SKILLS VISION

Advice for government to help meet the skills needs of advanced manufacturing and engineering, and the wider STEM sector.

SEMTA ENGINEERING SKILLS FOR THE FUTURE

We are witnessing an '**industrial revolution**' producing kaleidoscopic change across countries and continents – with emerging nations skilling their young people to fuel **growth** and **prosperity**.

Semta is a **not for profit** entity at the **epicentre of skills** – helping to ensure that Britain still continues to play a **leading role** utilising and enhancing its **unrivalled reputation** for **technological excellence**.

We are the voice of no less than **138,000 companies** large and small in the engineering and advanced manufacturing sectors.

We possess the **knowledge** and **experience** gathered over decades giving us a unique insight and understanding of engineering and advanced manufacturing.

We are **passionate** about the people and the practices that make engineering and advanced manufacturing such a **vital driver** of our economy.

Apprenticeships and vocational training are at the very heart of everything we do. It is our **Standards and Frameworks** from which apprenticeships are built.

Semta's roots are deep in our industrial heritage – with its focus firmly fixed on **the future**.

The Vision:

When industry thrives so does our nation.

We consulted the sector and asked what it needs to get the job done at this crucial moment in our history.

Skills Vision is a blueprint for change - to galvanise the government – to do the right thing.

The outcome of the most recent general election was one of the most uncertain in recent times, but the votes are in and we now have a stable government.

It is vital that the new government supports the advanced manufacturing and engineering sector. The sector is worth 20% of the United Kingdom's Gross Value Added (GVA) and has been identified, through the Industrial Strategy, as a strategic priority sector for future economic success.

All parties say that they want parity of esteem between academic and vocational routes, and all parties had policies before the election which they would have introduced in government to make it a reality. Innovations like University Technical Colleges, studio schools, Tech Levels and degree apprenticeships all provide a foundation upon which the new government can build, bringing about even greater collaboration between employers and educators and ensuring that those leaving education are ready for work.

Key to ensuring the success of advanced manufacturing and engineering is ensuring that the sector's employers have the supply of skilled workers they need.

We have made great strides in recent years – all parties are now fully signed up to the apprenticeship agenda, while employers are now taking ownership of apprenticeship standards and being given control of funding for training.

The Royal Academy of Engineering estimates that by 2020, we will need 800,000 new engineers to be trained if we are to replace retiring workers and meet employer demand as they look to expand. At current rates, we will not meet that target. It's clear that we need to do more – employers, government and other bodies within the sector – to ensure that we do hit this target and that the sector continues to thrive.

At Semta, we stand ready to work in partnership with the new government to ensure that advanced manufacturing and engineering continues to play its key role in the UK's economic resurgence.

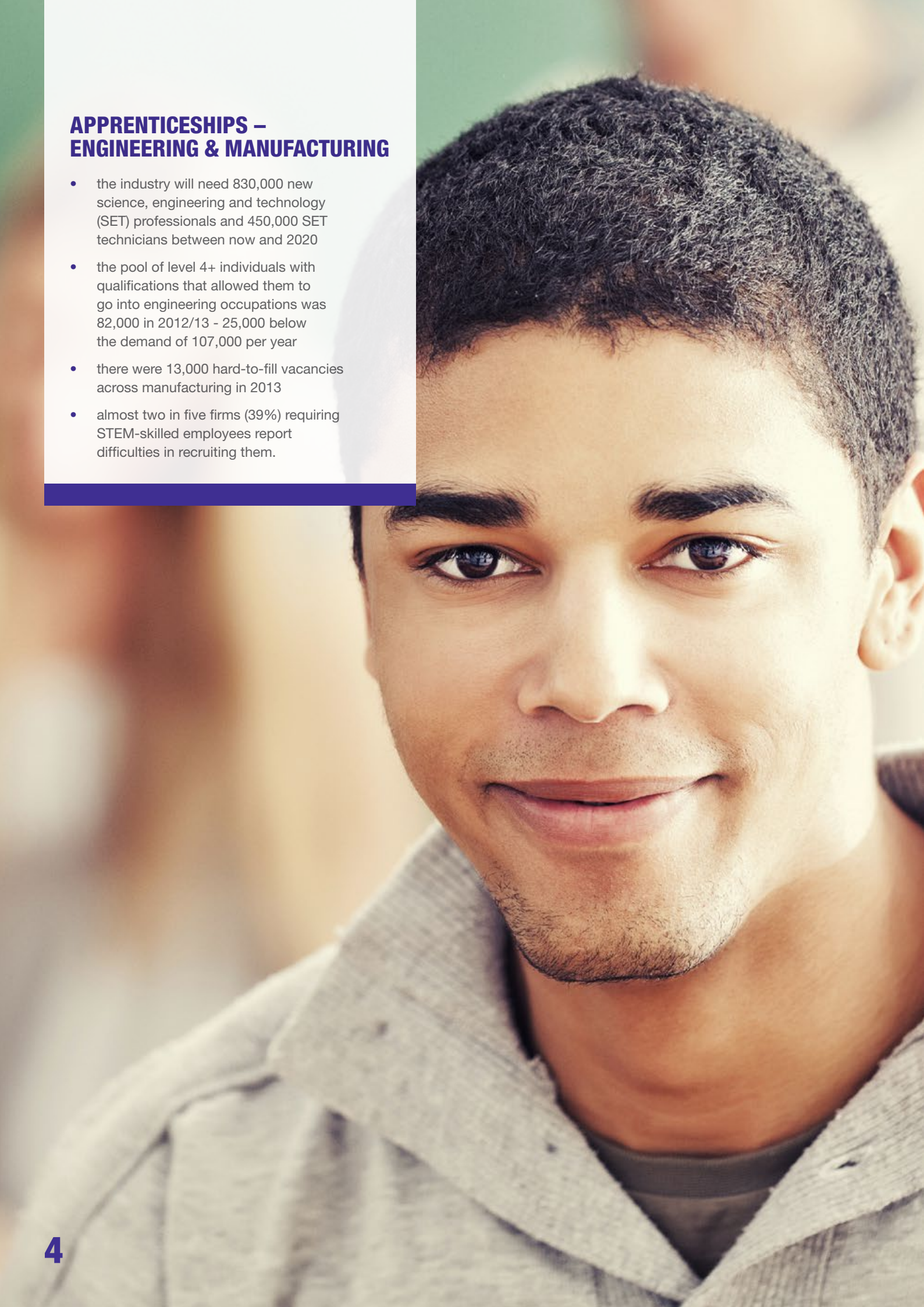
As a starting point, we have compiled our 'Skills Vision'. When it comes to skills, our overriding message to the new government is this: **employers need stability and certainty, and they need to know that in government they have a partner which understands their skills needs**.

Employers in our sector don't need the new government to reinvent the wheel, but they do need its support and they need a policy agenda which complements their own skills agendas. Implement the policies we suggest here, and that is what they will have.

Ann Watson
Chief Executive

APPRENTICESHIPS – ENGINEERING & MANUFACTURING

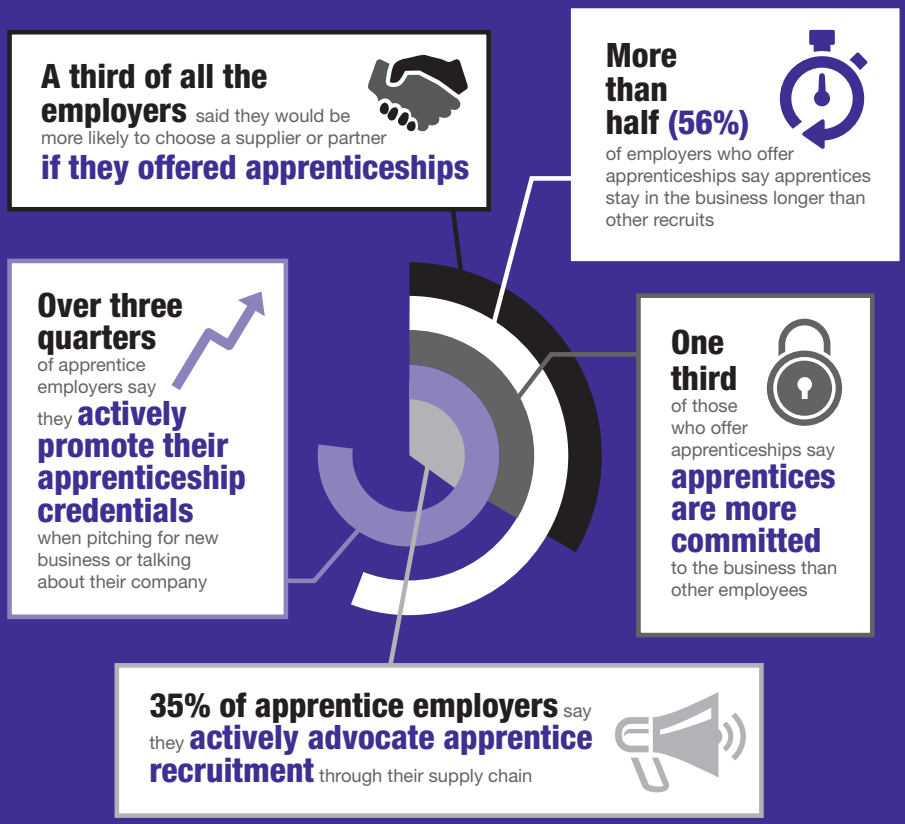
- the industry will need 830,000 new science, engineering and technology (SET) professionals and 450,000 SET technicians between now and 2020
- the pool of level 4+ individuals with qualifications that allowed them to go into engineering occupations was 82,000 in 2012/13 - 25,000 below the demand of 107,000 per year
- there were 13,000 hard-to-fill vacancies across manufacturing in 2013
- almost two in five firms (39%) requiring STEM-skilled employees report difficulties in recruiting them.



APPRENTICESHIPS

Employers in our sector really value their apprentices; they are an investment in the future and one which they expect to pay off handsomely. Last year, UKCES and Institute of the Motor Industry research showed that by the end of their third year, an apprentice can net a business between a 150% and 300% return on its investment.

With so few MPs having started out as apprentices, we all need to do more to ensure that politicians understand what apprentices mean to the advanced manufacturing and engineering sector and the UK economy as a whole.



An apprenticeship in our sector is a demanding and rigorous pathway to a career. It's about demonstrating to employers that you have achieved excellence in your chosen job role. It's about having that standard of excellence recognised by industry. It's about showing, through learning in the workplace, that you are ready for a career in your chosen industry.

Before the election, all of the main parties included apprenticeships as a key component within their skills policy agendas, a welcome development. At Semta we look forward to working with the new government to ensure that we reach new standards of quality and prestige in advanced manufacturing and engineering apprenticeships.

We need to be careful to ensure that 'apprenticeship' doesn't just become a political buzzword. We need to ensure that in advanced manufacturing and engineering; 'apprenticeship' continues to be a byword for quality. Most importantly, we need to ensure that young people recognise that, and that they see apprenticeships as an equal, viable and worthwhile alternative to academic routes.

To ensure that apprenticeships in advanced manufacturing and engineering become even more attractive to young people and valued by employers, at Semta we would like to see the new government:

PROVIDE A STABLE POLICY ENVIRONMENT FOR ENGINEERING EMPLOYERS.

At Semta, employers within our sectors consistently tell us that when it comes to taking on apprentices, the number one requirement from government is policy and funding stability. There should be an early commitment from the new government to guarantee the level apprenticeship funding over the lifetime of the Parliament, thus giving employers the stability they need to be able to take on new apprentices. There needs to be consistency across the four nations, as workers are mobile and employers' sites are spread across the United Kingdom. There needs to be stability in occupational standards, with government letting industry get on with the job of setting them. And we need government to recognise that it's not about setting numerical targets; if you provide the right environment, employers will create the apprenticeships.

RECOGNISE THE IMPORTANCE OF LEVEL 2 APPRENTICESHIPS.

For people who lack qualifications, and for whom Level 3 would be too demanding, Level 2 apprenticeships offer a suitable route into engineering. Where there is a clear earnings uplift and enhancement of skills, as is the case in engineering, the new government should follow the advice of the Education Select Committee and retain Level 2 apprenticeships. As an example, Rail Transport Engineering had 1,260 apprenticeship starts at Level 2 in 2013/14, but no starts at all at Level 3; the National Careers Service website states that the starting salary for such jobs is £18,000+, and experienced staff can earn up to £30,000 a year.

MAINTAIN EMPLOYER CONTROL OVER FUNDING OF TRAINING.

It's right that employers should be given purchasing power over training and right that they should not be required to directly handle government funding. To ensure the training needs of the whole of our

sector are being met, SMEs need to be assisted to procure training which meets their needs. We suggest this might take the form of an enhancement to the value of the voucher provided by government, or of 'pooling' of vouchers to negotiate better prices with training providers.

MAINTAIN EMPLOYER OWNERSHIP OF STANDARDS.

The Apprenticeship Trailblazers have demonstrated the enthusiasm amongst employers for development and ownership of standards. At Semta we are proud to play a key role in the development of new Trailblazer standards for the automotive and aerospace industries, and we are keen to facilitate the further development of new standards in other parts of the advanced manufacturing and engineering sector. There is a need to ensure SMEs are able to have a proper input when standards are being developed; one way of doing this could be to allow clusters of SMEs to rotate attendance at meetings amongst themselves, thus reducing the impact of lost staff time and financial cost on individual employers. Companies might also be required, as a condition of their involvement in standards development, to consult with their suppliers beforehand and feed those views into the development process.

ENSURE THAT EMPLOYER OWNERSHIP OF STANDARDS DOESN'T LEAD TO FRAGMENTATION.

As employers take ownership of more standards in more industries, there will be a need to ensure that the standards they create work for their whole sectors. The role Sector Skills Councils like Semta are playing in the Trailblazer process needs to be properly recognised and maintained; the sector-wide reach of SSCs means they have played a key facilitating role, as recognised in a BIS report on Trailblazers' progress; SSCs are described as a 'valued and trusted partner', with one employer saying "[they] listen to what we want; they really are employer-led".

ENSURE SMES HAVE ACCESS TO THE APPRENTICES THEY NEED.

Employers can only thrive if the companies in their supply chains have access to the apprentices they need to maintain their skills base and grow their output as demand for their products increases. Building on the good practice of the Automotive Industrial Partnership, larger employers should be encouraged to offer 'clearing houses' for young people who miss out on their own apprenticeship programmes, giving their suppliers and other companies within their industries the opportunity to take them on instead. Toyota's training centre showcases its collaboration with local employers, some of whom aren't even suppliers; this is an example of collaborative cross-sector working which other large employers should be encouraged to consider adopting.

ENSURE SMES CAN AFFORD TO TAKE ON APPRENTICES.

Taking on apprentices in advanced manufacturing and engineering can be costly at up to £35,000 per apprentice; employers recognise the value apprentices' offer, but for many SMEs it is seen as a cost rather than an investment. The new government must ensure that the National Minimum Wage rate for apprentices is set at a level which is affordable for SMEs – the advice of the Low Pay

Commission should be heeded. We would welcome a 'mutual guarantee' for SMEs, through which apprentices agree to work for an employer for a set period post-apprenticeship as a condition of their training being fully funded by the employer. And the Apprenticeship Grant for Employers (AGE) should be extended beyond 2015; wider promotion, e.g. through Sector Skills Councils and Industrial Partnerships, would give more employers the opportunity to take on apprentices.

ENSURE TRAINEESHIPS HAVE REAL VALUE.

For those lacking work experience and formal qualifications, traineeships offer a valuable first step into the world of work. However, while traineeships can help potential employees to demonstrate the 'soft' skills that employers want, at present the outcome for those who undergo them lacks certainty. A guaranteed exit interview is a good start, but those who undertake traineeships should also leave with a formal qualification, preferably at Level 2. This would ensure that those who do not go into a paid role after their traineeship have a tangible way to demonstrate what they have learned. As an example of good practice, the Ford Aerospace Academy offers a five day a week, six month programme, with employment skills taught through six weeks of real job experience and apprenticeship opportunities clearly promoted.

PROMOTE APPRENTICESHIPS EFFECTIVELY.

Radio, TV, newspapers, social media – these are all ways in which apprenticeships are currently promoted. They are all effective in their own ways, but there are too many people, especially young people, who are not hearing the message. Semta has supported the creation of an 'Apprenticeship App' in partnership with The Telegraph. Since the launch in November the App has been downloaded by over 3,000 users. All apprenticeship vacancies are advertised and can be applied for directly from the App. Vacancies can be searched via a variety of methods including, sector, postcode and discipline. The new government needs to work with employers to determine how best to reach those people for whom apprenticeships would be the right option but who aren't currently hearing about them.

ENSURE APPRENTICESHIPS INCLUDE RECOGNISED QUALIFICATIONS OR CERTIFICATED ASSESSMENT POINTS.

Employers in our sector need to know that those who have undertaken apprenticeships are competent. In our sector, competence is binary – you can either do the job or not. Recognised qualifications or formalised assessment points within the apprenticeship serve as an assurance to employers that former apprentices are competent, and ensure that apprentices have something tangible to show for their efforts. Gaining formal recognition throughout the apprenticeship is a strong motivational tool for the apprentice and if they leave or their apprenticeship becomes redundant they then have qualifications or certificated learning to take with them for the future.

APPRENTICESHIPS – ENGINEERING & MANUFACTURING

- there were nearly 64,000 starts on engineering and manufacturing technologies apprenticeships in 2013/14
- only 63% of employers offering engineering and manufacturing technologies apprenticeships feel that they have sufficient information, support and guidance
- a third of employers offering engineering and manufacturing technologies apprenticeships do not feel they can influence the structure, content, delivery or duration of the apprenticeship training before or during the training
- the average completion rate for apprentices undertaking an engineering and manufacturing technologies apprenticeship is 85% (87% for all frameworks)
- 82% of employers who had an apprentice undertaking an engineering and manufacturing technologies apprenticeship would recommend apprenticeships
- employers say the main staff benefits of apprenticeships are improved morale (82% of employers), improved staff retention (75%) and ability to attract good staff (71%)
- post-training, the retention rate for those completing an apprenticeship in engineering and manufacturing technologies is 74%
- the financial benefits of apprenticeships for employers are seen as improved productivity (82% of employers) and a lower wage bill (71%)
- the lifetime benefits of getting an apprenticeship are between £48,000 and £74,000 for a foundation apprenticeship and between £77,000 and £117,000 for an advanced apprenticeship. The average wage for an engineering apprentice is £6.23 – far higher than the minimum rate of £3.30 per hour.

APPRENTICESHIPS – ENGINEERING & MANUFACTURING

- more than half (56%) of employers who offer apprenticeships say apprentices stay in the business longer than other recruits
- one third of employers who offer apprenticeships say apprentices are more committed to the business than other employees
- over three quarters of employers with apprentices say they actively promote their apprenticeship credentials when pitching for new business or talking about their company
- a third of employers say they would be more likely to choose a supplier or partner if they offered apprenticeships
- 35% of employers with apprentices say they actively advocate apprentice recruitment through their supply chain
- Switzerland has 43 level 3 apprentices per thousand employed people and Germany has 40, compared with six in the UK.

SCHOOLS

There continues to be a deficit in the number of specialist Physics and Maths teachers in our schools, and too many schools lack the capacity to offer students the Physics and Maths courses they need. This has left too many young people without the option of studying these subjects past GCSE level and has denied too many young people the opportunity to progress along STEM career pathways.

Much careers guidance in schools is not up to scratch, with the Education Secretary confirming an 80% figure for schools with a poor offering. Part of the issue is that many teachers have gone through the traditional route of A Levels, university and teacher training, and have no direct experience of what engineering is and what an engineering career entails. As a result, too many young people who would benefit from taking a vocational path are not given the information or encouragement they need to do so.

Ultimately, this is bad for young people, who can end up making the wrong choices for themselves; bad for employers, for whom the pool of available talent is reduced; and bad for the economy, as without enough young people taking vocational paths, our workforce simply won't have the right skills in the future.

There were 121,000 teachers delivering STEM subjects in schools in England in 2014

To fix these problems, at Semta we would like to see the new government:

PROMOTE GREATER LINKS BETWEEN SCHOOLS AND INDUSTRY.

Where they have appropriate links, engineers should be encouraged by their employers and by local schools to put their skills and expertise to use on school governing bodies. Schools should be encouraged to seek out and appoint 'engineering champions' from local engineering businesses, similar to STEMNET's STEM Ambassadors, who could be approached by students with any questions they might have about the profession. And the Teacher Industrial Placement Scheme Semta helped to set up with the IMechE and IET should be adopted by government, with the aim of every school having a teacher who has gone through a similar industrial placement by 2020.

ENSURE THERE ARE SPECIALIST PHYSICS AND MATHS TEACHERS IN EVERY SCHOOL.

The new bursary schemes for trainee Physics and Maths teachers should be reconfirmed by the new government, as should the new Physics teaching degrees. Existing plans to retrain existing teachers to teach Physics and Maths should be committed to. The new government should go further, and mandate all schools which do not currently have specialist Physics or Maths teachers to either upskill an existing member of staff or hire a new member of staff who will do so. This will help to ensure that by 2020, no secondary school should be without specialist Physics and Maths teachers.

MAINTAIN STABILITY.

Chopping and changing the design and content of apprenticeship frameworks and vocational qualifications only sows confusion in employers' minds about the value new entrants to the labour market hold. Government should look to the example of Germany, where a long term view is taken and systematic tinkering does not take place.

OFFER ALL YOUNG PEOPLE THE CHANCE TO STUDY A VOCATIONAL QUALIFICATION.

Academic routes are not suitable for all young people, but too many are not aware of their alternatives. A requirement to offer all 14-16 year olds the chance to study a vocational qualification, as suggested by the Commission on Apprenticeships, would ensure that those young people who do not wish to pursue academic routes are not forced to do so through lack of knowledge. And the requirement for pupils to undergo a work experience placement should be reintroduced, giving them an early flavour of what the workplace looks like, building their employability skills and helping them to decide what their next steps should be.

PROVIDE CAREERS ADVICE WHICH WORKS FOR YOUNG PEOPLE.

All schools are currently required to provide independent and impartial careers advice; this requirement needs to be properly enforced and schools should be required to either hire a specialist careers adviser or commission careers advice from an external source, on pain of a negative impact on their Ofsted inspection grades. Employers and schools should ensure careers advice is engaging by making use of available technology, e.g. by using online quizzes and smartphone apps. And the requirement for pupils to undergo a work experience placement should be reintroduced, giving them an early flavour of what the workplace looks like and helping them to decide what their next steps should be.

PROMOTE SCHOOL MODELS WHICH HAVE EMPLOYERS AT THEIR HEART.

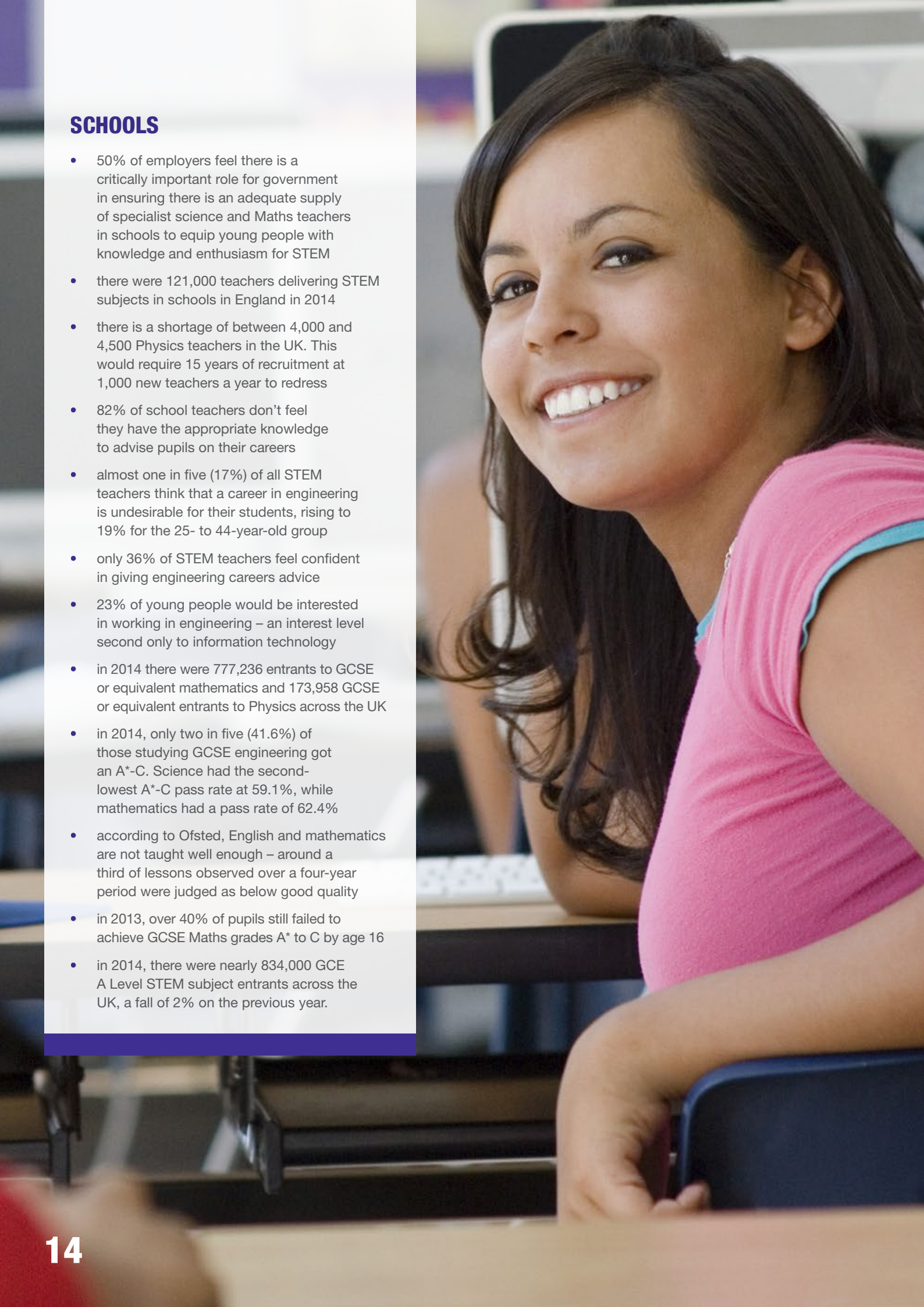
University Technical Colleges and studio schools have advanced the principle of employer involvement in our school system and the new government must not row back, but instead expand on this principle. We would also like to see an outreach programme to encourage more STEM employers to sponsor academies and free schools; using Sector Skills Councils to deliver this would ensure a joined-up approach across each sector. As an example of the role SSCs can play, Semta recently launched the STEM Exchange as part of the STEM Alliance initiative, which is commissioned and funded by the Education and Training Foundation. The STEM Exchange connects forward-thinking employers and FE practitioners to improve the quality of STEM teaching and training by offering professional development opportunities which ensure STEM teaching keeps pace with advances in modern industry. This is a model which could be rolled out to schools.

Employers value key skills like English and Maths proficiency, but some young people are turned off by academic learning and a non-academic alternative should be offered. Both academic and non-academic options must be rigorous and robust enough to ensure that employers have confidence in the skills of those who take them.

See the STEM Exchange in action, visit: **www.semta.org.uk/STEM-exchange** or scan the **QR Code**.

SCHOOLS

- 50% of employers feel there is a critically important role for government in ensuring there is an adequate supply of specialist science and Maths teachers in schools to equip young people with knowledge and enthusiasm for STEM
- there were 121,000 teachers delivering STEM subjects in schools in England in 2014
- there is a shortage of between 4,000 and 4,500 Physics teachers in the UK. This would require 15 years of recruitment at 1,000 new teachers a year to redress
- 82% of school teachers don't feel they have the appropriate knowledge to advise pupils on their careers
- almost one in five (17%) of all STEM teachers think that a career in engineering is undesirable for their students, rising to 19% for the 25- to 44-year-old group
- only 36% of STEM teachers feel confident in giving engineering careers advice
- 23% of young people would be interested in working in engineering – an interest level second only to information technology
- in 2014 there were 777,236 entrants to GCSE or equivalent mathematics and 173,958 GCSE or equivalent entrants to Physics across the UK
- in 2014, only two in five (41.6%) of those studying GCSE engineering got an A*-C. Science had the second-lowest A*-C pass rate at 59.1%, while mathematics had a pass rate of 62.4%
- according to Ofsted, English and mathematics are not taught well enough – around a third of lessons observed over a four-year period were judged as below good quality
- in 2013, over 40% of pupils still failed to achieve GCSE Maths grades A* to C by age 16
- in 2014, there were nearly 834,000 GCE A Level STEM subject entrants across the UK, a fall of 2% on the previous year.



FURTHER EDUCATION AND LIFELONG LEARNING

Further education is a complex and varied sector, encompassing a range of different providers offering courses in everything from aeronautics to zoology.

Often overlooked while attention is focused on schools, apprenticeships and higher education, the further education sector is vital if employers are to have access to workers with the right skills.

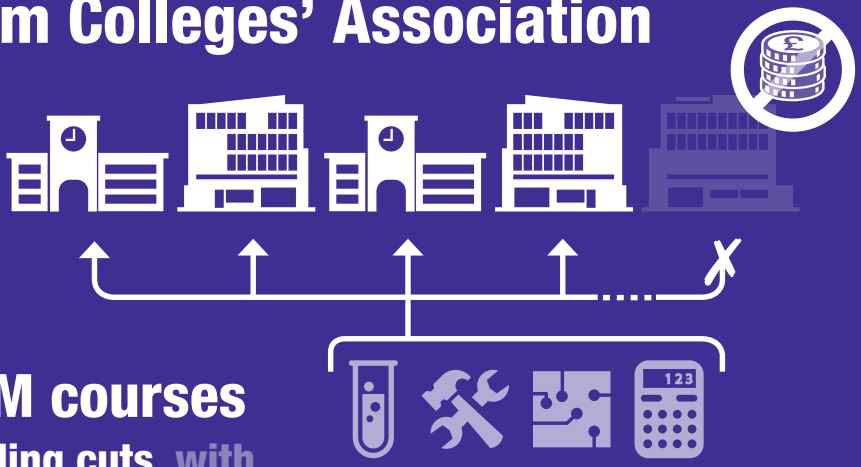
Workers need to be able to update and refresh their skills as economic and business needs dictate.

The jobs of tomorrow have possibly not even been thought up yet so it's vital, if high-value sectors such as advanced manufacturing and engineering are not to fall behind international competition, that workers are able to retrain and acquire new skills. While the focus on apprenticeships has been a real positive of the last five years, we can't afford to neglect further education as a consequence of that focus.

The **Sixth Form Colleges' Association** has identified that (a fifth)

22%

of colleges have **dropped STEM courses** as a result of **funding cuts**, with **science** subjects being the **worst hit**



The new government needs to recognise the value of further education in providing opportunities for learning not just to young people entering the workplace, but to older workers too. To do that, at Semta we would like to see the new government:

ENSURE THEY REVERSE THE PLANNED CUT TO THE ADULT FURTHER EDUCATION BUDGET.

The proposed 24% cut to the adult further education budget has come at a bad time. With the economy growing, British manufacturers and other businesses are looking to take on workers with the right skills to help them grow. With engineering courses requiring a relatively high capital spend to keep them up to date, engineering departments could be the first to be impacted if this cut is implemented – and with the UK requiring 800,000 more engineers by 2020, this would have a disastrous effect.

ENSURE FURTHER EDUCATION REMAINS AFFORDABLE AT 24+.

The 24+ Advanced Learning Loans programme is vital if we are to ensure that older learners are able to access the learning they need to acquire new skills and progress their careers. The new government should guarantee the continuation of these loans and should look to extend the bursary scheme for those with the greatest financial need, with targeted funding for STEM subjects to help to plug workforce skills gaps and shortages in high-value sectors like advanced manufacturing and engineering. Offering special disability, travel or childcare components would ensure those with the greatest barriers to overcome were able to access further education. There is also a clear need to promote these loans more effectively, as take-up in some subject areas has been very low. Engineering and manufacturing take up is only 2.3%.

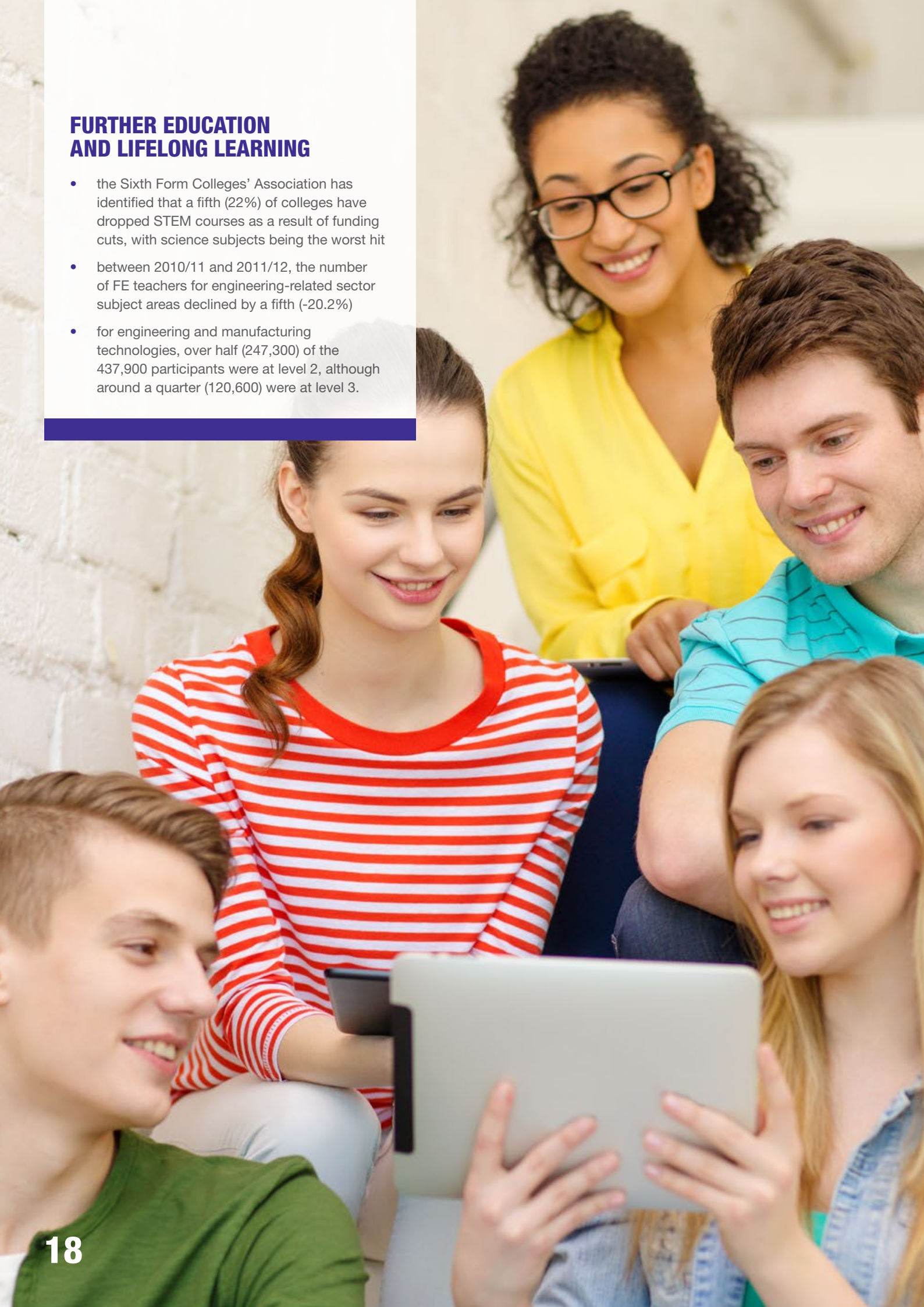
ENSURE THAT BEST PRACTICE IS SHARED ACROSS THE SECTOR.

With further education being such a varied sector, it's vital that best practice is shared if we are to ensure that standards are maintained across all types and sizes of institution. The Education and Training Foundation's Excellence Gateway, through which practitioners can share learning resources, is one innovation which we have helped to introduce; collaborative innovations like this should be more widely publicised to practitioners. Through the STEM Exchange, we are also helping to ensure STEM teachers have access to the Continuing Professional Development they need – the current average of 30 hours a year is not adequate.

See the STEM Exchange in action, visit: **www.semta.org.uk/STEM-exchange** or scan the **QR Code**.

FURTHER EDUCATION AND LIFELONG LEARNING

- the Sixth Form Colleges' Association has identified that a fifth (22%) of colleges have dropped STEM courses as a result of funding cuts, with science subjects being the worst hit
- between 2010/11 and 2011/12, the number of FE teachers for engineering-related sector subject areas declined by a fifth (-20.2%)
- for engineering and manufacturing technologies, over half (247,300) of the 437,900 participants were at level 2, although around a quarter (120,600) were at level 3.



HIGHER EDUCATION

The UK's higher education is widely recognised as world-class; UK universities regularly feature in lists of the world's best and foreign students, attracted by their reputation, flock to them in increasing numbers. It is a sector which has a huge role to play in ensuring the UK is able to keep pace in the 'global race'.

A **degree** in a **STEM subject** gives graduates a **clear advantage** in the jobs market.

48% of **employers** report that they **prefer graduates** with these qualifications

Higher education is particularly important to STEM industries. The undergraduates of today are the researchers, innovators and problem solvers of tomorrow. It is therefore vital that we encourage more of our best and brightest young minds to study STEM subjects if we are to face up to the big challenges we face, from climate change to resource scarcity.

As such higher education cannot exist in a self-contained bubble, particularly when it comes to STEM disciplines. Engineering, for example, cannot exist within textbooks alone - students need to be equipped with the ability to apply the knowledge they gain through their studies, and need to be able to adapt their skills to creatively solve any new challenges they might face in their careers.

At Semta, we would like to see the new government:

EXPAND THE PROVISION OF STEM DEGREES WITH VOCATIONAL ASPECTS.

The new degree apprenticeships will be a useful addition to the qualifications landscape, taking rigorous academic learning and teaching students how to effectively apply it in the workplace. Subject to their success, the new government should look at widening the scope of degree apprenticeships to further STEM disciplines and provide more young people with the opportunity to combine vocational and academic learning in this way. It would also be a positive development if more STEM degrees included a 'year in industry' along the lines of the old sandwich courses, exposing more young people to the workplace and giving employers a first look at fresh talent. Some young people have decided to leave STEM degree courses prematurely and switch to Higher Apprenticeships so they would have the opportunity to apply their knowledge in a workplace environment.

EXPAND FINANCIAL INCENTIVES FOR STEM STUDENTS.

Greater links between employers and universities should be encouraged, with the aim of providing more sponsored degrees in STEM disciplines. Universities should be encouraged to share best practice in incentivising the take-up of STEM subjects, with the aim of driving up enrolment across the country. There should be greater central funding of bursaries for students from disadvantaged backgrounds entering STEM undergraduate courses, in order to ensure that all who want to study STEM subjects are able to do so.

KEEP MORE STEM GRADUATES IN STEM CAREERS.

A majority of STEM graduates go on to pursue non-STEM careers. Careers advice at universities needs to be strengthened; at present, too many STEM graduates leave university without a clear awareness of the options that are open to them within the sector. Rather than careers advice being opt in, with students actively having to seek it out, it should be opt out; students should be offered a session with a careers adviser by their universities, either in-house or delivered by an external partner like Semta's STEM Alliance. And careers advisers should work with students on their employability skills, helping them to demonstrate the 'soft' skills employers are looking for.

WIDEN OUTREACH PROGRAMMES FOR STEM DISCIPLINES.

More STEM lecturers and professors should be encouraged to go into colleges and sixth forms to talk about what their degree programmes involve and what past graduates have gone on to do with their careers. Undergraduates and postgraduates in STEM subjects should be encouraged to act as ambassadors for their courses to local schools, giving interested potential students a first port of call to which they can take any questions.

MAINTAIN GOVERNMENT-BACKED FUNDING FOR POSTGRADUATE STUDY.

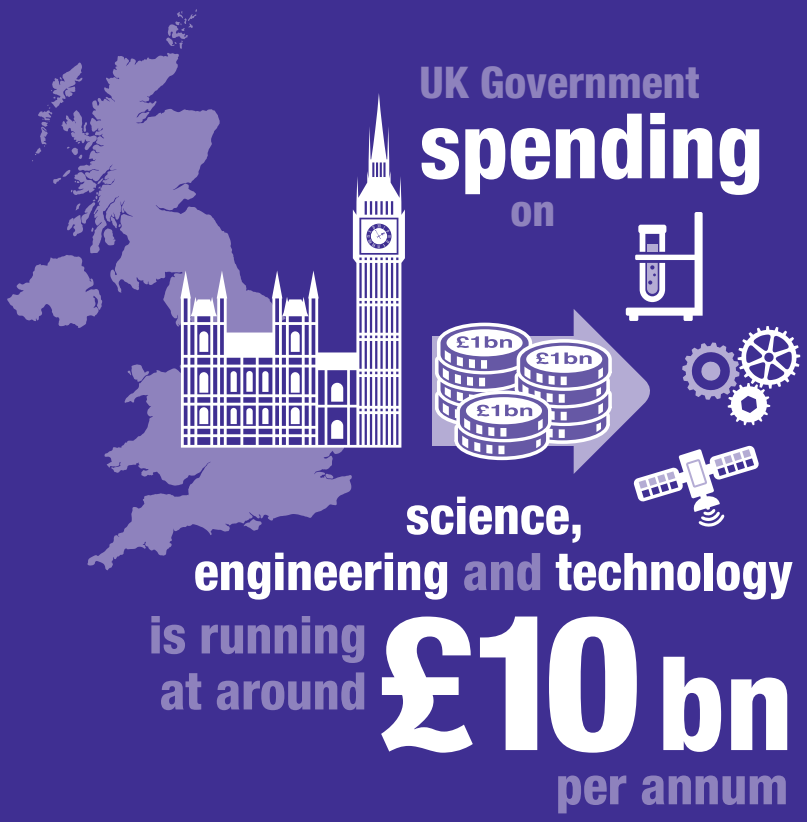
Government-backed loans for taught and research master's degrees and doctorates, working in a similar way to those offered for undergraduate study, will open up postgraduate study and encourage many who would have been unable to progress because of cost issues to do so. The new government needs to reaffirm its commitment to backing these loans, and should consider offering them on the basis of hypothecated future income as well as actual current income.

HIGHER EDUCATION

- employers are experiencing shortages of STEM graduates (19%) and are expected to affect many more STEM-based firms (28%) in the coming years
- a degree in a STEM subject gives graduates a clear advantage in the jobs market, with nearly half of employers (48%) reporting that they prefer graduates with these qualifications
- businesses have concerns about both the quality (48%) and quantity (46%) of STEM graduates, and report that too many lack general workplace experience (39%)
- the UK ranks seventh among countries by the percentage of students earning first university degrees who are studying science and engineering (34%)
- in 2012/13 applicants to engineering degree courses increased by 5.5% on the previous year, to 32,026
- out of the 548,420 students on a HE STEM course in 2012/13, 158,115 were studying engineering and technology - the second largest STEM subject behind biological sciences
- the overall non-continuation rate for first degrees was 14.2%. Three of the six subject areas with above average non-continuation rates were STEM subjects: computer science, engineering and technology and mathematical sciences
- over a third of HE staff teaching engineering and technology are from outside of the UK.

SCIENCE & RESEARCH

The UK continues to punch above its weight in the field of STEM research, including engineering research. 15% of our engineering research outputs are recognised as world leading, and between 2007-13 19% of European engineering and science research grants went to British researchers.



However, according to UKCES there is a shortage of 13,000 STEM research professionals in the UK. This isn't due to a shortage of qualified candidates for these roles – the numbers taking A Levels and graduate-level courses in some STEM disciplines have risen in the past decade. Rather, it's a product of people with STEM qualifications taking up non-STEM related roles.

Semta strongly supports British STEM research. It can have a halo effect on science and engineering as a whole, and cutting-edge research can capture the public's imagination and enthuse young people about becoming scientists and engineers. That's why it's vital that the new government protects this world-class sector.

To protect and expand our scientific and research base, at Semta we would like to see the new government:

KEEP THE DOOR OPEN TO FOREIGN TALENT.

Over the last eight years the UK has seen a 70% increase in the numbers of non-EU engineering students, and at 75% the proportion of non-EU postgraduate engineering students is high. This reflects the regard in which the UK's STEM research is held internationally, and it would be damaging to that reputation if we were to shut the door to talented engineers and scientists from overseas. Students, especially in shortage areas like STEM, should remain outside of any government cap on immigration, and foreign STEM graduates should be allowed to remain within the UK while they look for suitable work.

KEEP A LONG-TERM FOCUS.

The science and innovation strategy's long-term focus and funding guarantee gives the sector the stability needed to invest its own time and money in long-term research projects. The new government should reiterate its commitment to the £5.9bn in capital expenditure from 2016-21 outlined in the current strategy, and should listen carefully to what the Nurse review of Research Councils says when it reports back in summer 2015.

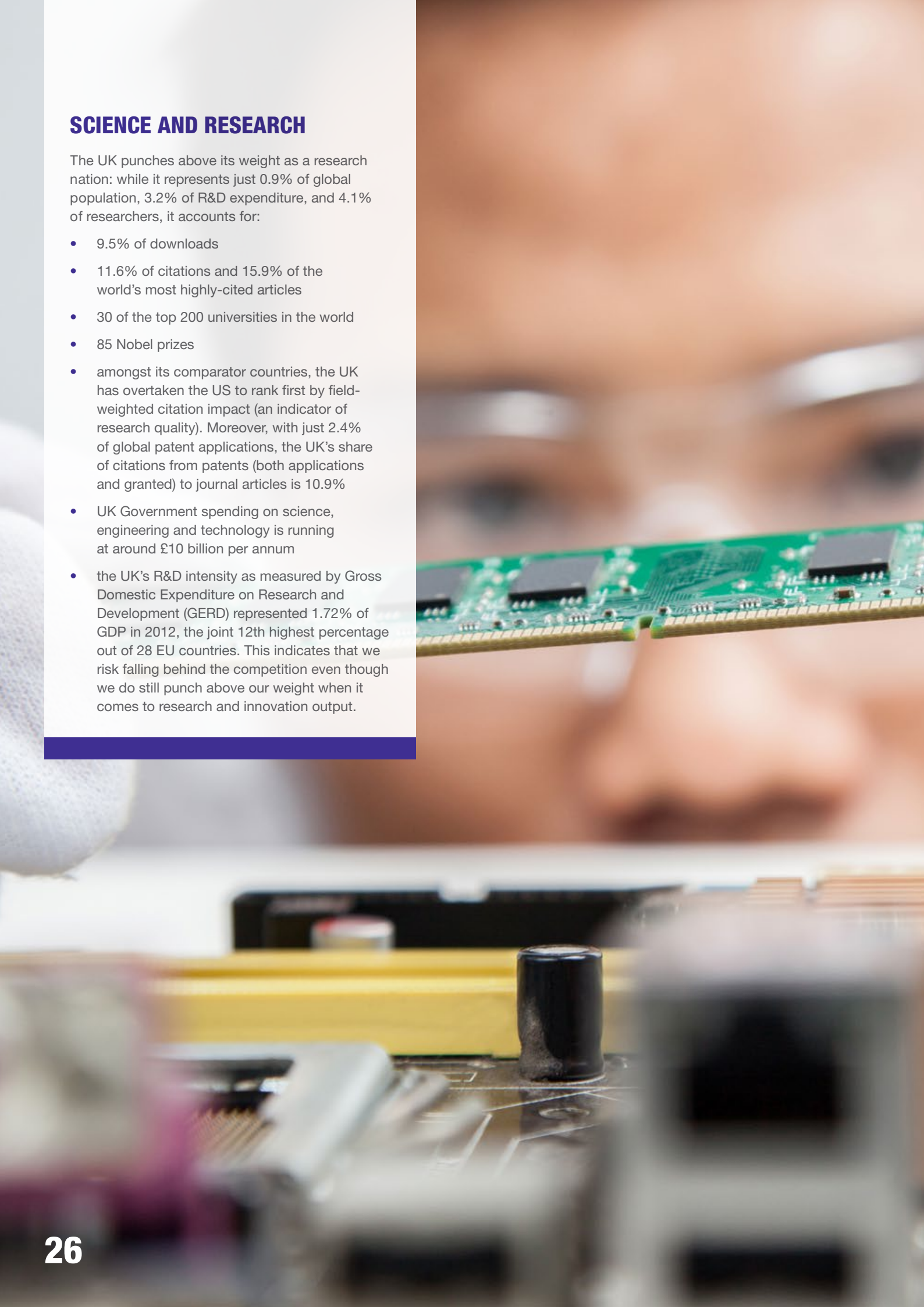
KEEP MORE STEM TALENT WITHIN STEM.

With up to 60% of people with STEM qualifications taking up non-STEM roles once qualified, we all need to do more to encourage people with the right skills to pursue STEM careers. Industry has a role to play in engaging with universities and other educational establishments, and universities need to be receptive when all employers show an interest in the STEM courses they offer, not just those which fund research projects. The new government could help to keep more STEM talent within STEM by offering a 'Golden Hello' for STEM research posts, similar to that which used to be offered to teachers in shortage subjects.

SCIENCE AND RESEARCH

The UK punches above its weight as a research nation: while it represents just 0.9% of global population, 3.2% of R&D expenditure, and 4.1% of researchers, it accounts for:

- 9.5% of downloads
- 11.6% of citations and 15.9% of the world's most highly-cited articles
- 30 of the top 200 universities in the world
- 85 Nobel prizes
- amongst its comparator countries, the UK has overtaken the US to rank first by field-weighted citation impact (an indicator of research quality). Moreover, with just 2.4% of global patent applications, the UK's share of citations from patents (both applications and granted) to journal articles is 10.9%
- UK Government spending on science, engineering and technology is running at around £10 billion per annum
- the UK's R&D intensity as measured by Gross Domestic Expenditure on Research and Development (GERD) represented 1.72% of GDP in 2012, the joint 12th highest percentage out of 28 EU countries. This indicates that we risk falling behind the competition even though we do still punch above our weight when it comes to research and innovation output.



WOMEN IN STEM

Women make up over half the population but at the moment, they account for just 13% of the labour force in STEM industries. This means there is a vast well of talent out there which, if tapped, could wipe out the skills shortages which STEM industries, including advanced manufacturing and engineering, currently face.

The problem begins at school, where nearly half of co-educational state secondary schools do not send any girls on to study Physics at A Level and where too many girls are discouraged from pursuing their aspirations to go into STEM careers by teachers, parents and fellow pupils.

It is then exacerbated at university, where around four fifths of engineering graduates are male. Only about half of female STEM graduates then go on to work in STEM roles, a huge loss of talented potential recruits to the sector.

Employers recognise that this is a problem and invest large amounts of time and energy into providing a welcoming environment for their female apprentices and employees. Government campaigns such as 'Not Just For Boys' and industry-backed campaigns like WISE are helping, slowly but surely, to break down perceptions of engineering and other STEM professions as being male-only areas, but more needs to be done – by government, educational institutions and industry.

overall

51.1%

of all entrants to

STEM GCSE

subjects in

2014 were **female**

To encourage more women to pursue STEM careers, at Semta we would like to see the new government:

EXPAND THE 'NOT JUST FOR BOYS' CAMPAIGN.

If the new government reintroduces the requirement for Key Stage 4 pupils to undertake a work experience placement, the 'Not Just For Boys' campaign should be the mechanism through which STEM employers are encouraged to offer placements to girls. A guide to apprenticeships along the lines of that provided by WISE should be produced under the 'Not Just For Boys' banner and distributed to all parents of girls who are considering them. And the new government should encourage more women in STEM to get involved as ambassadors for the campaign; they could then assume responsibility within their organisations for bringing in girls on work experience placements and going out to schools to talk to their female pupils.

ENSURE WOMEN AND GIRLS HAVE POSITIVE ROLE MODELS IN STEM.

The perception of STEM industries as male-dominated is not helped by the way in which women's contributions have been ignored and downplayed through history. STEM curricula should be revisited to ensure that the contribution of women is fully recognised. Universities should be encouraged to include in promotional material and advertising campaigns positive representation of their female STEM students and employees. And STEM employers should be encouraged to include positive images of their female workers in advertising campaigns – at Semta we have been working hard to do so through case studies in marketing material and on social media.

PROVIDE INCENTIVES FOR WOMEN TO PURSUE STEM CAREERS.

Existing bursary and scholarship schemes provided for women studying STEM subjects at university should be more widely promoted. Female STEM undergraduates should be mentored by women working in industry, not just by academics, and encouraged to explore options within industry. There should also be incentives for women who have left STEM to return, and a marketing campaign specifically targeted at those who might be considering doing so.

WOMEN IN STEM

- 22% of the current UK advanced manufacturing & engineering workforce are women
- women only make up 9% of those working in technical occupations (engineers, scientists and technologists)
- women account for only 7% of all those who started an engineering and manufacturing technologies apprenticeship
- overall, 51.1% of all entrants to STEM GCSE subjects in 2014 were female
- in 2012/13 almost half (49%) of state funded, co-educational schools sent no girls at all to do A Level Physics
- female students generally have a higher A*-C pass rate in STEM subjects than male students
- in 2012/13, the proportion of males (35.8%) studying STEM subjects in higher education was double the proportion of females (16.5%)
- the relatively low participation of girls in STEM continues through to higher education. In 2012/13, 87.1% of engineering applicants were male and just 12.9% were female
- in 2012/13, only 22% of courses in mathematics and computer science, 18% in technology and 13% in engineering, were taken by women
- if women were to participate more fully in STEM employment, it could contribute an additional £2 billion to the economy.

DIVERSITY IN STEM

There is a clear disconnect between the interest in engineering amongst people of Black, Asian and Minority Ethnic (BAME) backgrounds and the profession's ability to encourage them to put their skills to use in engineering careers. Despite the fact that 25% of engineering and technology graduates come from BAME backgrounds, only six per cent of engineering professionals do – and only four per cent of engineering apprentices do.

Diversity is not just about diversity of skin colour, and engineering needs to be more reflective of the wider population with regard to disability, socio-economic background and gender (see the Women in STEM section for further details on the policies we'd like to see implemented to close the gender gap). Having an engineering workforce which better reflects the make-up of the wider population will ensure the sector is better equipped to meet society's challenges.

25% of **engineering graduates** come from **BAME** backgrounds

- **6%** engineering professionals
- **4%** engineering apprentices

According to CaSE **disabled STEM graduates** are

57%

less likely

to go on to **postgraduate study** than **non-disabled STEM graduates**

To encourage a more diverse mix of people to pursue careers in engineering, at Semta we would like to see the new government:

RUN A CAMPAIGN TO ENCOURAGE A MORE DIVERSE POOL OF PEOPLE TO CONSIDER ENGINEERING.

Building on the success of the 'Not Just For Boys' campaign, which aims to encourage more girls and women to consider STEM pathways, the new government should commit to funding and running a campaign across media which promotes opportunities within engineering and the wider STEM sector to BAME communities, families and individuals. The campaign could be social media-based, with print and radio advertising used to reach out further.

ENSURE THE NEEDS OF DISABLED PEOPLE ARE CONSIDERED WHEN FORMING POLICY.

Peter Little's review of access to apprenticeships had a welcome focus on disability, but the subsequent Richard Review didn't include any material on disability at all. If apprenticeships are to be accessible to all, then when government commissions research, disability needs to be explicitly included within the terms of reference and remit.

ENSURE YOUNG PEOPLE OF ALL SOCIO-ECONOMIC BACKGROUNDS HAVE ACCESS TO STEM OPPORTUNITIES.

The Pupil Premium is one method which could be used to provide STEM opportunities for all young people, not just those whose parents can afford to send them on school trips and fund extracurricular activities; government should promote best practice examples of schools using their Pupil Premium funding in this way, where there are clear uplifts in the numbers of pupils going on to study STEM subjects at university or taking up apprenticeships in STEM industries. Government should also consider where new University Technical Colleges, and STEM-focused academies and studio schools, will be located, ensuring that their catchment areas include socially deprived areas.

ADVICE FOR MINISTERS

At Semta, we are ready to help the new government to meet the skills needs of advanced manufacturing and engineering, and the wider STEM sector, head on.

Advanced manufacturing and engineering is a crucial growth sector for the UK's economy, with greater gross value added than any other. In 2011, advanced manufacturing and engineering provided circa £280 billion, 20% of the UK's total in GVA.

Engineering-related sectors exported goods and services valued at around £239 billion in 2011, some 48% of the total value of exports for that year. If the UK is to be successful, advanced manufacturing and engineering must be successful – and it can only succeed if its workers have the right mix of skills.

There are things that the new ministers can do to ensure that we have the best possible skills policies for advanced manufacturing and engineering, and to ensure that employers, students, apprentices and workers alike are included in shaping those policies.

At Semta, we would like to see the new government:

SET THE RIGHT MOOD MUSIC.

Getting policy right is important, but so is creating the right environment for policies to be developed and implemented. Early, positive statements of intent regarding science, technology and engineering will give employers within those sectors the confidence that the new government is on their side.

ASK EMPLOYERS WHAT THEY NEED FROM THE SKILLS AGENDA.

It's in employers' interests to ensure that we have the right education, training and skills policies. As Apprenticeship Trailblazers have demonstrated, where employers are given the chance to engage and help to shape the skills agenda, they will take it. We, and employers within our sectors, would like to see a consultative and collaborative approach from the new government.

DON'T THROW THE CARDS UP IN THE AIR.

Sector Skills Councils are playing a key role in ensuring that there is pan-sector cooperation and engagement on the skills agenda; we speak for the skills needs of our industries as a whole, SMEs and large employers alike. In advanced manufacturing and engineering we have made great strides, e.g. through Apprenticeship Trailblazers, and we want to see that hard work built upon. Similarly, the Industrial Partnerships need time to bed in properly, given that they exist for the long-term benefit of their sectors.

BRING ENGINEERING TO THE HEART OF DECISION MAKING IN GOVERNMENT.

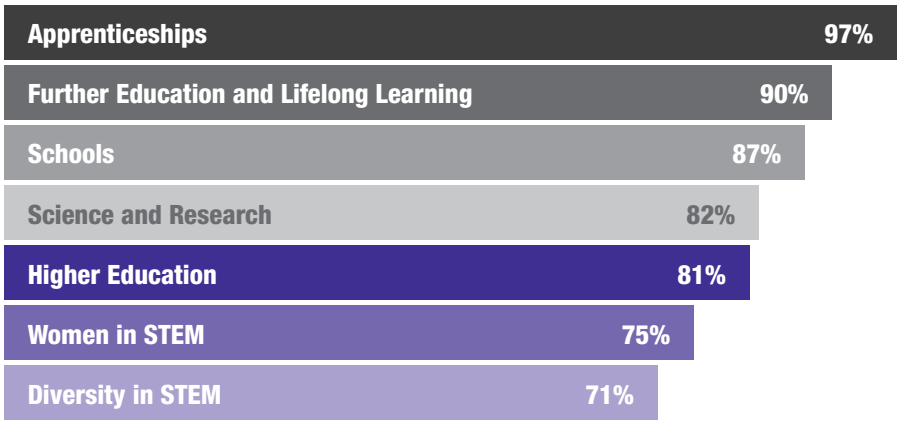
The Prime Minister currently has a Chief Scientist, who advises on science-related matters. The new government should consider appointing a Chief Engineer, who could then advise the Prime Minister not only on engineering-related matters, but help to apply engineering principles to other issues.

Skills Vision – Consultation Results

97% of people strongly agree or agree with the contents of **Skills Vision**

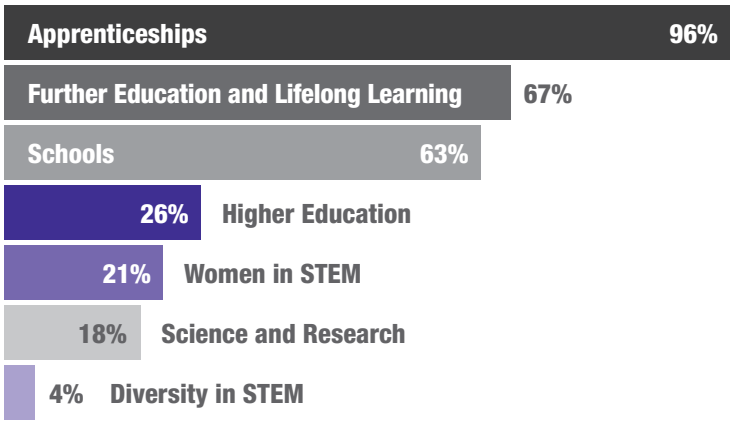
Policy area

% Respondents agreeing

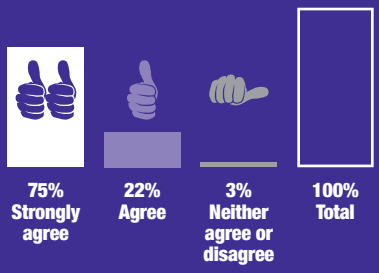


Policy area - Ranked in Top 3 policies

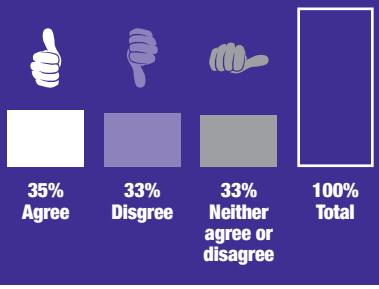
% Respondents agreeing



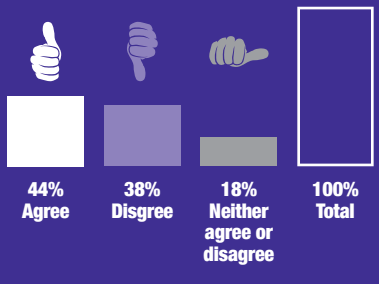
If these policies were implemented, do you think they would have a positive impact on the sector?



Employers should fund Apprenticeship Trailblazer standards



Employers should have control of Apprenticeship funding



Organisations like Semta are crucial to the development of Apprenticeships and National Occupational Standards (NOS)

86% of Respondents Agree

Organisations like Semta play an important role supporting employers

85% of Respondents Agree

INDUSTRY HAS SPOKEN – ITS VOICE MUST BE HEARD

Semta pledges to partner with the new government – and all interested parties – to help meet the needs of our nation and produce firm foundations for future prosperity.

To give your views and to support our **Skills Vision**, please visit **www.semta.org.uk/skillsvision** or scan the **QR Code**.

SKILLS VISION

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