Response to Migration Advisory Committee call for evidence to inform their 'Partial review of the Shortage Occupation List: Teachers'

16 September 2016

A joint response from:

The Advisory Committee on Mathematics Education (ACME), the Association for Science Education (ASE), the Institute of Physics, the Royal Society, the Royal Society of Biology, the Royal Society of Chemistry and the Royal Society of Edinburgh.

Our response will focus on providing evidence to support the continued inclusion of chemistry, mathematics and physics on the shortage occupation list and providing evidence to suggest that computing teachers should be added to the list. We structure our response into three specific questions, considering future as well as current shortages and the factors that will affect the ability of the education sector to respond. Supporting evidence for each of these points is provided in the accompanying annexes.

In addition to this joint written response, our learned societies were pleased to meet with the Migration Advisory Committee (MAC) during summer 2016 to further address evidence needs. These meetings covered both UK-wide and Scottish-specific discussions.

1. Are there indications of existing teacher shortages in chemistry, computing, mathematics or physics?

1.1. **There have been shortfalls in the recruitment of science and mathematics teachers for over 30 years.** The Royal Society presented the cumulative shortfall of science and mathematics teachers in its 2010 'The Scientific Century' report[1] (see Figure 1, Appendix 2: Supporting Figures). By 2010, there had been under-recruitment of physics teachers for 25 years, and the Institute of Physics estimated that 1,000 physics teachers a year for the next 15 years would be required to address this.[2] ACME has indicated that secondary schools have a shortage of 5,500 specialist mathematics teachers in England, and that one quarter of those teaching 11-14 year olds do not have a mathematics-relevant qualification.[3]

1.2. **This historic under-recruitment in STEM subjects is not currently considered in the National College of Teaching and Leadership (NCTL) teacher supply model,** which dictates initial teacher education recruitment targets in England. This is a recognised weakness of the model.[4]

[1] The Scientific Century: securing our future prosperity. The Royal Society, 2010. https://royalsociety.org/~/media/Royal_Society_Content/policy/publications/2010/4294970126.pdf
[2] Physics and: teacher numbers, Institute of Physics September 2010 http://www.iop.org/news/10/sep10/file_44832.pdf
[3] ACME Maths Snapshot, Teachers of mathematics: supply training and development http://www.acme-uk.org/media/20263/teachersofmathematics.pdf
[4] House of Commons, The Committee of Public Accounts. Training new teachers. 25 May 2016. http://www.publications.parliament.uk/pa/cm201617/cmselect/cmpubacc/73/73.pdf

1.3. **The quality of science, mathematics and computing teachers must be considered a priority, alongside the need for strong supply.** Research indicates that it is teacher competence that has the greatest effect on student achievement.[5] Initial evaluation of recently commissioned research by the Royal Society of Chemistry suggests that subject specialist degree-qualified teachers in chemistry positively affect pupil progression. The Department for Education Workforce Census data for England shows that the number of physics teachers with no relevant post A level qualification in physics is 37% and increasing.[6] For chemistry and mathematics the number of non-subject specialist teachers remains consistently high, at around 25%. 73% of National Union of Teachers (NUT) school leader members are finding it hard to recruit teachers and over half (51%) said that shortages mean lessons are being taught by non-subject specialists.[7] It is a different situation in Scotland relating to subject specialism where, once qualified, secondary school teachers will ordinarily teach their own specialist subject(s).[8] However, it is recognised that there is a shortage of specialist teachers at secondary level in Scotland in chemistry, computing, mathematics and physics. Furthermore, initial teacher education intake targets are not being met in these subject areas.[9]

1.4. **MAC should define subject specialism clearly within its review of teacher shortages as the number of subject specialist teachers is an important indicator of subject-specific teacher shortages.** A subject specialist has previously been defined as a teacher who has: "at least one of the following: a relevant degree; demonstrated sufficient experience in the subject through employment; or a qualification from a 24-week Subject Knowledge Enhancement course. The teacher must then gain a teaching qualification in the specialist subject."[10]

1.5. **In England, government vacancy data collected annually in November provides an inaccurate snapshot of staff shortages within schools because it is collected ahead of the peak periods when schools advertise posts.** TeachVac data indicate that in England most recruitment occurs between the Easter holidays and the end of May.[11] In Scotland, the Teacher Census[12] is an annual dataset collection of teachers in all publicly-funded schools in Scotland. However, in 2010 the Scottish Government discontinued its annual report on vacancy statistics for teachers. Improved central data on teacher shortages and vacancies are required.

1.6. **Recently published data show that Scottish secondary schools are experiencing a severe shortfall in computing science teachers. There has been a 25% drop in the number of computing science teachers in the past 10 years and in 2016 17% of schools do not have a specialist computing science teacher.[13]**

1.7. **Teachers' salary data is an unsuitable indicator of teacher shortages as salaries are often tied to paybands.** A qualified teacher in England is, in theory, qualified to teach any subject (this is not true for Scotland, see 1.3). Therefore, in science subjects, other science teachers or supply teachers may be used to fill gaps outside their own specialism, removing the need to pay more for a subject specialist. Instead of a rise in salary, there may be a rise in the number of non-subject specialist science teachers, which is indeed the case (see point 1.3 and Annex 2, Figures 1 and 2). In STEM subjects, changes in the number of teachers holding subject-specialist qualifications over time is a much clearer indicator of subject-specific teacher shortages than teacher pay.

---

[5] Husbands and Pearce, 2012. What makes great pedagogy? Nine claims from research. National College for School Leadership. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/329746/what-makes-great-pedagogy-nine-claims-from-research.pdf
[6] See Annex 2, Figures 1 and 2.
[7] Survey of NUT leadership members https://www.teachers.org.uk/news-events/conference-2016/education-chaos-survey-leadership
[8] General Teaching Council for Scotland, http://www.gtcs.org.uk/
[9] See Annex 2, Figure 7.
[10] Subject Specialist Teaching in the Sciences: Definitions, targets and data. SCORE 2011. http://score-education.org/media/7987/spec-teach.pdf
[11] The TeachVac Review. An analysis of the labour market for secondary school teachers in 2015 https://www.researchgate.net/publication/280577031_TeachVac_Review_Teacher_recruitment
[12] Scottish teacher census http://www.gov.scot/Topics/Statistics/Browse/School-Education/PubTeacherCensus
[13] Computing science teachers in Scotland 2016, Computing at School Scotland. http://www.cas.scot/wp-content/uploads/2016/08/ComputingTeachersinScotland-CASSReport2016.pdf

1.8. **To the best of our knowledge, there is no subject-specialist data available on hours worked for STEM teachers.** Across all subjects, on average, teachers work 49 hours a week in Scotland and 52 hours a week in the rest of the UK.[14]

1.9. **Teacher retention rates contribute to teacher shortages, so teacher survey data may be a useful additional indicator of shortages.** For example, in the Association of School and College Leaders' (ASCL) most recent survey in March 2016, 84% of respondents stated that teacher shortages are having a detrimental impact on the education they are able to provide.[15] Teacher workload is regularly cited as the main reason teachers are considering leaving the profession.[16,17]

2. Is there any evidence that demand for teachers in these subjects will increase or decrease in the future?

2.1. **A greater number of science, mathematics and computing teachers will be required over the next decade.** The number of secondary school pupils is set to increase from 2016, due to increases in the birth rate since 2002. Secondary school pupil numbers will continue to rise, peaking in 2024 when pupil numbers will be 20% higher than in 2015.[18]

2.2. **Changes in 16-18 mathematics provision in England and the Government's ambitions for more pupils studying science and mathematics to 18 also mean that a larger number of teachers will be required to teach these subjects.** 1) The new GCSE Mathematics requires more lessons per week and increased teacher expertise given the emphasis on problem solving.[19,20] 2) All students who do not achieve a grade C in GCSE Mathematics are now expected to continue with the subject post-16. 3) From 2015 a new post-16 Core Maths qualification for students with GCSE grade C and above (as an alternative to AS/A level Mathematics) has been made available.[21]

2.3. **The number of teachers available to teach STEM subjects will need to increase if industry skills needs are to be met.** Cogent Skills, the UK's strategic body for skills in the science industries, has estimated that UK chemistry-using industries will need 12,000 more apprentices and 19,000 more graduates than are predicted to be available by 2020.[22] The CBI highlights that STEM skills shortages are a key concern for their members.[23]

3. What factors could be affecting ability to meet current and future demands for teachers in these subjects?

3.1. **There is a shortage of STEM graduates across a wide range of sectors, including teaching.** Raising the total number of STEM graduates requires increasing the number of students studying STEM subjects post-16. Without subject-specialist teachers to inspire and

---

[14] Pay and Conditions of Scottish Teachers: Recent Evidence. David Bell, 2011 http://www.gov.scot/resource/doc/920/0120757.pdf

[15] Survey shows damage of teacher shortages, ASCL http://www.ascl.org.uk/news-and-views/news_news-detail.survey-shows-damage-of-teacher-shortages.html

[16] Should I stay or should I go? Analysis of teachers joining and leaving the profession. NFER, 2015 https://www.nfer.ac.uk/publications/LFSA01/LFSA01.pdf

[17] Workload Challenge: Analysis of teacher consultation responses https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/401406/RR445_-_Workload_Challenge_-_Analysis_of_teacher_consultation_responses_FINAL.pdf

[18] Statistical First Release, National Pupil Projections – Future trends in pupil numbers. Department for Education. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/478185/SFR24_2015_Projections_Text.pdf

[19] ACME letter to Ofqual, comments on proposals for new GCSE Mathematics, December 2013. http://www.acme-uk.org/media/14378/20131210%20letter%20from%20ss%20to%20glenys%20stacey.pdf

[20] Written statement to Parliament, Reformed GCSE's in English and mathematics https://www.gov.uk/government/speeches/reformed-gcses-in-english-and-mathematics

[21] ACME Maths Snapshot. Teachers of maths: supply, training and development. http://www.acme-uk.org/maths-snapshots/teachers-of-maths-supply,-training-and-development

[22] Parliamentary briefing: Specialist chemistry and primary science teaching in England, Royal Society of Chemistry. http://www.rsc.org/globalassets/04-campaigning-outreach/campaigning/campaign-for-specialist-teaching/parliamentary-briefing-england.pdf

[23] CBI and Pearson skills survey 2016, The Right Combination http://www.cbi.org.uk/cbi-prod/assets/File/pdf/cbi-education-and-skills-survey2016.pdf?mc_cid=dce980549f&mc_eid=6be1e9feb5

promote a love of the subject, which increases the pursuit of these subjects at 16-18 and beyond, the cycle of persistent STEM skills shortages is going to be difficult to address.

3.2. **Breaking this self-perpetuating negative feedback cycle will take time.** Research by King's College London[24] shows that if 10 year olds cannot visualise themselves as a future scientist or engineer, they are unlikely to be able to do so by the time they are 14, this self-perception then influences subject choices at age 14 and beyond. Primary students must be targeted if more students are to pursue these subjects, yet unfortunately very few primary teachers have STEM specialist qualifications.[25] Typically, it takes at least five years from starting post-16 courses for a science or mathematics graduate to be ready to enter teacher education programmes.

3.3. In England, the NCTL (or its predecessors) have been closest to reaching **teacher recruitment targets for STEM subjects during and immediately following the economic recessions in 2008-10 and 1991-93, indicating the difficulty in attracting STEM graduates into teaching when opportunities exist elsewhere.[26]**

3.4. **Teacher salaries do not compare favourably to the earning potential of STEM graduates.** The median salary of STEM graduates 5 years after graduation is £35,000.[27] The average salary for a teacher under the age of 25 is £24,400 and for those aged 25-29 it is £29,300.[28] Bursary schemes are in place in England to attract EBacc graduates into teaching[29] and similar bursaries exist in Wales. In England scholarships are also available for chemistry, mathematics and physics, but these incentives are still in the process of being evaluated.

3.5. **Raising teachers' professional status is the only long-term way to address teacher shortages.** Teacher professional status and supply, are fundamentally linked. If the status of the profession were to be raised and teaching were to be well marketed to undergraduates, this would undoubtedly attract a larger number of high quality, subject-specialist candidates and improve retention. High-quality initial teacher education and ongoing subject-specific professional development, as well as addressing workload issues, are key aspects of this.[30]

[24] ASPIRES Young people's science and career aspirations age 10-14. Kings College London. http://www.kcl.ac.uk/sspp/departments/education/research/ASPIRES/ASPIRES-final-report-December-2013.pdf
[25] State of the Nation, Science and mathematics education 5-14, The Royal Society 2010. https://royalsociety.org/topics-policy/projects/state-of-nation/5-14/
[26] Smithers and Robinson, Coping with Teacher Shortages, 2000. https://www.teachers.org.uk/files/active/0/Shortages.doc
[27] Higher Education Statistics Agency, Destinations of Leavers Data, Longitudinal survey. https://www.hesa.ac.uk/index.php?option=com_content&view=article&id=1899&Itemid=239#long
[28] School Workforce in England: November 2015. https://www.gov.uk/government/statistics/school-workforce-in-england-november-2015
[29] https://www.gov.uk/guidance/funding-initial-teacher-training-itt-academic-year-2016-to-17
[30] ACME, Beginning Teaching: Best in Class. http://www.acme-uk.org/news/news-items-repository/2015/11/beginning-teaching-best-in-class