THE REPORT OF THE **HARINGEY STEM COMMISSION**

STEM commission

Haringey LONDON

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This report is authored by Sam Elliot

FOREWORD

Giving Haringey's young people the best possible opportunities is one of the council's central priorities. With the regeneration of Tottenham, Wood Green and the development of Crossrail 2, Haringey is a place of new growth and new opportunity. We know, though, that not everyone growing up in our borough is able to take advantage of those opportunities. It is our aspiration that every Haringey young person has the same life chances as their peers anywhere else in the capital. In particular, they must have the education and training opportunities to access the new jobs that the new economy has to offer.

Cllr Claire Kober
Leader of Haringey Council

Our Outstanding for All Commission in 2012/13 set out to accelerate the rate of improvement in our schools, and some progress has been made, with all secondary schools being now rated good or outstanding. As this report indicates, however, there is still more work to do. We need to be more ambitious again, not only ensuring that basics are done well, but developing a modern, sophisticated education system that matches the innovation and change we see all around us.

I established the Haringey STEM Commission late last year to challenge us to take that next step and make some recommendations about how we can put Haringey at the forefront of science, technology and maths education. Chaired by Baroness Morgan of Huyton, the independent panel has featured expertise from the world of Government, industry and education, and I would like to thank all the Commissioners for giving us their time and insight. Their Call for Evidence has seen them gather ideas from an impressive range of witnesses, from international business leaders and national experts, to local teachers, parents and young people.

The recommendations they have made offer practical ideas to provide excellent teaching, a rigorous curriculum, inspirational extracurricular activities and better partnerships with employers and experts. They also show how a modern, ambitious local authority should support and lead our local education system, by strengthening schools' leadership and teaching, building partnerships that can drive improvement, and acting as a champion for parents and children. This is the challenge we must rise to, working together as a community to get the best outcomes for all our young people.

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CHAIR'S INTRODUCTION

Rapid technological innovation is changing our lives in ways we do not fully understand. The economy and the workplace are evolving rapidly. The jobs we have today may look very different even five years in the future, the way we operate as citizens and consumers of goods and services is changing too, and the full impact of this on how we teach and train our young people is not clear. It is an exciting time – there are potentially unprecedented opportunities for the next generation – but it one of great risk as well. If the education system does not adapt quickly then we face losing out in what is a global race. We will be denying our young people the opportunities they seek and deserve.

Baroness Morgan of Huyton
Chair, Haringey
STEM Commission

I was delighted to be asked to chair the Haringey STEM Commission to really look at what we could do on the ground to make our education system fit for the modern economy. We wanted to look at the range of skills young people will need to have access to the best career opportunities, and how we could support them through the curriculum, extracurricular activities and work-related learning. We wanted to inspire and inform young people about science, technology, engineering and maths and the exciting careers they can lead to. And we wanted to raise the aspiration for Haringey's education system, not letting the social barriers that young people face, particularly in the east of the borough, be an excuse for educational underachievement.

> We want the council to be the champion of educational excellence in the borough, publishing performance data and providing continuing expertise and challenge

The Commission issued an open Call for Evidence and held evidence sessions with businesses, experts, teachers, school leaders and governors. The Commission received submissions and contributions from a huge range of organisations and individuals. Maggie Philbin's organisation TeenTech convened a Haringey Young STEM Commission, a brilliant group of young people from Haringey's schools and colleges who conducted research with their peers and came together at an event in Parliament to share their ideas. Over 600 young people gave us their views in an online survey. Our deliberations were also supported by a review of the extensive secondary literature in this area, as well as research and data provided the local authority and their partners.

We were struck by the huge opportunities there are for Haringey to engage with businesses, third sector organisations and professional group in STEM fields, and by the energy and enthusiasm of many teachers. But we also saw how school and college performance in Haringey is patchy and fragile. We have made some practical proposals to support its improvement – two new centres of excellence for teaching, a STEM Coordinator to

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broker and coordinate the best extracurricular experiences, and a new partner to promote partnerships between schools and businesses. We also want to see a renewed focus on providing the best post 16 education, with high-quality vocational training, especially in the east of the borough. And we want the council to be the champion of educational excellence in the borough, publishing performance data and providing continuing expertise and challenge.

The recommendations we make are local in scope and can start to make a tangible difference from day one. They also hold lessons for other local authorities and public bodies. The new Mayor of London, Sadiq Khan, has made skills a key part of his policy programme, and has pledged to conduct his own London-wide STEM Commission. I hope our work provides a good starting point.

I'd like to thank all those who contributed to our work. There are enormous opportunities for the borough – the challenge now is for everyone with a stake in its young peoples' education to come together to make our vision a reality.

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ABOUT THE COMMISSION

Baroness Morgan of Huyton (chair)
Chaired House of Lords select committee on Digital Skills

Andrew Harrison
is Chief Strategy Officer of Manchester Airport Group.

Michael McKenzie
is Headteacher of Alexandra Park School, Haringey.

Robert Peston
is Political Editor for ITV News.

Maggie Philbin
is CEO and Founder of TeenTech.

This report was researched and written by Sam Elliot, Project Manager for the Haringey STEM Commission.

EXECUTIVE SUMMARY – THE COMMISSION'S VISION FOR STEM IN HARINGEY

A new economy means new opportunities for Haringey and its young people. These new industries demand new skills, and while we have seen some inspiring examples of teaching and learning in the borough, attainment and participation in relevant subjects is not high enough. The skewed perceptions of students, teachers and parents mean that young people may not be developing the skills necessary to take advantage of the opportunities that are out there.

Many young people do not know where they should be going to get the right advice and guidance about careers and subject choices. Parental expectations and cultural reactions in schools mean that many vocational routes, including apprenticeships, are discouraged. TeenTech research shows that parents and teachers are the main influencers for young people. Inspiring and informing parents and teachers, as well as young people themselves, about the range of career and training choices available should therefore be a priority.

Our vision:

Every student in Haringey should leave education equipped with both the educational achievements and employability skills to adapt and thrive in the modern economy, and have the chance to have those skills acknowledged through an accredited "Haringey Diploma".

Schools should teach a balanced and broad curriculum, with mathematics and science at its heart, keeping pace with technology and innovation and providing opportunities for young people to develop their technical skills, creativity and confidence.

To support this, Haringey needs to be the best place in the country to be a science, technology or mathematics teacher, with two centres of teaching excellence supporting outstanding continuous professional development and strong professional networks. The borough should also consider what incentives it can offer to attract the best teaching talent.

Young people should have access to exciting and innovative extracurricular activities, visits and experiences, linked to the curriculum and to the world of work, complementing outstanding work-related learning from industry partners, and relationships with inspiring role models. This should be supported and enabled by a new Haringey STEM Coordinator.

Haringey should forge new partnerships between educators and employers to support the curriculum, extracurricular activities, and careers advice and guidance, working with a partner organisation that can provide contacts and expertise.

Haringey needs better options for post 16 and further education study and training, especially in the east of the borough. This must include both strong academic provision and high-quality specialised vocational courses with a clear career outcome.

The local authority should continue to champion the interests of young people and their families, providing transparent and rigorous data about school performance, strengthening school leadership and facilitating continuing expertise and challenge from experts, businesses and professional organisations, as well as involving young people in the improvement of their education.

The Commission believes that, working together, the local authority, schools, colleges, businesses, parents and young people in Haringey need to forge a new vision for science, technology, engineering and maths education. The education system in Haringey needs to not only ensure every child receives the best possible teaching and has access to excellent training or employment opportunities, but also to extend its ambition, opening up new opportunities to engage with industry, experts and inspirational classroom and extracurricular experiences.

In particular it should ensure that everyone across the whole borough can benefit from these opportunities, including those traditionally under-represented in STEM careers, like young women and girls, students from black and minority ethnic backgrounds, and those who live in areas of disadvantage. It needs to overcome the legacy of educational inequalities that have resulted in an 'east-west divide' in the borough, striving for excellence in all schools.

This report makes practical recommendations that we believe can transform the provision of STEM education in Haringey.

Our Recommendations

1 *Haringey should convene a panel of employers, business leaders and experts to help develop and accredit a "Haringey Diploma", a framework of skills and experiences that young people should have when leaving education, supported by a programme of extracurricular activities and experiences.*

This should be based on, but not limited to, STEM subjects, and incorporate communication and presentation skills, problem solving, project working, creativity and entrepreneurship.

2 *The Commission strongly encourages Haringey schools to promote the study of mathematics and science. As many students as possible in Haringey should study some form of mathematics after the age of 16. Haringey schools and colleges should consider the use of new qualifications like Core Maths to provide additional mathematical education.*

Haringey should develop good quality additional provision focussed specifically on mathematics. This might include working with higher education and industry partners to establish a Saturday School, for example. New provision could provide additional support for those who need to improve their basic skills, supplement students' existing studies, and act as a link between Haringey and prospective university and employment routes.

The Government's forthcoming review into the extension of mathematics should consider what additional resources schools and colleges might need to provide mathematical education beyond the age of 16. It should recommend ways to recruit additional teachers to support this expansion, and look at how accountability measures and league tables need to be adjusted to incentivise take-up and provision.

All young people should study elements of all three sciences at least to the age of 16. As many young people as possible and where it is appropriate should study separate Science GCSEs or follow a strong double award science course.

3 *Haringey schools, working with the local authority, should establish two centres of STEM teaching excellence, one in the east and one in the west of the borough, based through the New River Teaching Alliance and the new London Academy of Excellence Tottenham. Both should act as hubs for improvement, support and professional development.*

They should work with existing alliances such as the Networked Learning Communities and broker new partnerships with employers, CPD providers and universities. They should also consider how best to promote collaboration between teachers, establishing subject specific teacher networks where appropriate, and consider the use of online tools to share ideas, resources and contacts.

4 *Haringey's Outstanding for All awards should explicitly recognise innovation, best practice and high achievement in STEM by both teachers and pupils through a dedicated STEM award.*

Haringey should explore offering practical support that might attract new teaching talent to the borough. This could include bursaries funded by corporate sponsorship; or accommodation for teachers identified as part of new developments.

5 *Haringey schools should jointly appoint a Haringey STEM Coordinator funded by the Networked Learning Communities to open up access to and coordinate STEM extracurricular provision across Haringey.*

The Coordinator, working with expert partners, should identify, evaluate and broker partnerships with the best providers of STEM education and experiences.

The post should support the delivery of the Haringey Diploma, work closely with the new Teaching School Alliances to support teacher professional development, and lead the development of an annual Haringey STEM Festival.

A specific duty for the Haringey STEM Coordinator should also be to put in place a programme focussed on inspiring and informing school leaders, teachers and pupils in Haringey's primary schools.

6 *Haringey should identify a partner organisation who can help build sustainable relationships between businesses and the local education system in order to support extracurricular activities, professional development for teachers and careers advice. This partner should work closely with the Haringey STEM Coordinator and the Teaching School Alliances.*

Haringey should create a clear pathway for STEM professionals to volunteer in Haringey schools to support enrichment activities such as after school clubs, mentoring and careers advice, and proactively work with businesses, universities and professional organisations to recruit volunteers. Schools should track the educational and career destinations of their students in order to identify role models, ambassadors and supporters for their extracurricular activity and work-related learning.

7 *The local authority, schools and colleges should work together to build a post 16 sector in Haringey that provides an improved academic and vocational offer across the whole borough that meets the needs of all young people.*

The Commission welcomes the establishment of an academic sixth form in the east of the borough and its ambition to support teaching and learning in other schools in the area. CONEL and Haringey Sixth Form Centre should provide other elements of a strong academic and vocational offer for young people of all abilities, along with specialist provision at Ada College and the Fashion Academy.

It is essential that Haringey Sixth Form College continues to improve and it should develop a strategic partnership with a strong further education college to support it in doing so. CONEL should develop high-quality, industry-focussed provision within specialist units, building on their emerging partnerships with employers like Siemens, alongside the provision of level one and two courses aimed at those lacking basic skills.

All Post 16 institutions should work with the Teaching School Alliances, Haringey STEM Coordinator, and business brokerage partner to develop their teaching, build relationships with employers and collaborate.

8 *Haringey should develop and publish its own annual Haringey Education Report, to inform parents and to monitor and drive improvement.*

9 *Haringey should develop a strategy for improving the information and advice parents receive about post-14 and post-16 choices and future careers. This should include:*

- *publishing clear information about the range of subject options, student attainment, and educational and employment destinations;*
- *schools opening up extracurricular and enrichment activities to parents as much as possible;*
- *aiming Haringey's new Careers Fair at both parents and young people;*
- *ensuring the proposed Haringey STEM Festival includes at least one event aimed at parents – e.g. a Haringey Annual Lecture.*

10 *Every school in Haringey should have a link governor for STEM, drawn from a relevant industry. Haringey should use its business brokerage partner to identify and recruit local residents who work in the STEM industries. Each governing body should set specific STEM-related objectives that reflect the borough's overall ambitions to improve STEM performance.*

11 *Haringey should appoint a standing expert reference panel, drawn from local residents active at a senior level in STEM industries, to provide continuing advice, guidance and contacts.*

Haringey should also recruit an "Innovator In Residence" able to work with schools and colleges to support enrichment activities and curriculum delivery, as well as provide advice and support to the council in continuing to develop work in this area.

12 *The borough should pilot a local STEM Leaders Programme, using those young people already involved in the Haringey Young STEM Commission, to champion STEM in schools and provide the insights of young people into the future of STEM in the borough.*

UNDERSTANDING THE CHALLENGE

Local leadership in education

The Haringey STEM Commission was established to look at how Haringey could position itself at the forefront of STEM education, raise attainment and participation in science, technology, engineering and mathematics, and open up career opportunities for the borough's young people. In this section we set out the context to our work, including the opportunities and challenges for the borough in education and the wider STEM economy.

It is a time of uncertainty for the education system in London and beyond. The recent Government White Paper 'Educational Excellence Everywhere' and the forthcoming Education For All Bill set a course for all schools – primary and secondary – to become academies by 2022. Alongside this, the proposed new national formula for school funding is likely to see significant reductions to funding for London schools, while a national review of the provision of further education is also underway.

Amidst this change and uncertainty, it is essential for local authorities and local school systems to focus on what really matters for children, young people and families, ensuring that every young person has access to a good education and the best possible career opportunities.

Haringey has been here before. The Outstanding for All Commission helped set the borough on the path to having all its secondary schools achieve good or outstanding OFSTED inspection results. Now this successor Commission intends to help the borough towards the next stage of its ambition.

What is STEM?

STEM is an acronym for science, technology, engineering and mathematics. In education, STEM encompasses a range of subjects and programmes, including biology, chemistry, physics, mathematics, computing, IT and ICT, and design and technology, as well as areas as diverse as agriculture, environmental science, interactive media, construction and accounting. It is also increasingly used as shorthand for an interdisciplinary approach that draws connections between these different areas to solve problems and innovate.

In early years settings children can expect to encounter basic mathematics and explore ways of understanding the world around

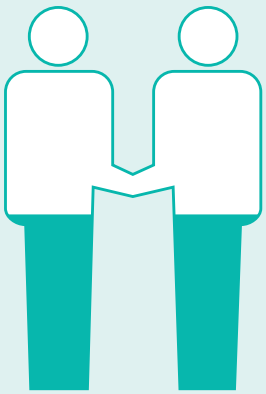
them through games and play. At primary level STEM subjects are taught in the context of the wider curriculum, while at secondary STEM subjects are taught individually by specialist teachers, with compulsory elements up to Key Stage 4. After the age of 16, students may take AS and A Levels in STEM subjects, while vocational STEM training is provided through further education colleges and apprenticeships.

The skills learned through STEM education, the understanding of scientific methods and principles, as well as numeracy, critical thinking and problem solving, are becoming more valuable to employers. The development of the information economy, increased digitalisation and the growth of niche manufacturing sectors mean digital, technical and engineering skills underpinned by scientific understanding and mathematical expertise are highly sought after.

Opportunity and growth inside and outside the borough

There is huge growth in scientific and technical industry. In 2014 there were 382,000 workers in London's technology and information sector, an increase of 11 percent since 2009[1], with the sector as a whole increasing by 15%. Technology and information is responsible for 30% of all job growth in the capital in that time. In their evidence to the Commission the Tech Partnership told us that a million new recruits will be needed in the technology sector by 2023.[2]

The life sciences in the UK – "covering medical devices, medical diagnostics and pharmaceuticals, through to synthetic and industrial biotechnology"[3] – has an annual turnover of £52bn. The pharmaceutical industry in particular generates £29bn in annual turnover and employs over 70,000 people. There are more than 700 life sciences companies in London employing over 21,500 people.



43%

of STEM vacancies are hard to fill due to a shortage of skills

UK Commission for Employment and Skills

The **London Stansted Cambridge Corridor** is a "life sciences corridor of global significance" which will see 14,000 additional jobs in life sciences by 2023. The **Harlow Enterprise Zone** alone will create a minimum of 2,500 jobs in medical technology, life sciences and ICT sectors within a twenty minute train journey from Tottenham Hale Station.

Haringey's **local economic development strategy** is "unashamedly pro-growth [and] pro-science", committed to "exploiting the diversification of London's economy and expansion of sectors including science, the digital economy, tech-led design and manufacture and low-carbon industries" to attract investment and jobs to the borough.[4]

The regeneration of Tottenham, one of the Mayor of London's designated housing zones, will bring over £1 billion of public and private investment to the borough, including 5,000 new jobs by 2025, many of them in technical and manufacturing roles. The extension of Crossrail 2 will unlock further regeneration opportunities in Wood Green, and improve transport links to employment centres across London.

1. Mandel & Liebenau (2014)
2. The Tech Partnership (2015)
3. OLS (2011)
4. LBH (2015)

Skills shortages in STEM industries

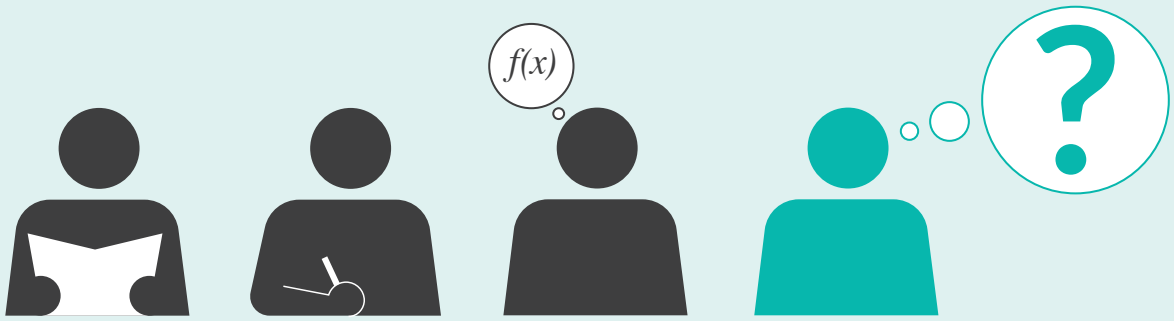
Despite this growth, the Commission has heard evidence of acute skills shortages across the range of STEM sectors. The consequences are stark. In evidence given to the Commission, the Chief Economist of the Bank of England, Andy Haldane, told us that the United Kingdom's economic productivity was flattening for the first time in a century and a half. The skills of the workforce must be improved to address this.

The largest skills deficit is in numeracy. Seventeen million adults have numeracy levels no better than a primary school child. **New research from the OECD** shows that England compares unfavourably to other developed nations.[5] Nine million adults – a quarter of those aged 16-65 – are deemed to lack basic skills, having low levels of numeracy, literacy or both. While in most countries younger people have stronger basic skills than those approaching retirement, in England this trend is reversed.

Amongst those aged 16-19, one third are found to have low basic skills, particular in numeracy. The report finds that "even for those with GCSEs that include maths and English, the basic skills outcomes are weaker than for many upper secondary qualifications obtained in other OECD countries." The estimated cost of the skills deficit to the economy is approximately £20bn a year.

The **UK Commission for Employment and Skills** tell us that 43% of STEM vacancies are hard to fill due to a shortage of skills.[6] Sarah Wood, the founder of tech start-up **Unruly** told **Robert Peston** that "finding the right people is our number one challenge" with a "chronic shortage of skills" in computer science, numeracy, problem and problem solving.[7] The shortage of talent is "the biggest single challenge facing London's tech businesses"[8] – with coders, software developers and data scientists most in demand – while the Tech Partnership gave evidence to the Commission showing "72% of large companies and 49% of SMEs are reporting skills gaps, with significant impacts on productivity".[9]

Sir Roger Carr, the Chairman of BAE Systems, told the Commission that the engineering sector will need 1.9 million more recruits by 2020, which will mean doubling the number of engineering graduates. The **2015 CBI and Pearson Education and Skills Survey** suggests "manufacturing and construction firms are finding it increasingly difficult to find skilled workers and expect the situation to get worse"[10], while almost



9 million adults – a quarter of 16-65 year olds are deemed to lack basic skills, having low levels of numeracy, literacy or both

5. Kuczera, Field & Windisch (2016)
6. UKCES (2015)
7. Peston (2015)
8. GfK (2013)
9. The Tech Partnership (2015)
10. CBI/Pearson (2015)

three quarters of employers in engineering and construction manufacture expect to need more employees with higher level skills.

In the life sciences, the **Association of the British Pharmaceutical Industry** cites "major skills gaps in the mathematical and computational areas" in industry sectors such as "bioinformatics, statistics, data mining, health informatics, and health economics and outcomes".[11] They also anticipate future shortages of skills in "device technology..., materials science, physiological modelling and physical chemistry."

In health and social care, an increased focus on population-level healthcare and prevention and new roles such as data analysts, trainers and dieticians will require an evolving skills mix. Medical and technological innovations like telehealthcare, mobile health and healthcare analytics will also provide new skills challenges. The **first 'fully digital' hospital** has opened in Canada,[12] while the **Office of Life Sciences** has already identified emerging skills gaps in digital health including "a lack of commercialisation skills and shortages of IT and analytical capabilities".[13] The **UKCES Employer Skills Survey 2013** found that in the health and social work sector 22% of vacancies were due to skills shortage – an increase from 10% in 2011.[14]

This is not simply about high level technical skills for those destined to specialise in STEM-focussed careers. Katie O'Donovan of Google UK told the Commission that the wider workforce will need greater digital and technological competence, while **O2** estimate that "Britain will need 2.287 million digitally skilled workers by 2020 to satisfy the UK's digital potential".[15]

Career opportunities – but an uncertain future

Of course, a shortage of skilled workers in growing industries means that there are good career opportunities for young people who do leave education with the right skills. There is an enormous range of jobs and many different pathways appropriate to all abilities – from academic routes through A Levels and Higher Education, to post 16 vocational qualifications, to apprenticeships at all levels.

It is not a straightforward picture, however. Employers told us how the world of work is changing in ways that we don't fully understand. Many of the jobs that our young people will be doing in ten or twenty years do not exist yet. Research by **Deloitte and the University of Oxford** suggests that by 2030 30% of London's jobs could be being done by machines.[16] Importantly, they found that in this environment

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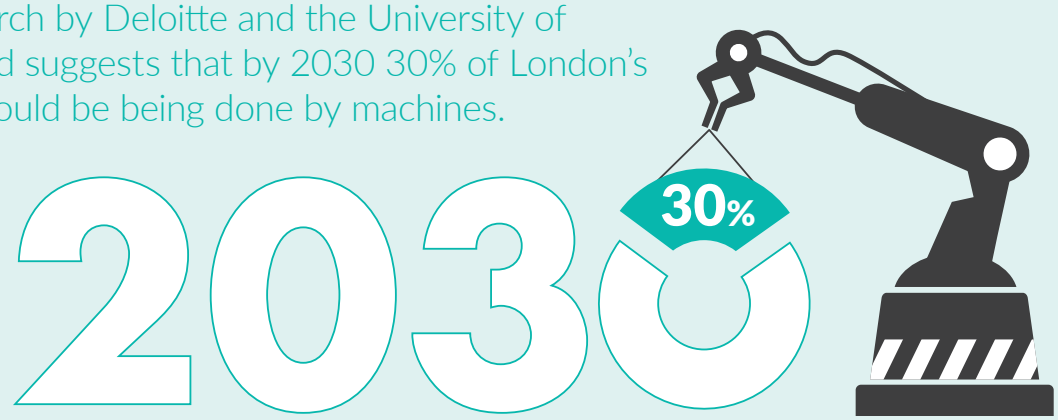
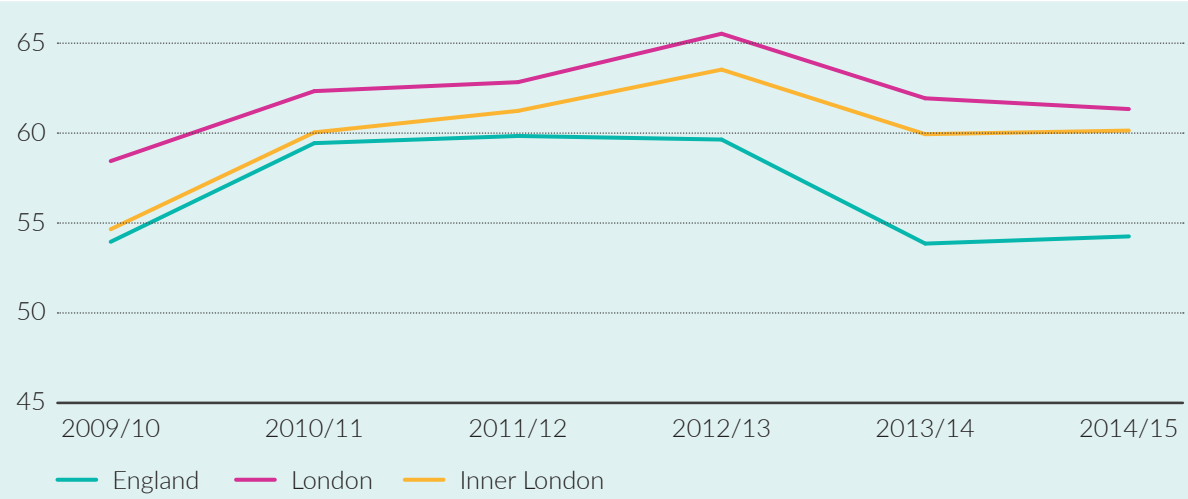


11. ABPI (2015)
12. Mangione (2015)
13. Deloitte (2015)
14. UKCES (2013)
15. Development Economics (2015)
16. Deloitte (2014)

GCSE and equivalent entries and achievements of pupils at the end of key stage 4 for each local authority and region



jobs that pay over £100K a year are eight times more secure than jobs that pay less than £30K.

The UK Commission on Employment and Skills report **'Careers of the Future'** gives us some idea of the kinds of jobs that are not only available but will grow and flourish in the modern economy – from mechanical engineers and physical scientists to programmers and software developers.[17] Employers gave evidence that two classes of jobs in particular will continue to grow: occupations that require a blend of high-level technical and creative skills; and those requiring emotional intelligence, such as the medical and caring professions.

In our findings we will identify how Haringey can respond and adapt to this changing employability challenge. The jobs and career pathways are there for the taking for Haringey's young people – the task for the education system in Haringey is to ensure they can access them and thrive.

Education in Haringey

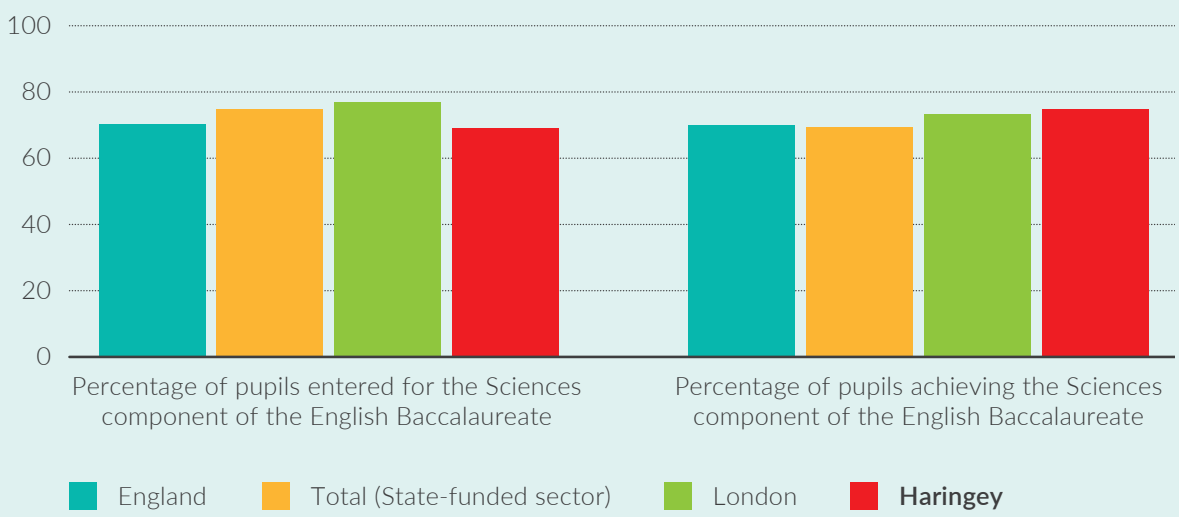
Achievement and participation in STEM subjects in Haringey are not of a high enough standard. Haringey has many schools and teachers with real strengths, but overall their performance is patchy and fragile, with a significant gap in attainment and quality between the east and west of the borough.

It is clear that between 2010 and 2014 there was a significant improvement in Haringey's education system. All secondary schools achieved 'good' or 'outstanding' ratings by OFSTED, and Haringey had some of the most improved GCSE results in the country. More recently, however, there are indications that that improvement is slipping – the percentage of pupils achieving five or more A*-C grades at GCSE (including English and mathematics) has fallen from 59.1% in 2013/14 to 54.6% in 2014/15.[18]

Attainment and participation in STEM subjects specifically are well below London and national benchmarks. The proportion of students studying more than the most basic level of science is well down on the London average. In 2015 68.9% of students were entered for the English Baccalaureate in Science – that is, they studied more than one science GCSE, either by taking core and additional science together, studying three single science GCSEs, or by being entered for the GCSE science double award. This is lower than both the national average of 74.9% and the London average of 76.5%. Indeed, it is the second lowest borough level in London.[19]

17. UKCES (2014)
18. DfE (2016a)
19. DfE (2016a)

Science participation

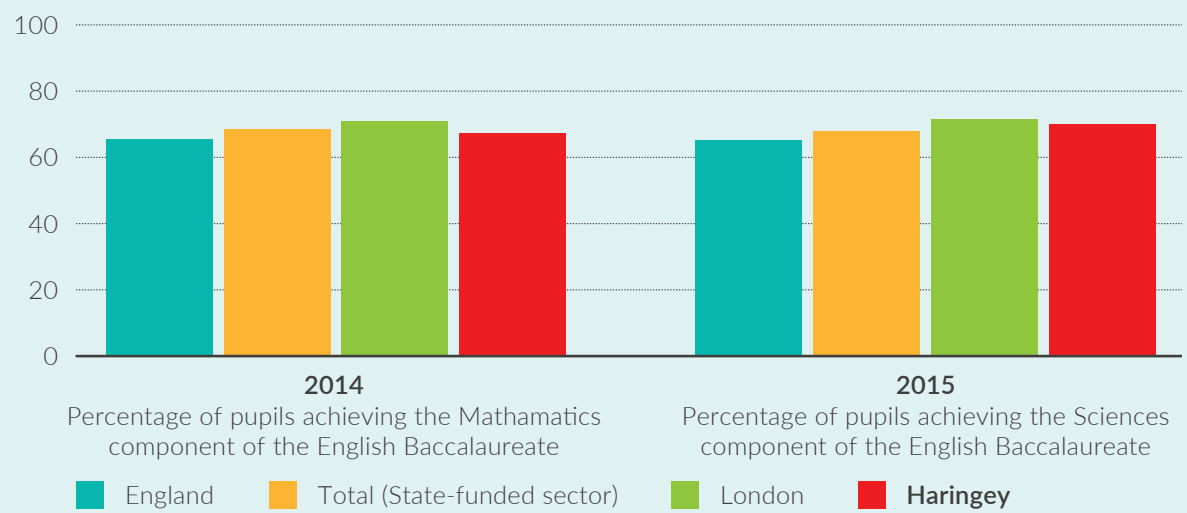


School breakdown Ebacc

	Science Ebacc		Maths
	% entered pupils achieving A*-C	%entered	% achieving A*-C
Alexandra Park School	97%	69%	84%
Fortismere School	96%	84%	83%
Gladesmore Community School	76%	60%	69%
Greig City Academy	57%	60%	56%
Heartlands High School	60%	91%	68%
Highgate Wood Secondary School	65%	83%	78%
Hornsey School for Girls	73%	82%	70%
Northumberland Park Community School	94%	36%	52%
Park View School	49%	71%	52%
St Thomas More Catholic School	55%	70%	71%
Woodside High School	94%	64%	58%

20. DfE (2016b)
21. DfE (2016a)

Maths attainment



The proportion of those who did achieve an EBacc in science (i.e. gained an A*-C) in 2015 (74.6%) was higher than England (68.9%) and London (73.1%). It was, however, a fall from 76.4% in 2014 (72.3% for England; 75% for London). At an individual school level, most secondary schools were around the borough average, but there are significant outliers with both higher and lower levels of participation. In general, schools in the east of the borough were less likely to enter young people for EBacc science.[20]

In 2015, 66.9% of all pupils in Haringey achieved the EBacc standards (A*-C) in Mathematics. This was below the average for England (68.1%) and London (70.4%). This was also a fall from 70% in 2014 (67.9% for England; 71.5% for London).[21] The proportion of students entered for maths and science A Level also falls below the London average.[22]

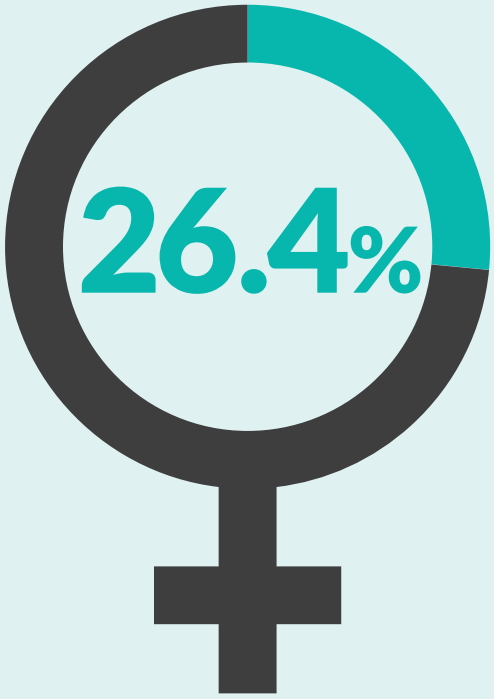
At primary level the picture is mixed. The majority of, but not all, schools are rated 'good' or 'outstanding'. Attainment at level 4 for reading, writing and maths can vary considerably, and again, in general, results are better in the west of the borough than in the east.[23]

The Commission has also identified particular weaknesses at in post 16 and further education. In Haringey the number of 19 year olds qualified to Level 2 with English and Maths remains lower than national, London and statistical neighbour averages,[24] and the number of apprenticeship starts has been declining.[25]

More young people leave the borough to study at 16 than remain – despite those who study elsewhere achieving less well.[26] The further education destinations chosen by a majority of students are not meeting high enough standards, both those in the east of borough such as CONEL and the Haringey Sixth Form College, and those outside the borough like City and Islington.[27]

The educational divide between east and west is reflected by numerous other social indicators – four of the wards in the west are among the richest 10% in the country, and four in the east are in the poorest 10%, while life expectancy is much higher in the west than in the east.[28]

22. DfE (2016c)
23. DfE (2016d)
24. DfE (2016e)
25. BIS/SFA (2016)
26. LBH (2016)
27. DfE (2016f)
28. North & Donnelly (2014)



26.4% of science and engineering technicians are female. Women make up 30% of the ICT workforce, 20% of computing graduates and fewer than 10% of app developers

The WISE (Women In Science and Engineering) Campaign report

The Commission is clear that such factors, while challenging to overcome, can never be an excuse for educational failure. Haringey have made improving the life chances of young people in Tottenham an absolute priority, and the education system must support that.

> You feel like there is not much to discover in life while you are stuck in a science lab or in a technology place of some sort.

> I don't think I know enough to work in any of them [STEM industries] and I don't think I am smart enough.

Perceptions and attitudes

As well as attainment, the Commission wanted to understand the perceptions and attitudes of Haringey's young people towards STEM subjects and careers.

Our research suggests that primary pupils generally see few limits to their own ambition and to the prospects of people like them.[29] Career aspirations are diverse, imaginative and, crucially, not stereotyped – "I see myself being a lawyer and an artist"; "fashion designer or business woman or dancer" – "a scientist or a fashion designer or a tattoo designer or a programmer". Almost 70% of primary school students told us they were very or fairly interested in working

in STEM industries. 73% thought it was very or fairly likely that the next big breakthrough in science or tech entrepreneur could come from their school.

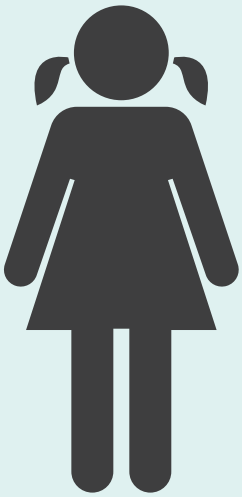
There is, however, an enthusiasm gap between primary and secondary students, with only 62% of secondary students surveyed expressing an interest in working in STEM industries, a difference of 8%. The **Tough Choices** report produced by the Your Life campaign bears this out.[30] They report a "dramatic decline" in STEM engagement through secondary school. They say "most young people see STEM study as a dead end" and identify an "alarming" lack of awareness about career paths.

Maths and physics are seen as less practical and relevant than other subjects. The perception of STEM being only for the "ultra bright" is damaging, with teachers and parents – the number one influencers of a young person's choices – prioritising good grades and diverting less able young people into other subject areas.

29. TeenTech (2016a)
30. AT Kearney (2016)

60%

of girls aged 12 believe mathematics and science are "too difficult"



77%

of girls feel that the science and technology sector is lacking high profile female role models.

This has a particularly extreme effect on girls and on those from a disadvantaged background. The masculine image of many STEM careers presents a significant barrier to encouraging more participation amongst young women and girls. A survey by **Accenture** found that 60% of girls aged 12 believe mathematics and science are "too difficult", with 77% of girls feeling that the science and technology sector is lacking high profile female role models.[31] The **WISE (Women In Science and Engineering) Campaign** report just 26.4% of science and engineering technicians are female.[32] Women make up 30% of the ICT workforce, 20% of computing graduates and fewer than 10% of app developers.

Evidence we received from the **ASPIRES** project at Kings College London supports this.[33] They have identified a correlation between a student's level of "science capital" (the level of science understanding, knowledge, interest, qualifications and contacts in one's family background) and the likelihood of students aspiring to science-related careers. They found a general lack of awareness of the range of science careers and the transferability of STEM skills. All factors discouraging science aspiration were found to be amplified in the case of black students. These findings resonate strongly with the picture in Haringey.

> "Aeronautical [engineering]... is amazing... We can make and create such amazing stuff which can actually float above the ground. The thought of travelling, exploring the globe is absolutely gob smacking

31. Accenture (2015)
32. The WISE Campaign (2015)
33. ASPIRES (2013)

FINDINGS AND RECOMMENDATIONS

The skills to thrive in a modern economy

The Commission's starting point was to examine the skills that every young person who leaves Haringey's education system needs to achieve their ambitions and to take advantage of the opportunities that the contemporary economy presents. Haringey's schools and colleges must be both pushing young people to achieve the best grades possible and setting them up for life in the world of work – which means giving them *employability* skills to complement academic or vocational achievement.

The Commission held a roundtable session in the Houses of Parliament in December 2015 which brought together major figures from the world of economics, business, technology and education. They looked at how the workforce was likely to change over the coming years and discussed what kinds of skills Haringey's young people will need to thrive. With increasing automation and new technologies, we were told how the workforce of the future needs transferable skills that will enable them to adapt and thrive. If future jobs are to be increasingly science and technology based or reliant on emotional intelligence, our young people need a balance of social and inter-personal skills as well as a grounding in STEM subjects to be best prepared for work. Peter Hyman, Head Teacher of School 21, felt education therefore had to balance the head, heart and hand – but that British schooling was "90% head".[34]

We also heard how young people, whilst often doing well at school or college, frequently leave education lacking employability skills. One parent and local youth worker told us how he had worked with young people who, although ostensibly well-qualified, did not know how to translate their academic qualifications and training into the workplace.[35]

In evidence to the Commission, UK Power Networks told us that "reasonable aptitude" in mathematics and science was "advantageous" but "not essential". Instead the key qualities they looked for were "a willingness to work hard to develop", "aptitude and interest in problem solving" and "an ability to innovate and… to think creatively".[36]

34. Haringey STEM Commission (2016)
35. Campbell (2015)
36. UK Power Networks (2015)

The **Centre for London** sums up this demanding and changing picture: "Many companies said they were looking not only for people with digital skills, but with broader entrepreneurial attitudes and business skills, especially at senior levels. Companies increasingly want creative, autonomous and flexible, 'multi-layered Renaissance people' – polymaths whose skills stretch beyond the purely technical".[37]

The best examples of STEM education we have heard about combine the teaching of technical skills and knowledge with the opportunity to solve problems, design and innovate. Apps for Good told us their classroom coding programme "teaches computing, while also developing skills in problem solving, communication, teamwork and critical thinking, key future work skills".[38] Students we talked to reflected that when they do practical work in the classroom, the 'experiments' can often be predictable. They were keen to have the opportunity to do work which might offer them the chance to truly explore and experiment.

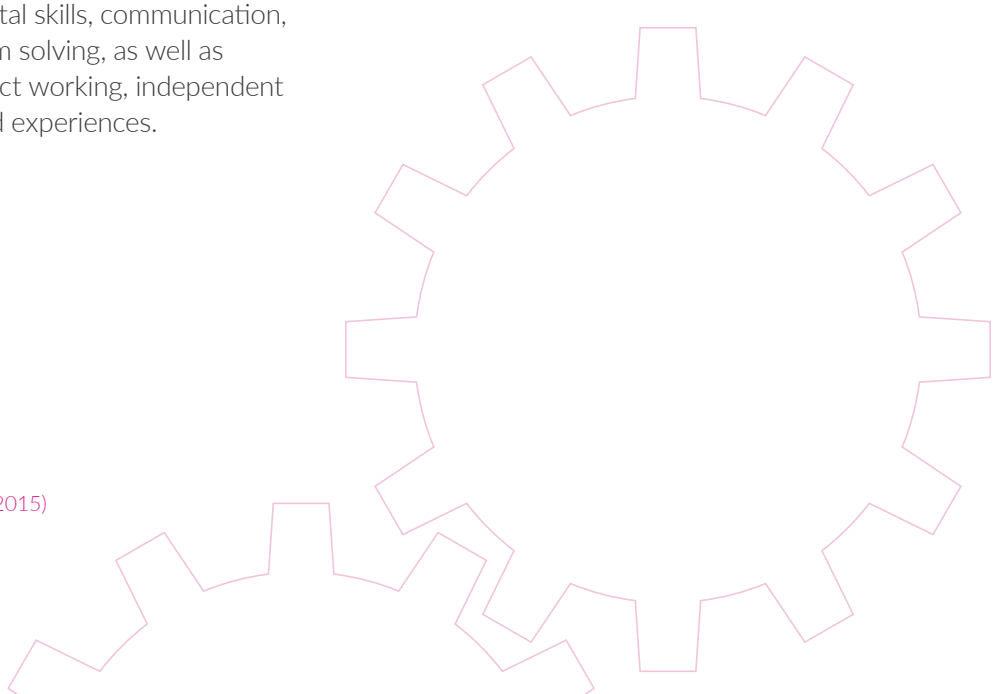
The Commission believes, therefore, that Haringey needs to provide a rich educational experience that combines a solid grounding in science, mathematics and technology with those future work skills.

We recommend that the borough develops its own high-status qualification that students can aspire to – what we will call for now a "Haringey Diploma". This should be underpinned by a programme of activities, experiences and projects that will enable Haringey's young people to develop a framework of transferable skills relevant to the world of work. This should include developing digital skills, communication, team work and problem solving, as well as opportunities for project working, independent study and work-related experiences.

The programme should be developed in conjunction with employers to ensure that the Haringey Diploma adds real value to a young person's life chances and career outcomes. It must be challenging and rigorous enough to have meaning for higher education institutions and employers, and should carry explicit employer endorsement or accreditation.

We therefore recommend that the borough works with a panel of employers and experts to identify and endorse the framework of skills required and the kinds of activities and experiences that would support them. We intend that this Diploma should provide a focus for work-related learning and extracurricular programmes in the borough, and we will make further recommendations to support its implementation.

"The best examples of STEM education we have heard about combine the teaching of technical skills and knowledge with the opportunity to solve problems, design and innovate.



37. Sims, Wilson & Tyrrell (2015)
38. Apps for Good (2015)

RECOMMENDATION

1

Haringey should convene a panel of employers, business leaders and experts to help develop and accredit a "Haringey Diploma", a framework of skills and experiences that young people should have when leaving education, supported by a programme of extracurricular activities and experiences.

This should be based on, but not limited to, STEM subjects, and incorporate communication and presentation skills, problem solving, project working, creativity and entrepreneurship.

A curriculum with mathematics and science at its heart

To complement a strong focus on employability skills, Haringey must be delivering a balanced and broad curriculum including the best possible teaching and learning in mathematics and science throughout a young person's educational journey.

Witnesses from all of the STEM sectors agreed that mathematics is fundamental – foundational to the scientific method, computing, engineering and design. It is directly linked to growing industries like data analytics, and provides the backdrop to a range of disciplines with clear application in the real world, including statistics, risk and mechanics. Our evidence tells us, however, that we are not doing well enough.

We have seen how Haringey's performance in maths is weaker than the London and national average. One story from our evidence indicates the impact this can have. A parent told us about the case of his son who attended a Haringey school sixth form and achieved the A Level results he needed to go to Oxford to study Chemistry. Despite having studied A Level Maths, however, he found himself "behind the curve compared to his peers, notably in Maths". His father urged the Commission that "if you want Haringey children to compete for, and flourish in, top universities studying demanding STEM subjects then you need to seriously up your game in delivering maths education".[39]

Evidence submitted to the Commission by the Royal Society suggests that "a strong scientific argument exists… for young people to maintain a broad curriculum to age 18, rather than specialise at an earlier age" and recommends that all students study mathematics and science up to the age of 18.[40] Likewise the OECD suggest that there is a pressing need for greater provision for studying mathematical skills beyond the age of 16.[41] Research conducted by the Royal Society suggests mathematics skills learned at school can have a significant effect on future career earnings – "a premium of up to 10%".[42]

Given this, the Commission believes maths needs to be a particular area of focus. The Commission would strongly encourage Haringey's schools to find opportunities for teaching numeracy across the whole curriculum, and to increase the amount of mathematics taught beyond the age of 16.

The Commission was concerned to hear how national accountability measures and other incentives can hamper this aspiration. Most schools now require students to achieve at least an A at GCSE in order to study maths at A Level. Professor Julia Higgins of the Royal Society was dismayed at this – "You do not *need* an A to do A Level maths".[43] While all schools were likely to be supportive of expanding mathematics in principle there would need to be league table recognition to adequately incentivise schools, and the Commission encourages the forthcoming government review into the provision of mathematics to take this into account.

39. Edwards (2015)
40. The Royal Society (2015)
41. Kuczera, Field & Windisch (2016)
42. The Royal Society (2014)
43. Haringey STEM Commission (2016)

Post 16 mathematical study does not mean all young people should be taking Maths A Level. Sir John Holman of the Wellcome Trust told us that maths is "like a language" needing to be used and practiced consistently to develop fluency. This could be done through new qualifications like **Core Maths**, by studying individual modules or lower level courses like GCSE Statistics, for example, or through extracurricular enrichment activities. To support this, Haringey should look at ways of offering additional mathematics provision like a Saturday school in partnership with universities and other educational providers.

Alongside strong mathematics, science is an essential part of a balanced curriculum. We know that participation in more than the most basic level of science at GCSE is low in Haringey, and improving this should be a priority. We have heard evidence of how studying the separate sciences – biology, chemistry and physics – improves a young person's options at A Level and beyond. Schools are already incentivised to improve this participation through forthcoming specification changes and the English Baccalaureate, but we would encourage them to ensure that their courses include elements of all three sciences.

As Sir Michael Wilshaw, the chief inspector of OFSTED, recently noted, the focus on literacy and numeracy at primary level, while essential, does restrict the ability of schools to lay the foundations for achievement at EBacc level in science.[44] Science has not been part of primary standardised assessments since 2010, and is rarely part of OFSTED inspections – a recent Wellcome Trust study of 770 primary school inspection reports found that 93% of them did not mention science at all.[45] Primary school teachers and governors have told us this often means the subject is squeezed for time and resources. Haringey needs to strengthen the ability of primary school teachers and subject leaders to deliver inspiring and innovative science education within these constraints. Teachers should be directed towards STEM resources which provide the opportunity for cross-curricular work where students can develop literacy and numeracy skills whilst simultaneously developing their knowledge of science and technology.

"Science has not been part of primary standardised assessments since 2010, and is rarely part of OFSTED inspections – a recent Wellcome Trust study of 770 primary school inspection reports found that 93% of them did not mention science at all.

44. Wilshaw (2016)
45. The Wellcome Trust (2015)

RECOMMENDATION

2

The Commission strongly encourages Haringey schools to promote the study of mathematics and science. As many students as possible in Haringey should study some form of mathematics after the age of 16. Haringey schools and colleges should consider the use of new qualifications like Core Maths to provide additional mathematical education.

Haringey should develop good quality additional provision focussed specifically on mathematics. This might include working with higher education and industry partners to establish a Saturday School, for example. New provision could provide additional support for those who need to improve their basic skills, supplement students' existing studies, and act as a link between Haringey and prospective university and employment routes.

The Government's forthcoming review into the extension of mathematics should consider what additional resources schools and colleges might need to provide mathematical education beyond the age of 16. It should recommend ways to recruit additional teachers to support this expansion, and look at how accountability measures and league tables need to be adjusted to incentivise take-up and provision.

All young people should study elements of all three sciences at least to the age of 16. As many young people as possible and where it is appropriate should study separate Science GCSEs or follow a strong double award science course.

The best place in the country to be a science, maths or technology teacher

In order to deliver a stronger curriculum and broader employability skills, Haringey needs outstanding teachers. A major barrier to developing student's STEM skills is a lack of staff skill and expertise. Just 3% of primary school teachers in England hold a specialist mathematics degree, while only 5% have a degree in science.[46] At secondary level, more than 20% of maths and chemistry teachers, a third of physics teachers and more than half of ICT teachers have no relevant post-A Level qualification.[47] Meanwhile, UCAS figures show a fall in applications to train as a teacher across all specialisms.[48]

In the face of these national shortages Haringey needs to aspire to be the best place in the country to be a science, technology or maths teacher in order to attract and retain the best teaching talent. The Commission has spoken to teachers from schools across Haringey about the barriers they face, and we want to give them a strong package of support.

Professor John Perkins's **Review of Engineering Skills** emphasised the importance of industry-focussed continuing professional development for teachers to enable them "to inspire and inform their students about engineering".[49] The Commission believes this applies equally across all the STEM subjects. Many schools and teachers are unfamiliar with emerging digital areas, for example, and need support to develop understanding of the changing landscape.

STEM Learning told us that teachers who attend their professional development courses produce better results and are more confident in engaging students and delivering STEM related careers advice. Their evidence shows that providing professional development opportunities helps with the recruitment and retention of STEM teachers.[50] They also host a significant amount of resources that schools could draw on. However, it was not always clear whether teachers know about these opportunities or are able to take best advantage of them.

46. The Royal Society (2014)
47. DfE (2015)
48. Boffey (2015)
49. Perkins (2013)
50. STEM Learning (2016)

Not all CPD courses are right for every teacher in every setting. UKIE, the trade body for the video games industry, told the Commission about the importance of personalising their educational support – providing courses at different times and on different days, setting up video conferences with experts, and building in professional development to school trips, for example.[51]

The Commission also heard of many high-quality training and development opportunities being provided by employers like Barclays, who work with teachers to provide continuous professional development focussed on expanding and developing their capacity to deliver the computing curriculum, or the Dot Everyone project which offers 'digital dunks', short courses for school leaders to expose them to the scope and potential of the digital field.[52]

There is some excellent work already going on in Haringey. The Commission heard from St Aidan's Primary School, who have hired a computer programming specialist to support the delivery of the computing curriculum, spending one day a week working with teachers. Alexandra Park School work with the Ogden Trust to support the delivery of physics in their own school and to support other schools in the borough. Teachers themselves told us that the most helpful thing for them would be the opportunity to meet with their peers, discuss their challenges and share their ideas.[53]

To further drive improvement, to open up access to the best professional development opportunities, and to share the best ideas across the borough, the Commission believes schools in Haringey need to work together to break down the barriers of cost, time and communication that prevent teachers from improving their practice.

The New River Teaching Alliance, based at Alexandra Park School, already works with schools, primarily in the west of the borough, to recruit and train high-calibre student teachers, provide training programmes for serving teachers and provide leadership and management training. They use Specialist Leaders in Education to provide targeted support for departments who need to improve results.

The London Academy of Excellence Tottenham, a new sixth form opening in Tottenham in 2017 and supported by Highgate School and Tottenham Hotspur Football Club, has made supporting teaching and learning in other schools in the east of the borough a priority. This new entrant into the education system provides a fantastic opportunity for Tottenham schools to benefit from a similar level of mutual support and collaboration that exists in the west.

The local authority should therefore work with schools to establish the New River Teaching Alliance and LAE Tottenham as twin centres of teaching excellence, with an express focus on improving teaching in STEM subjects across the borough. They should support the establishment of a Teaching School Alliance in the east of the borough based at LAE Tottenham, and identify what support NRTSA might need to refocus its work.

Both centres should work with existing networks such as the Networked Learning Communities and use our emerging partnerships with employers, universities and professional organisations to access the best industry-focussed professional development opportunities. These centres much be owned and led by the schools themselves, but in order to tackle the challenges we have identified, we would expect them to provide opportunities for teachers to collaborate, develop ways of delivering mathematics throughout the curriculum and provide a specific programme to support primary school teachers in delivering science.

As well as sharing good teaching practice and professional development, we believe that by collaborating in a much more structured way, Haringey's schools can find solutions to other challenges, such as accessing extracurricular activities, working together on post 16 transitions, and publicising and advising on the most appropriate courses for students, whatever the institution. Subsequent recommendations in this report will support that.

51. Haringey STEM Commission (2016)
52. Haringey STEM Commission (2016)
53. Haringey STEM Commission (2016)

RECOMMENDATION

3

Haringey schools, working with the local authority, should establish two centres of STEM teaching excellence, one in the east and one in the west of the borough, based through the New River Teaching Alliance and the new London Academy of Excellence Tottenham. Both should act as hubs for improvement, support and professional development.

They should work with existing alliances such as the Networked Learning Communities and broker new partnerships with employers, CPD providers and universities. They should also consider how best to promote collaboration between teachers, establishing subject specific teacher networks where appropriate, and consider the use of online tools to share ideas, resources and contacts.

Along with giving teachers as much support as we can, the Commission considered what practical things could be done to attract more teachers to work in the borough. Haringey should celebrate its teachers, recognising outstanding teaching practice in STEM through the council's Outstanding for All education awards. It should consider how else it might use its partnerships and influence to offset the costs of teaching in London, by identifying funding sources for bursaries or by using planning powers to negotiate accommodation for teachers in new developments.

> Haringey should celebrate its teachers, recognising outstanding teaching practice in STEM through the council's Outstanding for All education awards.

RECOMMENDATION

4

Haringey's Outstanding for All awards should explicitly recognise innovation, best practice and high achievement in STEM by both teachers and pupils through a dedicated STEM award.

Haringey should explore offering practical support that might attract new teaching talent to the borough. This could include bursaries funded by corporate sponsorship, or accommodation for teachers identified as part of new developments.

Inspiring extracurricular activities

To really inspire students, especially at primary level, witnesses urged the Commission to recommend more extracurricular space for STEM, including after school clubs, visits and other inspirational experiences. One witness told us "It is 100% about making the subjects interesting, engaging and bringing them to life. If young people can see how the theory applies to real life it instantly increases their interest".[54]

> I am not a massive fan of science when it comes to learning and remembering things off by heart, however I do enjoy doing physical and practical work.

54. UK Power Networks (2015)

There is also a growing evidence base that extracurricular activities can have a tangible impact on student participation and attainment, especially for those from more disadvantaged backgrounds.

STEMNET, a national programme providing access to ambassadors, STEM clubs and informal advice and support for schools, gave evidence of the significant impact their interventions have on student interest, enthusiasm and knowledge. 93% of teachers who had used STEMNET schemes and resources said that they had seen an increase in understanding from their students, while "seven out of 10 pupils (71%) who had taken part in STEMNET's programmes said they were more interested in studying science compared to four out of ten pupils (44%) who had not".[55]

An independent evaluation of the British Science Association's **Silver CREST Award** scheme showed that participants achieved half a grade more on their best science GCSE and were more likely to continue studying STEM subjects when compared to a statistically matched control group. Students eligible for Free School Meals saw larger grade increases (up to two thirds of a grade) when compared to a similar group on Free School Meals.[56]

The young people from Haringey's primary schools that we spoke to loved to experiment, test and explore scientific concepts, computer coding and design by themselves. We heard about the huge number of lunchtime and after school activities the borough's schools host – coding clubs, maths clubs, science and STEAM clubs, even robotics and Minecraft. We heard about visits to the **Science Museum**, the **Royal Institution**, technology companies, the **Big Bang Fair**, and the **Brilliant Club**. We heard about schools holding their own STEM or science weeks, a STEM Family Challenge, a Christmas Lecture, and schools joining forces to host workshops, competitions and events.

> "What makes a lesson boring? Only sitting around and listening for ages so you get bored and try to find something else to do so what you are learning doesn't go into your head properly. Writing so much it makes your hand ache.

The scale of the "STEM Third Sector", with organisations like **Code Club**, **Apps for Good**, **Stemettes**, **TeenTech**, and initiatives from professional bodies like **Tomorrow's Engineers**, mean there are significant opportunities. Stemettes told us how they work with corporate sponsors to provide half or full day workshops for girls to work with women in STEM and STEM companies, as well providing more in-depth experiences such as weeklong placements and longer term mentoring. Locally, the Commission has heard from the **Markfield Beam Engine and Museum**, which is working with Thames Water to develop a proposed STEM education centre on their site.

As the Centre for London notes in its own survey of 'digital learning programmes', projects like this are born out of the science and technology culture.[57] They are entrepreneurial and innovative, close to the relevant industries and excellent at building partnerships with professionals. They understand the different careers available, have up to the minute understanding of the latest advances and technologies, and can even be a 'trusted recruitment source'.

Extracurricular activities like this should support the other recommendations in this report – promoting mathematics, inspiring young people about science, and improving their employability skills. Programmes like **Mathletics**, the **British Mathematical Olympiad** and the **NRICH Hands On Maths Roadshow** are ideal for developing numeracy and deepening mathematical understanding. In establishing the Haringey Diploma, we expect the borough to develop a

55. Straw & Macleod (2015)
56. Stock Jones, Annable, Billingham & MacDonald (2016)
57. Sims, Wilson & Tyrrell (2015)

programme of activities and experiences that will allow young people to demonstrate and improve their communication, problem solving and teamwork skills. This should also include extracurricular project work that can offer opportunities for self-directed learning, giving the sciences a real world focus.

> One of my favourite lessons was when we were learning about how animals in the Arctic insulate themselves. We used vegetable shortening as a substitute for blubber. First we put our bare hand in the ice coldwater, then we put it in the 'blubber' and into the ice cold water and saw how it insulated our hands.

The biggest obstacle facing schools in taking forward innovative extracurricular ideas is time. Teachers need support to understand what the opportunities are. Access needs to be as easy as possible, with the focus being on providers and partners coming into the classroom rather than taking students out of school, and we need to ensure that all schools, teachers and students in Haringey have the opportunity, information and support to participate.

The Commission therefore recommends the appointment of a Haringey STEM Coordinator to facilitate access to these opportunities for all schools. The Coordinator should build partnerships with providers, identify the best products, and inform teachers about the opportunities available.

We believe schools would be keen to fund such a resource through their Networked Learning Communities and we expect the Coordinator to work closely with the borough's Teaching School Alliances, sharing partnerships and supporting their work.

The local authority should develop a full role description in consultation with schools, but we expect the ideal candidate to be an experienced and innovative teacher or Head of Department in a STEM subject. In order to establish the new role and attract suitable candidates, funding should initially be identified for three years.

To provide a focus, there should be a major annual borough-wide STEM initiative, run in partnership with an organisation like TeenTech and sponsored by business. It should enthuse and inspire students, give them information about careers and help them develop innovation and entrepreneurship skills.

> What has made me interested in science is that I have invented a lot of my own things and you can do cool experiments.

This might take the form of a Haringey STEM Festival, including an annual Haringey STEM Lecture from a high profile scientist, entrepreneur or inventor; a borough-wide competition like the Big Bang Fair; and a major careers event, bringing in support from industry partners. Haringey is already intending to hold a borough-wide careers fair later in the year, and this will be a good platform to build from.

In the light of the weaknesses identified in primary school science, a specific focus for the coordinator should be to work with Haringey's primary schools.

RECOMMENDATION

5

Haringey schools should jointly appoint a Haringey STEM Coordinator funded by the Networked Learning Communities to open up access to and coordinate STEM extracurricular provision across Haringey schools, primary and secondary.

The Coordinator, working with expert partners, should identify, evaluate and broker partnerships with the best providers of STEM education and experiences.

The post should support the delivery of the Haringey Diploma, work closely with the new Teaching School Alliances to support teacher professional development, and lead the development of an annual Haringey STEM Festival.

A specific duty for the Haringey STEM Coordinator should also be to put in place a programme focussed on inspiring and informing school leaders, teachers and pupils in Haringey's primary schools.

Careers advice and partnerships with employers

Extracurricular STEM activities are also an essential part of informing and inspiring young people about potential future careers. Students form ideas about what they might like to do in the future from primary age onwards and age-relevant activity should be provided throughout the education journey to help students better understand both the opportunities there are in STEM industries and how they match their own potential.

> I like technology and science but I don't see myself doing that job

Whilst young people may have a high awareness of digital products, for example, far fewer see themselves as being potential creators, makers or developers. Students' eyes should be opened to the range of career choices they have in contemporary industries. Schools no longer have a statutory duty to provide work-related learning, and the provision and use of work placements can vary, not least because of the pressure of timetabling and examinations.

> I've never really been able to try out any of these things apart from science which I enjoy, if I had more experience I might be more interested.

Our TeenTech research into the attitudes of Haringey's young people asked what sort of advice would help them to better understand what careers might interest them in the future. They suggested talks at schools from ambassadors from different industries and visits to inspiring and exciting work places. However, over 35% of students at primary school and 47% of secondary students said they had not been to visit to an employer at all.[58]

> Science has become my favourite subject at school and it's something I enjoy doing even when I'm at home, but I don't know what jobs I could actually do in science outside of school.

The advice students do receive can vary in quality and relevance. They told us that, for example, that advice from careers advisors and industry ambassadors may not provide practical information like the necessary exam choices or

58. Teen Tech (2016)

future pay. Often they find the advice does not genuinely engage with their own views, and is too focussed on the professional perspective of the advisor or ambassador.

> I would like to know if you have to have a good childhood and education to have an important career. I think that what would help me understand more is if I could talk to someone about my dreams of my future career and ask them if they had any advice on how to achieve your target.

It is essential that students are given access to role models and inspirational figures that they can identify with. This is especially critical in ensuring that girls and young women are not shut out of the STEM sectors. Apps for Good told us their **Expert community** who provide mentoring and expert support, is 35% women, while their new **TechFuture Women's Network**, launched in partnership with Capgemini and the Tech Partnership, is designed to enable female digital professionals to engage with schools and students.[59]

> Meeting individuals who actually have experience in the field I am interested in... is important so they can share their passion, work-ethic and day-to-day experiences in their career.

Haringey needs to tap into similar networks and promote the opportunities for STEM academics, undergraduates and professionals to volunteer in schools. Schools should also monitor the educational and career destinations of their students as a means by which to identify role models and ambassadors whose experiences will genuinely resonate with Haringey's young people.

> They tell us what the job involves but they need to tell us how you can get the job and how they did.

Haringey is already working with schools to integrate careers education into the curriculum and link the subjects they are teaching to relevant job pathways, and this needs to continue. Alongside this, it should make establishing and strengthening the partnerships between schools and employers a priority. The recommendations we have made so far about improving employability, industry-focussed professional development for teachers and inspiring extracurricular activities all depend on good links between employers and educators.

We have heard evidence of great examples of relationships between industry sectors and schools and colleges. In the digital and start-up sphere, organisations like **Founders 4 Schools**, which connects entrepreneurs with schools, are able to engage young people with different perspectives of business. Building links with start-up accelerators or a representative group like **Tech London Advocates** might be another way of accessing this sort of sector. **Ada, the National College for Digital Skills**, to be based in Tottenham Hale, has a rich set of relationships with both large technology companies and emerging start-ups, while the **Fashion Technology Academy** has built similar links with textile manufacturers and fashion designers.

In life sciences, all major research institutes, such as the **Francis Crick Institute** or the **Centre of the Cell** at the Blizard Institute, Queen Mary University, have public engagement and science education as one of their strategic priorities. Haringey could also use its own existing partnerships, with, for example, developers, the construction industry, the NHS and TfL to unlock new opportunities for schools.

It is vital to ensure such partnerships are sustainable and able to benefit schools consistently across the borough, and that schools have the capacity to integrate these opportunities into the work they are already

59. Apps for Good (2015)

doing. Corporate Social Responsibility schemes from major firms can often be limited in terms of time and scope – or do not match adequately with the goals of the schools.

Nor is it always a straightforward dialogue. The Commission has heard from both businesses dismayed at a lack of interest from schools, and from teachers who find businesses inaccessible and remote – "too often, industry doesn't know how to engage with education and education doesn't know how to engage with industry."[60]

There is therefore a clear need for some form of effective brokerage between schools and employers. The STEM Coordinator will be important in this, but may not have the expertise or contacts to do it without support. The Commission therefore recommends that the council identifies a partner organisation to lead this work.

Organisations like **Business In The Community** and the **East London Business Alliance** are already active in the borough. ELBA's successful **Business Action Group for Schools** initiative, which links groups of businesses with individual schools and colleges, is one model that could be used, as is BITC's **Business Class** programme, which establishes long term partnerships between individual businesses and schools, to support leadership and governance, mentoring, careers guidance, work experience, enrichment activities and teaching.

RECOMMENDATION

6

Haringey should identify a partner organisation who can help build sustainable relationships between businesses and the local education system in order to support extracurricular activities, professional development for teachers and careers advice. This partner should work closely with the Haringey STEM Coordinator and the Teaching School Alliances.

Haringey should create a clear pathway for STEM professionals to volunteer in Haringey schools to support enrichment activities such as after school clubs, mentoring and careers advice, and proactively work with businesses, universities and professional organisations to recruit volunteers. Schools should track the educational and career destinations of their students in order to identify role models, ambassadors and supporters for their extracurricular activity and work-related learning.

A more specialised and effective further education sector

Getting post 16 and further education right is essential for giving Haringey's young people the best chance of accessing appropriate training and employment. The further education system is especially important in meeting the needs of those students of middle ability who may not wish to follow an academic route. As the Royal Society notes, "more STEM qualifications in England are completed by 16-18 year olds in the FE and skills sector than in schools".[61]

STEM sectors will require and support jobs at every level. The Gatsby Foundation projects that as many as 700,000 more science and technology technicians will be needed by 2020 to meet demand from employers, for example.[62] High-quality vocational training and credible apprenticeship programmes are a critical vehicle for allowing young people to access these opportunities.

Our discussions with both employers and colleges suggest that post-16 education does not work for all young people. A recent report

60. Apps for Good (2015)
61. The Royal Society (2014)
62. Gatsby (2016)

from the **House of Lords Social Mobility Committee** described the system as "complex and incoherent, with confusing incentives for young people and employers".[63] A CBI survey showed that 38% of businesses want post-16 qualification programmes to be "more relevant to business needs", and reported declining satisfaction with training providers, with private sector providers felt to be outperforming further education colleges.[64]

We know that the successes London has had in primary and secondary education over the last decade have not been replicated at key stage 5 and the Mayor of London's **Annual Education Report** suggests this may be partly down to young people making inappropriate choices of what to study after GCSEs.[65]

Certainly we have heard evidence that the expectations of both teachers and parents – the main sources of advice for young people when it comes to educational and career choices – tend to privilege academic routes over vocational ones. CONEL told us in their evidence that there is "a perception of parents and young people – typically reinforced by schools – that A Levels followed by University is the best route to success for students with technical education seen a second-best alternative".[66] One student expressed frustration that there was an assumption "that because I am academic I am automatically going to follow a traditional academic pathway (e.g. college and university)."[67]

We know that the provision of post 16 education and training in the east of the borough is not as strong as it should be. The performance of Haringey FE institutions, and the most popular destinations outside the borough, is worse than that of Haringey school sixth forms, at both academic and vocational level[68]. The Commission considered whether the absence of school sixth form provision in schools in the east of the borough was a barrier to improvement, but there is little evidence that school sixth forms in themselves provide better outcomes for young people than strong further education settings, and establishing new school sixth forms is unlikely to be financially sustainable.

We do believe, however, that a substantial intervention may be required in the further education sector to ensure Haringey has post-16 provision that is fit for the challenge of the modern economy. Haringey needs a range of high-quality provision meeting the needs of all students, enabling young people to pursue high-end vocational qualifications and apprenticeships as well as traditional academic routes.

Typically, colleges face difficulties in providing both the essential courses necessary to improve the basic skills of those leaving school with few or no qualifications and higher level qualifications across a large range of subjects and specialisms. Furthermore, the relationships colleges have with businesses are weaker than elsewhere in the country. London's diverse economy means the picture is more complex than in areas with a single large employer, but the capital could learn from the experience of, for example, the north east, where links to industrial partners are particularly strong.[69]

Evidence we have heard from the National College for Digital Skills and Fashion Technology Academy show that tightly-focussed, specialised provision can attract significant industry support and endorsement. Siemens also gave evidence about their work with the **National Training Academy for Rail** in Northampton, and their partnership with **Barking & Dagenham College** which delivers advanced apprenticeships in electrical and electronic engineering.

The Commission therefore believes that the provision in Haringey and beyond needs to become more specialised and focussed. This will enable colleges to build better links with employers and businesses, supporting qualifications and training with clear job

63. Social Mobility Committee (2016)
64. CBI/Pearson (2015)
65. GLA (2015)
66. CONEL (2015)
67. TeenTech (2016b)
68. DfE (2016f)
69. AoC (2013)

outcomes. It should also give young people and parents a clear idea of the most appropriate institution and courses for them.

The University Technical College in Tottenham has outstanding facilities and a strong reputation for outreach in local primary schools, but, as with many UTCs across the country, has struggle to recruit students for entry at 14. There are now proposals to establish a new London Academy of Excellence on the UTC site, sponsored by Highgate School and Tottenham Hotspur. As well as providing a new setting for the most able students, their ambition is to support provision in 11-16 schools in the local area, through outreach activities and professional development for teachers.

The Commission welcomes LAE Tottenham as an exciting new institution which has the potential to raise the ambition and the status of education in Tottenham, and we see them as an important new partner in delivering other recommendations in this report.

We are also clear, however, that this must be complemented by improvement elsewhere in the system to ensure young people of all abilities have access to the best possible education or training. By sending such a strong signal about the future of the education system in Tottenham, we are optimistic that the arrival of LAE Tottenham will help Haringey Sixth Form College to continue to improve. HSFC should also identify a strong further education college to act as a partner to support that process.

With LAE Tottenham and HSFC focussing on A Levels, CONEL should continue to focus on improving their vocational provision. At a time when the instinct of many providers is to expand in size and merge with others, we believe there may be benefit in smaller specialist colleges being established within larger institutions like CONEL, partnered with business, to provide high-quality training with a clear focus on career outcomes. The schools-within-schools established in some academies may be a useful model.[70] CONEL's new Advanced Engineering Centre of Excellence, supported by employers like Bayleigh International, Siemens, Kelvin Hughes and Johnson Matthey, is a good example of what can be achieved. These could run alongside courses aimed at those who still need to develop basic maths and literacy skills.

The area review of skills provision in central London, of which Haringey is a part, has been taking place since early 2016, and its conclusions are likely to coincide with the publication of this report. We have urged the review to be as concerned about the quality of future provision as it is about its financial sustainability, and hope that the outcomes will provide a fertile context for the kind of improvement we propose.

70. e.g. The Hastings Academy

RECOMMENDATION

7

The local authority, schools and colleges should work together to build a post 16 sector in Haringey that provides an improved academic and vocational offer across the whole borough which meets the needs of all young people.

The Commission welcomes the establishment of an academic sixth form in the east of the borough and its ambition to support teaching and learning in other schools in the area. CONEL and Haringey Sixth Form Centre should provide other elements of a strong academic and vocational offer for young people of all abilities, along with specialist provision at Ada College and the Fashion Academy.

It is essential that Haringey Sixth Form College continues to improve and it should develop a strategic partnership with a strong further education college to support it in doing so.

CONEL should develop high-quality, industry-focussed provision within specialist units, build on their emerging partnerships with employers like Siemens, alongside the provision of level one and two courses aimed at those lacking basic skills.

All Post 16 institutions should work with the Teaching School Alliances, Haringey STEM Coordinator, and business brokerage partner to develop their teaching, build relationships with employers and collaborate.

The role for the local authority

As our findings and recommendations show, the way for education system in Haringey to thrive is not for individual schools to exist in isolation, but for the whole system to work together with businesses, experts and other partners to collaborate, share and improve.

A fundamental part of that system is the local authority. Local authorities have not 'run schools' in a direct sense for many years, but they are legitimate partners in influencing the education system on behalf of parents, young people and their local area. Throughout the report we have envisaged the council as influencing change, supporting school improvement, brokering partnerships, and providing important institutional support for the implementation of our proposals.

Haringey council should continue to champion the interests of young people and their families by keeping parents informed, strengthening school leadership, and providing continuing expertise and challenge.

Providing information for parents

There is a clear role for the local authority as the hub of information about the quality of schooling in Haringey. Lack of transparency about how schools perform is a barrier to improvement and the information that does exist can be inaccessible and hard to interpret. The Commission itself has found it difficult to get information about, for example, the teaching workforce.

It will also be essential to track and monitor the impact of the Commission's recommendations. We have seen how existing accountability measures are imperfect, with science is no longer tested at Key Stage 2, for example, and there would be benefit from the local authority identifying additional indicators that could help incentivise improvement in the areas we have identified.

The local authority should develop a set of indicators and contextual information to be published in a clear and accessible format as an annual Haringey Education Report that will both inform parents about the quality of education in the borough, and help to drive improvement.

The content should be developed following consultation with parents, teachers, schools and colleges, but should include the amount of mathematics, science and technology taught at primary level; secondary attainment in STEM subjects; the number and diversity of students taking STEM qualifications to 16 and post-16 and their subsequent educational or employment destinations; and the numbers and specialisms of STEM teachers.

RECOMMENDATION

8 *Haringey should develop and publish its own annual Haringey Education Report, to inform parents and to monitor and drive improvement.*

The local authority should also support parents to help young people make appropriate decisions about subject choices, post 16 courses, and future careers. When we asked Haringey's young people where they got advice about potential careers from, almost 70% said they received advice from their parents – the biggest proportion of any information source, and vastly more than those who cited careers advisors, online resources or careers events.[71]

Many parents, however, are not aware of the kinds of careers that are on offer and have a limited understanding of the best routes towards them. One parent told us: "As non-scientists we weren't in a position to advise our son on which subject to pursue and it is very difficult to get a good understanding of the full range based on paper or website detail." Kings College London and their ASPIRES programme encouraged us to improve Haringey's "science capital", the confidence and capability of families to support young people in choosing science-based careers. To do this we need to not only inspire and inform our young people about STEM, but also their parents.

Many of the recommendations made in this report – for new enrichment activities, workplace visits, and events – can be broadened to involve and inform parents, and the Commission suggest that the local authority, as the champion of parents, develop a strategy to ensure this happens.

RECOMMENDATION

9 *Haringey should develop a strategy for improving the information and advice parents receive about post-14 and post-16 choices, and future careers. This should include:*

- *publishing clear information about the range of subject options, student attainment, and educational and employment destinations;*
- *schools opening up extracurricular and enrichment activities to parents as much as possible;*
- *aiming Haringey's new Careers Fair at both parents and young people;*
- *ensuring the proposed Haringey STEM Festival includes at least one event aimed at parents – e.g. A Haringey Annual Lecture.*

Strengthening leadership

The local authority should support schools in strengthening their governance and leadership. Where relationships with business, innovation in the classroom and enriching extracurricular activities exist in Haringey, the Commission heard time and again how many of these were brokered through a school parent or through a governor. The Head of Careers at Engineering UK is a parent governor in a Haringey primary school, and has been instrumental in brokering links with a local secondary school, supporting the development of STEM and Code Clubs, and supporting and advising teachers.

These serendipitous and informal links are often the best way of replicating the entrepreneurial quality of much of the best STEM education work. Links with employers thrive where they are organic and built on prior relationships, and all schools should have this capacity within their leadership. The Wellcome Trust recommended having subject-specific link governors in every school.[72] The council should encourage professionals from STEM sectors to become

71. Teen Tech (2016)
72. Haringey STEM Commission (2016)

school governors and to bring the benefit of their experience and networks to supporting STEM provision in schools.

In order to give a focus to this governor's work, governing bodies should also set their own specific STEM-related objectives as part of their overall strategic planning. These should be linked to the indicators identified in the Haringey Education Report (recommendation 8) as well as setting out how they contribute to supporting the Commission's other recommendations.

RECOMMENDATION

10 *Every school in Haringey should have a link governor for STEM, drawn from a relevant industry. Haringey should use its business brokerage partner to identify and recruit local residents who work in the STEM industries. Each governing body should set specific STEM-related objectives that reflect the borough's overall ambitions to improve STEM performance.*

Continuing expertise and challenge

The Commission evidence sessions have been a valuable process in and of themselves, in building new partnerships, identifying new opportunities and ideas for Haringey, and in ensuring our view of the sector is up to date and relevant. Maintaining the momentum of the Commission would be supported by the establishment of a standing group, hosted by the local authority, to test, challenge and inspire new ideas around STEM education in the borough.

As a part of this, the borough should recruit an "Innovator In Residence". Inspired by the successful "author in residence" schemes used by many schools to promote reading and literacy, the Commissioners expect the ideal candidate to be an entrepreneur or digital professional able to inspire and capture the imagination of young people. They should work directly with schools to provide workshops and other activities, and provide expert advice to the council, schools and colleges about ways to develop their practice.

RECOMMENDATION

11 *Haringey should appoint a standing expert reference panel, drawn from local residents active at a senior level in STEM industries, to provide continuing advice, guidance and contacts.*

Haringey should also recruit an "Innovator In Residence" able to work with schools and colleges to support enrichment activities and curriculum delivery, as well as provide advice and support to the council in continuing to develop work in this area.

The local authority should also involve children and young people in the delivery of the Commission's aims. The Haringey Young STEM Commission, hosted by TeenTech, have already provided valuable insights and should continue to be used to test new ideas and champion STEM to their peers across the borough. The **Childnet Digital Leaders Programme**, which aims to "champion digital citizenship and digital creativity" within schools, may be a model.

RECOMMENDATION

12 *The borough should pilot a local STEM Leaders Programme, using those young people already involved in the Haringey Young STEM Commission, to champion STEM in schools and provide the insights of young people into the future of STEM in the borough.*

NEXT STEPS

No single organisation can take forward our recommendations in isolation. To truly transform STEM education in Haringey and make a tangible difference to the life chances of its young people will require schools, colleges, businesses, teachers, parents, governors and young people to work together, with the support of the local authority.

We expect the local authority, in consultation with schools, colleges and employers, to put together an action plan for implementation of the Commission's recommendations by the autumn, and believe it would be helpful to review progress in eighteen months time, during the first quarter of 2018.

The Commission has worked with businesses, experts and institutions – many with a personal connection to Haringey – who have expressed a genuine willingness to work with and support the borough in the next phase of this work. We will be handing over those partnerships to the local authority and hope they will be able to use them to make the vision of this Commission a reality.

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