



Parliamentary briefing: Specialist chemistry and primary science teaching in England

The subject knowledge of chemistry and primary science teachers has a positive impact on pupil attainment, yet in England there is a shortage of teachers with this knowledge. The Royal Society of Chemistry believes that the Government should take action to address this shortfall in order to give students in England a world-class science and chemistry education.

Chemistry benefits the UK economy

Science is crucial to the UK economy, creating opportunities across the country. However, despite the benefits it brings, too many young people are missing out on job opportunities because of a lack of science and chemistry skills.

For example, Cogent, the Sector Skills Council, has estimated that chemistry-using industries in the UK **will need 33,000 apprentices and 37,000 graduates by 2020, yet projected supply is only 21,000 and 18,000 respectively.**

We're lagging behind our competitors

The UK's overall rating for science education in the recent PISA assessment, including the specific rating for England, lags far behind those of many international competitors including Singapore, Germany, Poland, Vietnam and the Chinese regions of Shanghai and Hong Kong.

In addition, an international analysis from the Department for Business, Innovation and Skills identified that despite the UK's good global reputation for science, the country shows "weaknesses in the [STEM skills] talent base". The same report stresses that the UK's comparator countries "are making significant efforts to train, attract and retain STEM talent".

Specialist teaching is part of the solution

One key area of chemistry education where England is lacking in comparison to these countries is the subject knowledge of chemistry and primary science teachers:

- **One-third of secondary-school chemistry teachers do not have a chemistry degree.¹**
- **In a survey of a sample of primary schools, only 6 per cent were found to have a science subject leader with a science degree.²**

¹ School Workforce Census 2013: <https://www.gov.uk/government/publications/school-workforce-in-england-november-2013>. Data covers maintained schools, free schools and academies

² *The deployment of science and maths leaders in primary schools. A study for the Wellcome Trust* (2013)

- **In addition, only 8.3 per cent of primary school teachers overall (as opposed to just science subject leaders) in England have a science degree.³**

We believe that having a qualification from a relevant Subject Knowledge Enhancement course, or holding relevant professional experience, should also be viewed as viable alternatives to holding a relevant degree. In addition, at primary level, we believe that an A Level in at least one science subject is also sufficient. However there are still far too few teachers who even have these qualifications.

This means that many students in England are taught by teachers who do not have a specialist knowledge background of the subject they teach. This is a concern, as evidence shows that **teachers with specialist subject knowledge can have a positive impact on a child's education.**

For example:

- Subject knowledge of teachers “is a **key determinant of success**, especially in the sciences and mathematics”, according to 2010 DfE report
- Teaching is of **better quality** where secondary chemistry and primary science teachers hold qualifications in the subjects they teach, according to the National Audit Office
- The Sutton Trust recently found that the **most effective teachers have a deep knowledge** of the subjects they teach, and when teachers' knowledge falls below a certain level it is a significant impediment to students' learning
- A lack of specialist subject knowledge can result in teachers focusing on presenting unrelated facts, rather than teaching with a wider conceptual framework, according to the Wellcome Trust
- Subject specialist knowledge enables teachers to be **more capable of stretching the most able students**, according to research undertaken for BIS
- The Royal Society of Chemistry has found that chemistry specialist teachers often have a significant **impact on the decisions of students to study the subject at A-level or university**

“I have recruited and worked in departments with specialist and non-specialist chemistry teachers. Specialists are able to provide a better quality of education due to their breadth of knowledge. They're much more flexible in the classroom and are often more likely to come up with creative ways to teach the subject beyond the text book. In my school, those taught by a chemistry specialist at GCSE have been much more likely to continue the subject at A-level – I believe this is because the quality of teaching has been better and the teachers are more likely to make the subject exciting.”

Head of Chemistry at a state secondary school in England

Policy makers should avoid the temptation of focusing just on secondary school teaching when seeking to address this issue. Effective science teaching at primary level is extremely important, as children start to develop perceptions about whether science is ‘for them’ towards the end of primary

³ Outlined in answer to House of Commons written question 218919
<http://www.parliament.uk/business/publications/written-questions-answers-statements/written-question/Commons/2014-12-16/218919/>

school⁴, potentially impacting on their long term attainment and interest in the subject. In addition, as young children's own ideas are often in conflict with scientific ones, if taken into secondary school these ideas can inhibit effective learning.⁵

The importance of continuing professional development

Holding expert subject knowledge through a degree or other routes is essential in becoming an effective subject specialist, but continuing professional development (CPD) is also important for new and existing teachers, particularly for those teaching science subjects.

For example, Ofsted's 2013 report on science teaching in English schools shows a **connection between schools gaining an outstanding inspection grade and whether teachers had access to science-specific CPD.**

We believe that all chemistry and primary science teachers should undertake ongoing CPD.

What are the solutions?

To give students in England a world-class science and chemistry education, the Government must ensure that by 2020:

- **Every post-14 chemistry student, including those studying the subject as part of a combined science qualification, is taught by a chemistry-specialist teacher;**
- **In every primary school, the science subject-leader is a specialist.**

To achieve this, the Government should work with a variety of stakeholders to:

Ensure chemistry teachers and primary science leaders have the right subject expertise:

- *The Government should maintain and increase successful initiatives to encourage more chemistry and science graduates to enter teaching.*
- *The Government should urgently address the severe shortage of science graduates becoming primary teachers and consider rolling out some of the more successful secondary science teacher recruitment incentive programmes to primary.*
- *Secondary schools should ensure that all new chemistry teachers not holding a chemistry degree or equivalent professional experience complete a 24-week Subject Knowledge Enhancement course.*

⁴ Wellcome Trust: Primary Science: Is It Missing Out? Recommendations for reviving primary science (2014) http://www.wellcome.ac.uk/About-us/Publications/Reports/Education/WTP057244.htm?utm_source=Adestra&utm_medium=email&utm_content=Is%20Primary%20Science%20Missing%20Out%3F&utm_campaign=Primary%3A%20Advocacy%20 and also see Kings College London: Aspires project report (2013) <http://www.kcl.ac.uk/sspp/departments/education/research/aspires/ASPIRES-final-report-December-2013.pdf>

⁵ Wellcome Trust: Perspectives on Education – Primary Science (2008) http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtd042076.pdf

Ensure chemistry teachers and primary science leaders have access to continuing professional development:

- *Schools and governing bodies should consider the specialist knowledge of their staff, and ensure that sufficient time and funding is allocated for subject-specific Continuing Professional Development (CPD).*
- *The Government should monitor the effect of the “Professional Update” programme in Scotland, particularly on science teaching. If the scheme has a positive impact, it should consider implementing a similar scheme.*

Learn from best practice overseas, and build a better understanding of the situation in England:

- *The Government should collect and assess data on the subject-based qualifications, training and deployment of chemistry and primary science teaching staff. This data should be made available for analysis at local, regional and national levels.*
- *The Government should undertake research into the impact of science specialism in other jurisdictions, and identify areas of best practice that could be applied in England.*

Action MPs and peers can take

To help increase specialist teaching in England, there are three actions parliamentarians can take now:

- Ask the Education Secretary and all political parties to commit to ensuring **every post-14 chemistry student is taught by a chemistry-specialist teacher by 2020**
- Ask the Education Secretary and all political parties to commit to ensuring that **by 2020 every primary school should have science subject-leader who is a specialist**
- **Publicly support specialist teaching** by contributing to debates in Parliament and by making your support clear in the media

Our full report, *Inspiring, engaging and expert: the formula for world-class science and chemistry education*, is available here: www.rsc.org/AboutUs/Campaigns/science-teaching/index.asp

About the Royal Society of Chemistry

The Royal Society of Chemistry is the world's leading chemistry community, advancing excellence in the chemical sciences. With over 49,000 members and a knowledge business that spans the globe, we are the UK's professional body for chemical scientists; a not-for-profit organisation with 170 years of history and an international vision for the future. We promote, support and celebrate chemistry. We work to shape the future of the chemical sciences – for the benefit of science and humanity.

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