this role is a feature of successful manufacturing and innovation-based economies such as Germany's. In England at present, relatively low numbers enter technical roles, as a training and opportunity path is often not clearly defined in our educational system. Pathways into technician training vary from the traditional academic route, through vocational and work-based learning, including apprenticeships. In recent years, successive governments have placed much greater emphasis on both improving options for training and raising the status of technicians, but much remains to be done.

There has been concern for some time that technicians and new graduates in technically orientated subjects lack clearly defined career pathways. The Science Council has begun to address this through the development of a registration scheme for technicians, to ensure that technicians' skills and knowledge develop in line with industry needs. The registration scheme provides a common framework of professional registration across the STEM sectors and is supported by the Gatsby Charitable Trust, the learned societies and by stakeholders throughout the science community.[43]

The ultimate aims of professional registration are to develop transferable skills and to provide clear training and progression pathways, including qualifications for technicians to support recruitment and address the UK-wide shortage of technicians.

There is already a well-established technician registration scheme licensed by the Engineering Council, with registered EngTech technicians benefitting from improved recognition, earnings potential and career prospects, and through opportunities to network and access professional development.

The 2010 National Strategic Skills Audit forecast problems for employers recruiting into technician roles in a number of sectors, including health care, oil, gas, electricity, chemicals, pharmaceuticals, transport equipment and broadcasting.[44] In response to the future gap in supply, work is taking place to expand the range of routes into technician roles. The apprenticeship route is under expansion by government and industry to improve recruitment and retention in technical roles.

43 Gatsby Charitable Trust Technicians Council, Science Council and Society of Biology websites

44 http://www.ukces.org.uk/ourwork/nssa

The expansion of apprenticeships for both school leavers and graduates is, at least in part, dependent on schools, colleges and universities having a clear understanding of the range of technical careers to best inform students of the options available to them post-16. It is also essential that these teachers have a clear understanding of the skills needs of these students and access to the resources needed to deliver the skills in an appropriate and relevant environment, including suitably equipped workshops and laboratories that reflect the workplace.

Chapter 5:
Exploring the ‘skills gap’

Background

Education in England has typically emphasised the acquisition of academic skills, resulting in 18-year-olds who are under-prepared for the transition to further study or for entry to the world of work. In many cases employers have found it more effective to recruit staff from abroad rather than to recruit from an under-qualified local workforce. It is therefore critical to ensure that young people develop the skills needed for success.

The 'skills gap' at 18 puts significant pressure on young people – requiring the acquisition of the necessary skills in the first year of employment or their first term of higher education. Young people should not themselves be held responsible for their lack of skills; it is a direct consequence of the academic focus of the education system. The lack of these skills is making the transition harder, and may have an impact on retention at university, and, more generally, the success of UK businesses.

The modern workplace needs workers who have broad cognitive skills which include being able to solve complex interdisciplinary problems, thinking critically about work tasks, communicating effectively with people from a range of different cultures, being able to collaborate with others, and also being able to adapt to rapidly changing environments or conditions.[1]

The impact of technology

The increasing use of technology has created access to huge amounts of information and has increased the need for knowledge management. Rather than focusing on the acquisition of a further body of knowledge, students increasingly need to focus on knowledge management, evaluating and selecting appropriate information from the increasing range of sources available to them.

In addition, technology has changed the way workers perform tasks – changing the type of training and skills that workers need. Computers now perform the routine tasks, as well as the communication of both straightforward and complex information. This has led to an environment where workers need to be flexible, resilient and have skills that are transferable to new ways of working, and to new jobs, including those that have not yet been invented.

Technology brings both benefits and drawbacks. It can, for example, reduce students' attention spans by facilitating shallower levels of analysis, create over-reliance on software packages for statistical analysis without the need to understand the underlying mathematical techniques, and facilitate plagiarism.[2]

1 Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st century (2012).

2 Skills Gap Project: Higher Education Focus Group (July 2013).

What are the 21st century skills?

OECD defines skills (or competences) as 'the bundle of knowledge, attributes and capacities that can be learned and that enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning.' The sum of all skills available to the economy at a given point in time forms the human capital of a country.[3]

The need for transferable, high-level skills is well documented. The OECD Skills Strategy provides an integrated, cross-government strategic framework to help countries understand more about how to invest in skills in a way that will transform lives and drive economies. It shifts the focus from traditional proxies of skills, such as years of formal education and training or qualifications/diplomas attained, to a much broader perspective that includes the skills people acquire, use and maintain – and also lose – over a whole lifetime. People need a range of transferable skills that help them to succeed in the labour market, and a range of skills that help them to contribute to better social outcomes and build more cohesive and tolerant societies.

References to 21st century skills permeate this report. This is deliberate – skills needs have changed significantly over the past decades. For example, the table below[4] summarises the changes from 'old-world' skills to 'new-world' 21st century skills.

There are many definitions of 21st century skills, and consequently many skills frameworks. The table below summarises the key frameworks to emerge over the past decade or so, and is put forward as a description of current thinking and classifications. See table on pages 48 and 49.

'Old-world' skills	'New-world' skills
Learning one or two specific technical roles	Mechanical reasoning, logic trouble-shooting, and spatial visualisation
Physical strength and flexibility	Personal flexibility, communication, and cooperation
Ability to follow fixed, unchanging procedures	Initiative, persistence, and independence
General attention to production and safety procedures	Attention to detail, self-control, and dependability
Following orders	Making independent decisions
Operating, maintaining, designing machinery	Operating computers or computerised machinery and using computers for a wide range of critical functions

3 OECD (2012], *Better Skills, Better Jobs, Better Lives (2012): http://skills.oecd.org/documents/OECDSkillsStrategyFINALENG.pdf.*

4 Pearson TalentLens. http://www.talentlens.co.uk/

The frameworks have much in common – but there are differences in skills definitions and interpretations. The European Framework of Key Competences (discussed in more detail in Chapter 3) provided us with a strong starting point in defining 21st-century skills, as it was designed to support the labour market across Europe, while also supporting lifelong learning, active citizenship and social cohesion.

In earlier chapters we talked about the importance of mathematical and literacy skills, including those around communication. These skills are fundamental, as they underpin the other competences, and are therefore essential for success.

We need to be very clear about our expectations for young people, and these expectations need to permeate the education system and the world of work.

Skills delivery

It is important that the development of the skills starts as early as possible in the education system. Primary schools as well as secondary schools should build relationships with employers to provide early opportunities for students to engage with employability skills in a work-related context.

Teachers frequently lack experience of the world of work outside the classroom and even those who have a broader vocational experience need to have their skills refreshed regularly. All teachers should be provided with opportunities to work in industry, perhaps through enhanced opportunities for secondments to support them in delivering a relevant learning experience.

Embedding skills will require a different curriculum approach and teachers and students will need help and support in identifying and developing and applying the skills, mirroring the approach adopted in BTECs and other vocational programmes.

Assessing skills and attributes

Some skills can and should be tested within a learner's qualifications. Recent attempts have been made to do this – at least in part – and we welcome, for example, the increased emphasis on the assessment of mathematical skills as part of the 16–19 reform agenda. We would like to see a similar emphasis on literacy skills – beyond the purely written element of literacy. We also believe that there should be greater emphasis on problem-solving and project work. Students should be encouraged, from an early age, to engage with open-ended questions and to learn from both success and failure.

While embedding the skills in the curriculum is important, assessing some skills may distort the learning by focusing on delivering the part of the skill that can be assessed. Further thought is needed on what to assess and how, and what not to assess.

We believe that assessment could in part be based on delivery rather than on outcomes, focusing on the school, rather than on individual student attainment. Evaluation of the school curriculum by external inspectors for teaching in these areas, and concomitant assessment of the importance a school places on their acquisition, we agree is a route to explore.

Preparing students for life in the 21st century is complicated, as there is a rapidly changing context: globalisation, technology change and evolution, migration, international competition, changing markets as well as environmental and political challenges across the world.[5] There is wide agreement that new skills and competences are needed to succeed in education and the workplace, and the skills that are needed in today's world are different from the skills that have underpinned the education systems of the previous two centuries.[6]

5 'Teaching and learning 21st-Century Skills: Lessons from the Learning Sciences' (Asia Society: Partnership for Global Learning – April 2012) – page 1. http://asiasociety.org/files/rand-1012report.pdf

6 Cambridge Assessment '21st-Century Skills: Ancient, ubiquitous, enigmatic?' (Dr Irenka Suto, Principal Research Officer, – January 2013) – page 3. http://www.cambridgeassessment.org.uk/Images/130437-21st-century-skills-ancient-ubiquitous-enigmatic-.pdf

Taxonomy of Skills Framework

	European Framework (2006)	Confederation of British Industry (CBI) (2007) Updated 2013	Pearson Analysis of evidence of students' skills gap at age 18 (November 2012)
Problem-solving and critical thinking		Problem-solving	Problem-solving, critical thinking skills and making decisions and connections Application of numeracy, including mathematical modelling and statistical analysis
Understanding, using and applying numerical (incl. quantitative) methods	Mathematical competences and basis competences in science and technology	Application of numeracy	
Communication: oral and written	Communication in the mother tongue. Communication in foreign languages	Communication	Literacy: oral and written communication; including writing for a purpose
ICT skills	Digital competence	ICT operations and concepts	ICT skills
Research / Information Literacy skills			Research skills (including extended writing)
Collaboration and Teamworking		Collaboration	Teamworking
Initiative and self-direction		Initiative and self-direction	Self-management skills (readiness to accept responsibility, flexibility, time-management, self-improvement)
Leadership and influence			
Creativity and innovation	Sense of initiative and entrepreneurship		
Intellectual curiosity	Learning to learn		Independent learning and intellectual curiosity
Ethics / Personal and Social Responsibility	Social and civic competences Cultural awareness and expression		
Business and customer awareness		Business awareness and Customer care	Business and customer awareness
Practical and laboratory skills		STEM technician skills	Practical and laboratory skills

National Academy of Sciences (2013)	Partnership for 21st Century Skills (2013)	International Society for Technology in Education (STE) NETS (2013)	ETS iSkills (2013)	ATC21S 21st Century Skills
Critical thinking, problem-solving, analysis, reasoning/ argumentation, interpretation, decision making, adaptive learning, executive function	Critical thinking, problem-solving, decision-making	Critical thinking, problem-solving, decision-making	Critical thinking and problem-solving	Critical thinking, problem-solving and decision-making
Oral and written communications, active listening	Communication	Communication	Communication	Communication
Information and communications technology literacy	ICT operations and concepts	ICT operations and concepts	ICT operations and concepts	ICT operations and concepts
Information literacy (research using evidence and recognising bias in sources)	Information literacy, media literacy	Information literacy	Information literacy	Information literacy (includes research on sources, evidence, biases etc)
Collaboration, teamwork, cooperation, coordination, empathy, perspective, trust, conflict resolution, negotiation	Collaboration	Collaboration		Collaboration / teamwork
Initiative, self-monitoring, self-evaluation, self-reflection, physical and psychological health	Initiative and self-direction, flexibility and adaptability, productivity, leadership and responsibility			Life and career
Leadership, responsibility, assertive communication, self-presentation, social influence on others				
	Creativity, innovation, complex problem-solving (idea generation)	Creativity and innovation	Creativity and innovation	Creativity and innovation
Adaptability, continuous learning, intellectual interest and curiosity				Learning to learn, metacognition
Personal and social responsibilities, ethics, integrity, citizenship, career orientations		Digital citizenship (or digital ethics)		Personal and social responsibility – including cultural awareness and competence

Chapter 6:
Conclusions and recommendations

The Advisory Group, following a series of discussions and review of research evidence, reached a number of conclusions. Our discussions were augmented by the views of focus groups of employers and higher-education representatives. These conclusions are presented below as eight **recommendations for change** and a further five **recommendations for enhanced action**.

The **first conclusion** focuses on the effects of the many policy changes in education that have taken place over the past three decades as a consequence of changes of government and or changes of Secretary of State for Education. The period since the introduction of the 1988 Education Reform Act, vesting control of the curriculum in the Secretary of State, has seen twelve individuals hold the post; excluding the current Secretary of State, Michael Gove. Their average time in office is just over two years. Each Secretary of State for Education has sought to implement his/her own policies, but the timing of changes has resulted in many implementing the policies of their predecessor.

The impact on the education system has been one of continuous – and occasionally disjointed – change. The teaching profession has had to adapt many times over the past three decades to new directives on what is taught, to changes in the precise structure of the curriculum and to changes in the methods of assessment, including changes to qualifications. Since the first examinations in 1988, for example, GCSE qualifications have been reviewed on average every five years.

What can be done to plan educational policy and curriculum development in a more ordered and transparent way? The Secretary of State's control of the National Curriculum, as defined in legislation, encourages and facilitates frequent change. In an international context this is unusual, given that Government as a whole has major interests in the quality of our educational system and its influence on both the nation's future economic performance and the quality of life.

Employers are important stakeholders in the education system, as the ultimate destination for all learners is employment. We believe that the education system should be linked to the country's long-term economic strategy so that the needs of one can be met successfully by learners leaving the education system and moving into employment. School leavers need to have a skill set that enables them to compete successfully in increasingly competitive global employment and higher-education markets.

In the area of large infrastructure planning for the UK, a recent report by Sir John Armitt argues for an independent commission to identify the nation's long-term infrastructure needs and monitor the plans developed by governments to meet them. He argues that the National Infrastructure Commission should consider how future needs could be met in a targeted and efficient manner. This report was published during the deliberation of this Advisory Group, but its conclusions are broadly similar to those arrived at in the discussions leading to this report.

Government must, of course, remain responsible for allocating taxpayers' money to education, taking account of other departmental needs and national priorities. Long-term curriculum

and assessment for education should be arrived at by consensus across all key stakeholders: government; employer representative groups; higher education, awarding bodies, teachers' representative groups and those responsible for teacher training, such that a new Secretary of State for Education would not automatically result in a new education policy. Agreed aims should be defined for the longer term, a model not unlike that used successfully in Singapore.

In setting up such an independent body[1] a range of models should be examined, including the National Institute for Health and Care Excellence (NICE) which acts to develop a series of national clinical guidelines to secure consistent, high quality, evidence-based care for patients using the National Health Service.

Recommendation 1
The secondary curriculum must support the economic strategy of the country. To ensure long term planning for the secondary curriculum linked to this strategy, the creation of an independent body is recommended representing all key stakeholders (the teaching profession, the employers, higher education and political parties). Responsibility for the secondary curriculum, its delivery, and assessment should remain vested in Government. The role of the independent body would be to provide wide representation and consistency, and mitigate disruption associated with the frequency of change in the role of the Secretary of State for Education, an appointment that has changed regularly over the past 25 years with an average time in post of just over two years. Advice from the independent body should be strategic, for the long term, and must reflect the social and economic ambitions of the country.

The **second conclusion** relates to the case for broadening the range of subjects taught to 16- to 18-year-olds to include, as a minimum, continued study of English and mathematics. This has implications for the current A level structure (with its focus on three to four subjects). A baccalaureate structure is one option, and within the UK there are currently about 30 different baccalaureate approaches. Each typically involves the study of about six subjects, allowing some element of student choice and drawn from a number of categories. The International Baccalaureate (IB), for example, requires students to choose subjects from a number of categories: language and literature, language acquisition, individuals and society, experimental sciences, mathematics and the arts.

Take-up of baccalaureate programmes in England has been modest. This is in part due to the need (and associated cost) for expert teachers across a broad range of subjects and in part due to the increased challenge of a programme providing both breadth and depth allied to the perception (rightly or wrongly) that higher individual subject grades are required for university entrance by comparison with those required for A level.

Despite the desire by the Advisory Group to extend the number of subjects taken by 16- to 18-year-olds, we recognise that the significant changes required to replace A level with a broader curriculum offer are likely to pose additional issues and may not, of themselves,

1 *Leading on Standards*, Pearson. http://www.leadingonstandards.com/wp-content/themes/pearson-theme/Pearson_LeadingOnStandards_OurNextSteps.pdf

prove to be an ideal solution for all learners. In some STEM subjects, for example, the requirement for university entrance is an in-depth study of a limited number of science-orientated subjects. Retention of this depth of study in the sciences and mathematics within a baccalaureate qualification might, for example, require additional teaching at university with the associated costs for students and increased demands on HE staff time.

A new curriculum model must provide opportunities for depth of study as well as breadth. Changes to 'school-leaving' qualifications at 18 should be implemented in association with corresponding curriculum changes at university. Broadly speaking, universities are less keen to see a move away from A level because of these factors, especially within research-intensive universities, but most feel they are able to adapt to change in the direction of a broader school curriculum. It is important to note that among the business representatives on the advisory group, more enthusiasm was shown for a broadening of the curriculum.

What is apparent from trends in educational policy and curriculum design among top-performing countries (with high economic performance), as judged by the PISA surveys, is a shift to broaden the curriculum to include teaching of the 'softer' skills (see Chapter 3). The examples of Finland, Hong Kong, Canada and Singapore are informative. To a lesser or greater degree, all have begun a move to a broader curriculum for 16- to 18-year-olds.

Within any broader curriculum in schools, we strongly support the inclusion of mathematics and English and skills development in line with the requirements set out in the European Framework of key competences and other frameworks. Recognising that mathematics and English, in particular, provide an underpinning framework to facilitate understanding, we believe that, as a nation, we need to increase our expectations of learners in these subjects, raising standards to match the best in the world.

The introduction of a broader curriculum at 16 needs strategic planning and a long implementation timeline. We believe a horizon of six to eight years would allow time for development, trialling and implementation, enabling teachers to fully understand the requirements and building consensus from all stakeholders involved in policy, curriculum development and delivery and in qualifications development and assessment.

Curriculum change needs to be planned and introduced with sufficient time for teachers and other stakeholders to develop, trial and reflect on new approaches to delivery. To be successful, the curriculum should be designed for the long term, it should be stable over time and it should be designed via a consensus of all stakeholders, including all political parties. A good example of introducing changes over time is that of the Ontario curriculum in Canada[2] and, closer to home, the changes to the mathematics curriculum in the Republic of Ireland.[3]

2 http://www.edu.gov.on.ca/eng/teachers/curriculum.html

3 http://www.ncca.ie/en/Curriculum_and_Assessment/Post-Primary_Education/Review_of_Mathematics/Review_of_Mathematics.html

Recommendation 2
The A-level system should be slowly changed to a baccalaureate-type system in which a broader curriculum (including core English, mathematics and the Extended Project qualification) which meets the requirements of a designed framework for key competences as outlined in recommendation 3, is provided for all post-16 learners.

The **third conclusion** concerns the teaching of the so called 'softer' or non-cognitive skills for all 16- to 18-year-old students, but with the process of learning these starting much earlier in school life. There are many definitions of what these skills are, and we have provided a taxonomy linked to the European Framework of key competences and other frameworks (see Chapter 3).

In broad terms, they are the skills that enable young people to face the demands of higher education and career challenges in a global and very competitive environment. Multinational companies, for example, recruit staff from all over the world on the basis of ability. They are not tied to recruiting locally, even if their headquarters are in the UK. Increasingly phrases such as '21st century knowledge and skills' are used with reference to adding to the traditional skills defined by the 3Rs (reading, writing and arithmetic), the 4Cs (defined in many US states as critical thinking and problem-solving, communication, collaboration, and creativity and innovation). There are many possible additions to the defined 4Cs, such as teamwork (within collaboration), social responsibility, behaviour in groups, ethics, how to use the internet as a knowledge acquisition tool, and how to manage and distil information from the growing volume of data being generated by all aspects of the modern digital world.

Defining the non-cognitive skills is an issue; with a range of (mainly) closely related models available. While all have value and demonstrate considerable overlap, we believe it is critical to adopt a single model in England; one that supports globalisation and is clearly understood and used consistently by all stakeholders.

There is a need to generate a better understanding of the European Framework for key competences within the English educational system. We also recognise that the EU is but one employment market in the global economy and therefore it would be wise to explore creating a global standard on the acquisition of a wider skill set for school leavers to best fit them for a changing world.

Recommendation 3
England must, as soon as possible, formally adopt a framework for key competences guided by recent international developments (such as the European Framework), which includes: communication in English and in foreign languages, competence in mathematics, science and technology and digital competence, learning to learn individually and as part of a team, personal, interpersonal and intercultural competence, including an understanding of codes of conduct and the importance of business ethics, a sense of initiative and entrepreneurship, creativity and cultural awareness. These competences must fall under the inspection framework and should be embedded throughout the curriculum and associated qualifications.

The **fourth conclusion** concerns delivery and assessment of the non-cognitive skills. We believe this is central in the evolution of England's education policy over the coming decade. The strongest support for their inclusion in the curriculum comes from representatives of the business sector on the Advisory Group, and supported by evidence drawn from successive CBI reports, but they are just as relevant to the needs of higher education.

How to embed skills in the post-16 curriculum is a matter of some debate, as is the important issue of how to assess a student's ability in these fields once they are taught. We recognise that some schools and colleges provide a good environment for the acquisition of these skills, but these examples need to be replicated across the whole education system. In overcoming the problem of diversity in backgrounds, schools need to try to create for all students, irrespective of their home environment, the opportunity to learn these softer skills and understand their importance in the work and social environments.

Given the difficulties surrounding the definition of good metrics to record ability in some of the non-cognitive skills – which are essentially behaviours and attributes – and the difficulty in defining an objective measure of competence, we believe that assessment could, in the short term, operate at the point of delivery. As assessment drives learning, it must focus on what is important for the learner, not on what can be easily assessed. We propose that evaluation of the delivery of the school curriculum by external inspectors in these areas, with concomitant assessment of the importance a school places on skills acquisition, coupled with teachers' judgement of students' performance, is the best route to explore in the short term. In addition, investment is needed to identify ways of evidencing these skills.

We recognise that integrating skills-delivery programmes in the school curriculum will require changes to teacher training, and teacher-training providers should be consulted on the most effective means of delivery.

In making both these recommendations, we have considered the guidelines set by the European Parliament and Council in 2006 on key competences for lifelong learning. The EU defined eight key competences, one of which is communication in a foreign language.

The British Academy, in its recent report Languages: the State of the Nation indicates a growing deficit in language skills, in a time when the global demand for language skills is increasing.[4] Given the relatively low starting point, we recognise that this particular requirement may need a slightly longer timeline for development.

One aspect of the European Framework key competences was regarded as of such high importance by the Advisory Group members that it is singled out for specific mention is the need to make students aware – from an early age – of the importance of business ethics in the modern world. Recent events in the banking sector (the mis-selling of financial products) for example, and other areas of business, such as the media (the 'phone-hacking scandal'), have raised concerns about how incentives for success in business can inadvertently drive

4 http://www.britac.ac.uk/policy/State of the Nation 2013.cfm

behaviours that benefit neither customers nor the general public. Unfortunately, there have been too many examples in recent years that could form the basis for taught work and discussion in schools.

Recommendation 4
Project work, evidenced by the Extended Project and other qualifications, should become a key requirement for university entrance.

Recommendation 5
Non-cognitive skills such as team working, emotional maturity, empathy, and other interpersonal skills are as important as proficiency in English and mathematics in ensuring young people's employment prospects. Assessment should reflect this reality and so investment is needed to support assessment experts in finding ways of reliably evidencing these skills.

The **fifth conclusion** relates to the great increase in the numbers of students going to university that has taken place over the past three decades. While we strongly support lifelong education, we believe that many students entering university may not be following the most appropriate pathway to support their future aspirations, and that the benefits of apprenticeships and on-the-job training lack a sufficiently high profile in schools at present.

The main issue is the task of elevating the status of this route of education and of providing pathways to switch between technical training and university if desired, as exemplified by the German system. Encouraging a higher proportion of students to go down the vocational/technical training route may take some students away from the universities, but could provide alternative and more relevant pathways. Examples include the 'University of John Lewis', which aims to professionalise the retail sector and provide its workforce with the skills they need to progress and stay competitive in the ever-changing retail environment, while supporting them with externally recognised qualifications.

There have been many attempts in the past to raise the status of vocational learning; that these have not been successful is we believe, in part because of a lack of appropriate careers advice aimed at students and their guardians.

Recommendation 6
A national careers service should be created and its advice aligned with the areas of the government's growth strategy, to gear the education system more clearly towards the areas that support the country's economic strategy and ambitions.

The **sixth conclusion** concerns the question of whether employers and businesses, and universities, could become more involved in helping schools prepare students for progression into employment, apprenticeships, and/or further and higher education. We believe that much more could be done by enhanced two-way interactions. Teachers could spend some time in businesses (small, medium and large) during the long vacation, and staff from businesses (especially local ones) could spend some time in schools, explaining to students what employment involves and which skills are appropriate to particular jobs. Much is already

being done is this area, for example, through Teach First (see recommendation 13). The National Grid has a schools-liaison policy that links the development of its future needs to the work it carries out with schools – advising students and developing transferable skills while building the workforce of the future. We recognise that large companies have the ability to allocate staff and resources to such activities more easily than smaller businesses. What is required, however, is a more coordinated approach, perhaps run centrally by collaboration between the CBI, other interested employer groups and school-leadership representative groups. The employer representatives on our Advisory Group were enthusiastic about expanding such schemes.

Recommendation 7
An exchange of staff between schools and employers is essential to enhance teachers' engagement with the worlds of business and industry. Employers and employer representative groups must collaborate with school and college leadership groups to design and implement a national scheme to promote this exchange.

Recommendation 8
Access to high quality teaching and learning is currently unequal – technology offers a way to resolve this – at least in part. Government should invest in virtual learning as a way to improve the quality of provision and make it more consistent for all students in public and private sectors.

In addition to the recommendations for change above, we believe that, while progress – and in some instances considerable progress – has been made in a number of areas, further investment is needed to ensure continuing effectiveness. Consequently, we have also included a number of **recommendations for enhanced action**.

The **eighth conclusion** concerns the organisation and responsibility within government for the long-term planning of education. At present, primary and secondary education are the responsibility of the Department of Education (DfE). Undergraduate and graduate training in universities and apprenticeship schemes are managed by the Department of Business, Innovation and Skills (BIS).

We view all aspects of education: general academic education, vocational learning, apprenticeships, and technical training in further education as a coherent whole. It is critical that these pathways are designed to support appropriate progression for learners that link to the country's long-term economic strategy. We propose that strong links are established between BIS and DfE to ensure that the education system supports the national economic needs.

Recommendation 9
The roles of BIS and DfE should be reviewed by government to ensure closer working relationships and a shared set of objectives for the education system as a whole. The case for placing all education responsibilities, including apprenticeships, within one department should be examined.

The **ninth conclusion** focuses on apparent changes in the quality of the education available to 16- to 18-year-olds in England and the associated skill set acquired as evidenced by international comparisons. Our ranking in the educational attainment of 15-year-olds, as evidenced by PISA 2012, for example, suggests that we are around average in reading and mathematics and above average in science among the participating 65 countries and economies including all 34 OECD member countries. While the average reading score of students in the UK is not statistically much different from the OECD average and is comparable with France, Germany, Sweden and the United States, it is well below the highest-performing countries examined. As the countries that belong to the PISA scheme produce a significant proportion of the world's goods and services, we can conclude that we are failing to match up to the needs of England's students and employers in the 21st century.

There have been five PISA surveys since 2000. They test literacy in reading, science and mathematics in 15-year-old students, and are carried out every three years. The 2012 results were published in December 2013, and the outcomes of these tests and the previous four surveys (2000, 2003, 2006 and 2009) enable us to determine trends over the past decade. From 2000 to 2012 the UK has fallen from 4th in science to 20th, (16th in 2009) from 8th in mathematics to 26th (28th in 2009), and from 7th in reading to 23rd (26th in 2009). Care must be taken in assessing trends due to changes in methodology over time, however, the key issue is to improve our current ranking. We appear to be standing still while other countries up their game. This issue needs to be addressed urgently, as levels of educational attainment will undoubtedly influence the competitiveness of our economy over the coming decades.

There was a diversity of views about the causes for the heterogeneity in the rankings, including the quality of teaching, the impact of frequent changes in educational policy, other countries having greatly improved their educational provision, and the lack of long-term strategic planning to meet educational and economic needs in the modern world. Whatever the cause of our current position in international rankings, we believe that England needs to enhance its performance in order for school leavers to be employable in a competitive international labour market.

Recommendation 10

We should learn from curriculum design and content initiatives in high performing countries as judged by international rankings (e.g. PISA), commission further research to investigate why England's performance has stagnated and other countries have improved, and implement policies to increase our performance relative to other countries.

We note that in other surveys, such as TIMSS (Trends in International Mathematics and Science Study) and PIRLS (Progress in International Reading Literacy Study) 2011 surveys, England does well in curriculum-based assessments of reading, mathematics and science for 10-year-olds and 14-year-olds (TIMSS only).[5] The Advisory Group will continue to

5 http://timss.bc.edu

investigate the factors governing high performance in reading and numeracy in international rankings. While we believe that England must aim to catch up with high performers and aspire to take the lead in thinking and delivery, we recognise that there is no 'quick fix': high-performing countries themselves are continuing to examine the fitness for purpose of their own educational systems, currently focusing, for example, on the problem of over-testing and the issue of creativity.

Recommendation 11
Greater focus on the quality and recognition of vocational learning for all students is necessary to increase understanding and acceptance of the diversity of routes available to learners to enable them to acquire the skills necessary to support progression to further or higher education and employment.

The **seventh conclusion** relates to the important and far-reaching question of how advances in technology will impact on the provision of education in the coming decade. Technology, especially computers and tablets, and access to web-based resources have already had a major impact on teaching practices and access to information. We believe this revolution is only just beginning, and the coming decades will see dramatic changes in how teachers and students access information and use web-based learning resources. Web-based learning and educational services will have a huge impact on at all levels of education (primary, secondary and tertiary). To take one example, pioneered by the Open University in 1969, web-based degree courses, where students participate in learning and assessment remotely, are expanding very rapidly worldwide. At the same time, many universities, including some of the world's leading institutions, are providing open access to some of their courses and lectures via the web.

The opportunities to provide nationally approved material to support teachers in specific taught courses, including live classes via the web by the best teachers in the nation (and internationally) are considerable. Great value for money can be obtained from web-based services, but the need to personalise the services to individual students and centres must be kept in mind.

Recommendation 12
In association with our second recommendation for a broader curriculum, the cognitive skills of application, analysis, synthesis and evaluation should be delivered and assessed in all qualifications, in line with the methodology adopted for mathematics in the current A-level reform programme.

The **tenth and final conclusion** relates to the status of teachers in society and the goal of improving the attractiveness of teaching as a career for some of the most able graduates across all disciplines, but especially in the STEM-related subjects. The Advisory Group is encouraged by recent progress in this area in England, and its recommendation is for government and the Department for Education to continue to press for further progress and to encourage high-performing graduates to enter teaching, for example, through the excellent work of the charity Teach First.

Recommendation 13

Government should continue the development and promotion of programmes to encourage the most highly qualified graduates to enter the teaching profession.

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