

Education Select Committee Inquiry: Careers Education, Information, Advice and Guidance (CEIAG)



Representation from the Royal Society of Chemistry

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About Us

With around 45,000 members in more than 100 countries and a knowledge business that spans the globe, the Royal Society of Chemistry is the UK's professional body for chemical scientists, supporting and representing our members and bringing together chemical scientists from all over the world. Our members include those working in large multinational companies and small to medium enterprises, researchers and students in universities, teachers, and regulators.

Careers Education, Information, Advice and Guidance (CEIAG) inquiry

The Education Committee of the UK parliament is holding an inquiry into the effectiveness of CEIAG given to students. The inquiry includes a review of the effectiveness of the current system, whether it provides sufficient careers advice to young people, and how arrangements for CEIAG could better support disadvantaged groups.

This is the RSC response to the call for written evidence on these areas.

Summary

The Royal Society of Chemistry has significant concerns that students do not understand the careers opportunities that chemistry can offer, and that this may be having an impact on student entry numbers to further study and careers. Chemistry is an important contributor to the UK economy and supports hundreds of thousands of jobs. Under the Government's plan to build back greener and achieve net zero emissions by 2050, we need people with the right skills and knowledge in the chemical sciences to take up green jobs. Chemistry is key to understanding and addressing many global challenges such as climate change, health, and energy; the chemical sciences will play a vital role in the transition to a more just and sustainable world. Without an adequate pipeline of chemical scientists, there is a real risk that the UK's ability to address these global challenges will be impacted.

Research indicates that students' aspirations to be scientists are formed early on and remain stable over time so careers advice and education should start early in secondary school. Inequalities exist in student aspirations and identities; there are several factors that are thought to contribute to these inequalities such as a student's experience of school science and the nature of the curriculum. Young people should understand the value of chemistry to society and to their future careers. This should be embedded in the curriculum as an expected learning outcome, and teachers supported with resources and ongoing professional development opportunities. Our response to this inquiry contributes evidence on the following two points:

- Whether the current system of careers education, information, advice and guidance (CEIAG) is serving young people, particularly:
 - those from disadvantaged backgrounds;
 - those who are known to the care system
 - those who are not in mainstream education, including home-educated pupils and those in alternative provision;

- those from different ethnic minority backgrounds; and
 - those who have a special educational need or disability.
- How careers and skills guidance could be better embedded in the curriculum across primary, secondary, further, higher and adult education, to ensure all learners are properly prepared for the world of work

Our Response

1. With about 50,000 members in 120 countries and a knowledge business that spans the globe, the Royal Society of Chemistry is the UK's professional body for chemical scientists, supporting and representing our members in large multinational companies and small to medium enterprises, universities, schools, government, and regulatory agencies. The contribution (direct, indirect and induced) of chemistry-using professionals to UK GDP was estimated to be £87 billion in 2019ⁱ. In a world where global challenges and advances in technology bring both uncertainty and new possibilities, the chemical sciences have a critical role to play. A successful chemistry education will ensure we have a sustainable supply of people with the curiosity, knowledge, and skills to address these global challenges.
2. UCAS figures available for chemistry show a 18 % drop in applications between 2015-2018ⁱⁱ. Since then, the most recent figures available for chemistry appear to show application numbers may have stabilised at this lower point, with a slight downturn in the most recent number for 2021ⁱⁱ. This decline is despite the numbers of students sitting A-level chemistry increasing, in England numbers have increased from 48,765 to 55,485 students from 2017 to 2021ⁱⁱⁱ.
3. Evidence shows that students may not understand the careers opportunities chemistry can offer. The ASPIRES2 survey was answered by more than 7,000 17- and 18-year-old students in England. In this survey, 31%^{iv} of chemistry A-level students said they picked chemistry A level because they were interested in the subject. Only 17.4%^{iv} of chemistry A-level students identified career relevance as one of their main motivations for studying chemistry A-level, this is much lower than for other subjects. In addition, only 7%^{iv} of chemistry A-level students reported they intended to pursue chemistry, or directly related courses after school. Our [open letter](#)^v signed by industry leaders, calls on the government, academy trusts and local authorities to take action to improve careers advice.
4. In [Green Shoots: a sustainable chemistry curriculum for a sustainable planet](#)^{vi} we presented findings from a recent survey of 549 11–18-year-olds. 66% of young people identified they are interested in future careers or study relating to sustainability. However, only 38% felt that studying chemistry can lead to lots of jobs in sustainability and climate change. The majority of respondents to our [Science Horizons Researcher Survey](#)^{vii} said that their work had potential applications in one of the global challenge areas we identified, with 86% identifying applications in relation to the environment and 68% to energy. Our recent report [Chemistry's Contribution: Workforce trends and economic impact](#)ⁱ highlights the role of the UK's 275,000 chemistry using professionals in underpinning a diversity of economic sectors which will contribute to and undergo significant change in a low carbon or circular economy future; for example oil and gas refining, chemical feedstock production, energy supply, waste and recycling and our world leading research organisations. We are calling on governments to ensure young people have the skills and careers information needed to progress into green jobs in the chemical sciences and contribute to the future green economy.
5. The uptake for science apprenticeships has declined from 2016 to 2020. Figures show that there were 3,150 new science apprentice starts in the academic year of 2019 to 2020, in comparison to 5,200 new starts in 2016-17^{viii}. At the same time, there is a particular challenge with attracting and retaining people in technical roles in the UK. Careers information appears to be linked to uptake of

apprenticeships. Data from the Careers and Enterprise company suggests that uptake of apprenticeships was about 16% higher for schools who provided access to information about the full range of apprenticeships to most or all students compared with schools who only provided information for a small minority^{ix}. ASPIRES2 found that students planning to pursue apprenticeships were 1.68 times more likely to report having careers education than their peers who plan to enter full-time work^x.

6. Data from the 2020 ASPIRES2 report shows that A-level chemistry students are more likely to be from the most socially advantaged backgrounds than those studying other subjects at A-level (25% vs 19%)^{xi}. A-level chemistry students are also more likely to have high science capital^{xii} compared with all other A-level students, including those studying physics and biology (14.1% compared with 2.7% for all other A-level students)^{iv}. There is a significant gap in undergraduate chemistry study between the most advantaged and disadvantaged students. There is a higher percentage of students from socio-economically advantaged backgrounds who study chemistry at undergraduate level than the percentage for all undergraduate subjects or the percentage for the wider population (of all ages) and vice-versa for socio-economically disadvantaged students^{xiii}
7. ASPIRES2^{xi} found that aspirations to be a scientist are formed early on and remain stable from ages 10 to 18. Inequalities exist in science identities and aspirations; these were already evident in primary school and exacerbated throughout secondary school. Teacher attitudes and behaviours, student experience of school science, and the curriculum all have a role in reinforcing or undermining science aspirations and identities.
8. [Chemistry for All](#)^{xiv} was a five-year research and outreach study conducted by the Royal Society of Chemistry to explore and address the barriers to participation in post-16 UK chemistry education. To increase the number of students who continue with chemistry post-16, and increase the numbers from underrepresented groups the following issues need to be addressed:
 - Challenge the perception that chemistry is a difficult subject only suitable for ‘naturally clever’ students.
 - Support teachers in providing examples in curricula of successful people in chemistry who have ‘worked hard’ rather than relied on ‘natural cleverness’.
 - Ensure a diverse range of people (gender, ethnicity, social background, age, etc) are portrayed as contributing to chemistry and working in it and with it.
 - Careers advice and information about the range of courses and qualifications available with a post-18 chemistry qualification needs to start in early secondary school; this will help more students realise that there are a range of paths that they can take.

The Chemistry for All programme showed that targeting students from disadvantaged backgrounds can draw students into the chemistry pipeline and strengthen their identification with chemistry and was able to raise students' awareness of the careers available with a post-16 qualification. Our recommendations are as follows:

- Urgently reassess long-standing barriers in education such as grading severity, inequality embedded by dual routes of study, inaccessibility and confidence.
 - Support young people's understanding of the value of chemistry to society and to their future careers. Embed this in the curriculum as an expected learning outcome, and support teachers with resources and ongoing professional development opportunities. Provide fit-for-purpose careers advice.
9. We continue to work to support schools to meet the eight Gatsby Good Career Guidance Benchmarks^{xv} under the government's careers strategy for schools in England. Our [careers resources](#)^{xvi} showcase the diverse options and opportunities available to young people should they choose to continue to pursue a career in the chemical sciences.

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- ⁱ Chemistry's Contribution: Workforce trends and economic impact, Royal Society of Chemistry <https://www.rsc.org/new-perspectives/talent/chemistrys-contribution-workforce-trends-and-economic-impact/>
- ⁱⁱ UCAS undergraduate sector-level end of cycle data resources 2021, <https://www.ucas.com/data-and-analysis/undergraduate-statistics-and-reports/ucas-undergraduate-sector-level-end-cycle-data-resources-2021> gives the number of Main scheme applications for JACS3 of "F1 – Chemistry" to be 31,105 in 2015 and 25,420 in 2018.
- ⁱⁱⁱ Provisional entries for GCSE, AS and A level: summer 2021 series, Ofqual 2021 <https://www.gov.uk/government/statistics/provisional-entries-for-gcse-as-and-a-level-summer-2021-exam-series/provisional-entries-for-gcse-as-and-a-level-summer-2021-exam-series#as-and-a-level-entries>
- ^{iv} Moote & Archer, 2019, Contextualising Chemistry Choices: Analysis of A level Chemistry students' aspirations, attitudes and choices in the ASPIRES 2 Year 13 dataset: Unpublished report for the Royal Society of Chemistry. London, UCL
- ^v Open letter from industry leaders, Royal Society of Chemistry <https://www.rsc.org/news-events/articles/2019/sep/open-letter-from-industry-leaders/>
- ^{vi} Green Shoots: a sustainable chemistry curriculum for a sustainable planet, Royal Society of Chemistry <https://www.rsc.org/globalassets/22-new-perspectives/sustainability/sustainability-curriculum/green-shoots-a-sustainable-chemistry-curriculum-for-a-sustainable-planet.pdf>
- ^{vii} Science Horizons: leading-edge science for sustainable prosperity over the next 10-15 years, Royal Society of Chemistry <https://www.rsc.org/globalassets/04-campaigning-outreach/campaigning/science-horizons/science-horizons-report.pdf>
- ^{viii} Data from Science Industries Partnership.
- ^{ix} The benefits of Gatsby Benchmark achievement for post-16 destinations, The Careers & Enterprise Company https://www.careersandenterprise.co.uk/media/zt0bgoa0/1488_destinations_report_v4.pdf
- ^x Archer Ker, L., & Moote, J. K. (2016). ASPIRES 2 Project Spotlight: Year 11 Students' Views of Careers Education and Work Experience. King's College London. https://kclpure.kcl.ac.uk/portal/files/64130618/ASPIRES_2_Project_Spotlight_1.pdf
- ^{xi} Archer, L., Moote, J., MacLeod, E., Francis, B., & DeWitt, J. (2020). ASPIRES 2: Young people's science and career aspirations, age 10-19. London: UCL Institute of Education. https://discovery.ucl.ac.uk/id/eprint/10092041/15/Moote_9538%20UCL%20Aspires%20%20report%20full%20online%20version.pdf
- ^{xii} ASPIRES2 defines science capital as: *all the science-related interests, attitudes, resources, behaviours and social contacts that a person might have. Science capital provides a way of differentiating between different (science and non-science related) forms of capital but also helps to explain why some students' science-related capital may be valued and translated into science progression, whereas others' may not*^{xiii}
- ^{xiii} "Is chemistry accessible for all?", p9, <https://www.rsc.org/globalassets/22-new-perspectives/talent/is-chemistry-accessible-for-all/rsc-is-chemistry-accessible-for-all.pdf> based on 2019 student acceptance numbers from UCAS purchased via the EXACT service (EXACT_003700 and EXACT_003704)
- ^{xiv} "Is chemistry accessible for all?" Learning from five years of outreach and participation, Royal Society of Chemistry <https://www.rsc.org/globalassets/22-new-perspectives/talent/is-chemistry-accessible-for-all/rsc-is-chemistry-accessible-for-all.pdf>
- ^{xv} Good Career Guidance, Gatsby Foundation <https://www.gatsby.org.uk/education/focus-areas/good-career-guidance>
- ^{xvi} Chemistry: Making the difference <https://edu.rsc.org/future-in-chemistry/making-the-difference>