

Written evidence submitted by the Royal Society of Chemistry

Written evidence from the Royal Society of Chemistry to the Education Select Committee concerning the impact of Covid-19 on education and children's services.

20 July 2020

Introduction

1. The Royal Society of Chemistry is an international organisation connecting chemical scientists with each other, with other scientists, and with society as a whole. Founded in 1841 and based in London, UK, we have an international membership of around 50,000. We use the surplus from our global publishing and knowledge business to give thousands of chemical scientists the support and resources required to make vital advances in chemical knowledge. We develop, recognise and celebrate professional capabilities, and we bring people together to spark new ideas and new partnerships. We support teachers to inspire future generations of scientists, and since lockdown began we have provided free remote teaching support for all teachers of chemistry.¹
2. The Royal Society of Chemistry is submitting this evidence because we believe that an excellent chemistry education, from primary education onwards and across academic and vocational settings, is vital for the chemical sciences. It sets the foundations for progression into further learning and the profession, and can also be a valuable experience for young people regardless of their career aspirations. We have a number of concerns about the short and long-term impacts of Covid-19 on chemistry education across primary, secondary, technical and undergraduate settings, as well as initial teacher training.
3. The impact of Covid-19 on education has been more significant for some students than others, students from disadvantaged backgrounds have been particularly impacted,² and there are concerns that existing inequality gaps will be accentuated.³ The impact on disadvantaged students is of particular concern for the chemical sciences because we already see disparity of experience, and access, for students from disadvantaged backgrounds. In view of existing attainment gaps and progression barriers in chemistry education, and the very real probability that those barriers will become much greater in the current circumstances, we believe it is important that decisions are made on the basis of supporting the most disadvantaged students. This should be done by mitigating any disproportionate negative impact of their experience as far as is possible. Our concerns and recommendations outlined in this document reflect that.
4. In collating this response, we have drawn on expertise and insights from across our member community, including teachers, lecturers, training providers (including initial teacher training and subject knowledge enhancement) and those involved with undergraduate teaching and learning. The response has also been informed by our established policy positions, published research and guidance, the work of our colleagues across the organisation, and discussion with the other science learned societies. We have summarised our evidence and key recommendations in the table below.

Summary

| Section | Key recommendations | Paragraphs |
|---|--|------------|
| <p>The impact on practical or laboratory work at all educational stages</p> <p><i>There has been a significant impact on the amount of practical work that can be completed at all educational stages. Practical work is integral to our discipline, and it is a requirement of some qualifications. There are number of longer term concerns about doing practical work in 2020/21, mainly focusing on logistical challenges.</i></p> | <ul style="list-style-type: none"> The Royal Society of Chemistry recommends that the government reviews the impact of Covid-19 on practical work in the sciences, at all levels of education. The review should consider the long term impacts for these subjects, and how progression into further study and employment might therefore be affected. | 5–14 |
| <p>The impact on next academic year's newly qualified teachers (NQTs)</p> <p><i>Disruptions to this year's initial teacher training will affect new teachers' preparedness to embark on their NQT year. Chemistry trainees have been additionally impacted through being away from school - they have missed crucial opportunities to hone the skills needed to lead practical activities safely in a laboratory setting.</i></p> | <ul style="list-style-type: none"> To mitigate against an increase in NQTs wanting to leave the profession, and ensure schools have the staff they need, the Royal Society of Chemistry recommends that additional support be put in place for all NQTs starting in September 2020. This support package will require additional government funding. It must be confirmed as soon as possible to give schools and NQTs the confidence they need to plan for next academic year. The following options should be considered: <ul style="list-style-type: none"> Encourage schools to implement 'sympathetic timetabling' for beginner teachers in secondary schools. Ensure extra subject-specific (or phase specific for primary) professional development and mentoring is available for NQTs to compensate for the missed time in schools during their ITT year. Provision of funding to enable schools to give their NQTs fewer teaching hours for an initial period (perhaps a term). Provision of additional funding to allow schools to over-recruit NQTs on a reduced timetable. | 15–21 |

| | | |
|--|--|-------|
| <p>The impact on teacher training in 2020/21 <i>We are concerned that there is likely to be less practical work done in school science lessons next academic year. This will reduce trainee teachers' opportunities to develop the skills needed to teach practical chemistry. In addition, there is emerging evidence that some ITT providers may struggle to find placement schools for their trainees next academic year.</i></p> | <ul style="list-style-type: none"> • The Royal Society of Chemistry recommends that guidance is given to help ITT providers and placement schools ensure that next years' ITT students have adequate training. | 22–26 |
| <p>The impact on 11–19 education <i>Covid-19 has had a significant impact on students. We have concerns about the impact in particular on disadvantaged students, progression and student choice. We are very disappointed with proposals for assessment of science qualifications in 2021, and are concerned by the lack of contingency planning.</i></p> | <ul style="list-style-type: none"> • The Royal Society of Chemistry recommends that there is a reduction of overall examinable content, to include a change to practical work requirements, for assessments in summer 2021. • The Royal Society of Chemistry recommends that proposals for assessment of science qualifications in 2021 are reconsidered. • The Royal Society of Chemistry recommends that Ofqual, or the DfE, commit to conducting analysis of the patterns in summer 2020 grade results compared to previous years in order to determine whether there was an impact on students on the basis of protected characteristics or socio-economic status, for all qualifications with calculated grades. Similarly, we recommend that any changes to assessment in 2021 are also monitored for their impact on students. • The Royal Society of Chemistry recommends that the government considers interventions that specifically support disadvantaged students. There should be monitoring of the long term impacts of Covid-19 on disadvantaged students, and if necessary support should be provided to support transition into further study. | 27–40 |
| <p>The impact on Apprenticeships <i>The short term impact on apprenticeships in our sector remains unclear, although it is likely a proportion of apprentices are continuing to work and access training. The longer term impact</i></p> | <ul style="list-style-type: none"> • The Royal Society of Chemistry recommends that the ESFA provider relief scheme be applied to all apprenticeships, with funding support extended to levy-funded providers and independent providers. | 41–47 |

| | | |
|--|---|-------|
| <p><i>on apprenticeship applications is unknown, but there are concerns that fewer new apprenticeship positions are opening. With already low numbers, it is important to safeguard this route into the chemical sciences.</i></p> | <ul style="list-style-type: none"> • The Royal Society of Chemistry recommends that the government monitors sector-specific impacts, bearing in mind the importance of laboratory sciences and the value of technicians in furthering future research. • We recommend that the government works to reassure employers and prospective apprentices about the importance and viability of apprenticeships, and takes steps to safeguard this sector if necessary. | |
| <p>The impact on Higher Education <i>We have a number of concerns about the effect of Covid-19 on Higher Education including the effect on student numbers, financial implications, and the high cost of teaching chemical sciences.</i></p> | <ul style="list-style-type: none"> • The Royal Society of Chemistry suggests that the impact of the pandemic, and of reductions to the teaching grant, should be monitored at subject level. We ask that additional funding is provided to universities, if necessary, and that this is ring-fenced for high-cost subjects such as the chemical sciences to ensure the viability of chemistry departments and protect teaching capacity. | 48–56 |

The impact on practical work

5. Practical work is an essential aspect of the discipline of chemistry. During 5–19 education, practical work supports the understanding of chemistry as an empirical science, and provides the opportunity to learn skills that are useful not only for progression into further study and careers in the sciences, but also more widely. The inclusion of practical work also contributes to giving students an informed choice, by giving an impression of the type of work that may be involved in further scientific study and careers. At A Level students complete a practical endorsement as part of the qualification. BTEC qualifications, and other technical qualifications, also have significant practical requirements.
6. The Royal Society of Chemistry is very concerned about the short and long term impacts of Covid-19 on practical work at all levels of chemistry education. We are working with our community to further understand the challenges they are facing, and the concerns they have.
7. Since March, some limited ‘kitchen experiment’ type practical work might have occurred at school level, but the majority of students will not have experienced any hands-on practical work during this time. We are hearing concerns from teachers about the feasibility of school level practical work in academic year 2020/2021, with similar concerns reflected in the FE sector.
8. Teachers are reporting a number of logistical challenges that will need to be addressed in order to carry out practical work in line with CLEAPSS recommendations,⁴ and the Department for Education’s (DFE’s) latest guidance.⁵ These challenges include rooming, timetabling, adapting practical work, as well as increased teacher and technician workload. Some teachers are planning to prioritise practical work with particular year groups next year. We expect to see a great deal of disparity around the amount and type of practical work that is carried out next year.
9. Laboratory work is central to the chemical sciences at university, with laboratory sessions complementing theory taught in lectures, and developing practical skills required by employers. As a field with a significant practical element at HE, the teaching of the chemical sciences is strongly impacted by social distancing measures and the move to distance learning.

10. Laboratory courses in the current academic year have been cancelled or redesigned, and chemistry departments are currently putting into place a range of plans for laboratory teaching in 2020/21. Postponing laboratory work to a later date in the academic year will allow minimal redesign of content and will minimise a loss of practical experience; however, this is only possible if it is clear that these sessions will be held safely. Alternative arrangements using virtual alternatives to laboratory sessions may meet some of the desired teaching outcomes; however, designing and delivering these courses requires time, experience, and suitable funding. At universities, teaching laboratory sessions must be run at reduced capacity due to physical distancing requirements, with one university planning to reduce the number of students taught at one time from 160 to 42.
11. We are also hearing reports from our community that schools, colleges and HE institutions donated their PPE to the NHS and other keyworkers who were in need; this will need to be replaced before any practical work can be undertaken.
12. Practical work is important for our discipline, however the safety of staff and students during this pandemic is our foremost concern. Taking into account logistical and safety concerns, for 5–19 education we are suggesting that:
 - i) As long as it is safe to do so, students should still carry out practical work where appropriate, to continue the development of practical skills.
 - ii) Microscale practical work should be encouraged. Practical work might need to be adapted so it can be carried out in a classroom rather than a lab setting. Teachers should be provided with guidance, examples and resources to be support these adaptations.
13. Changes to practical work are required to manage the risk from Covid-19. However the longer these changes are required, the greater the impact on progression into further study and employment. There is also an impact for trainee and newly qualified teachers which is set out in paragraphs 15–26.
- 14. The Royal Society of Chemistry recommends that the government reviews the impact of Covid-19 on practical work in the sciences, at all levels of education. The review should consider the long term impacts for these subjects, and how progression into further study and employment might therefore be affected.**

The impact on next academic year's newly qualified teachers (NQTs)

15. This year's cohort of postgraduate trainee teachers have missed a significant proportion of their initial teacher training (ITT) year. Teacher training providers have worked hard to prepare their students for their teaching careers. They have helped trainees use their time out of school to focus on addressing gaps in their subject and pedagogical knowledge. However, these individuals have not been able to reflect on their learning by 'trying it out' in the classroom. Crucially, trainees in the sciences have also lacked essential opportunities to develop the skills needed to safely conduct whole class practical work and demonstrations in a laboratory setting.
16. The extent to which trainees have had opportunities to work with children remotely has been highly variable. From talking to our networks of trainees and ITT providers, we suspect that PGCE students are less likely than those on school direct or SCITT routes, to have had any interaction with their placement school classes since schools closed for the majority of pupils in March. In addition, individual schools' circumstances and distance learning policies during lockdown, as well as trainees' personal circumstances (such as if they have had to look after their own children), have also resulted in huge discrepancies in trainees' experiences this term.
17. The cohort of new teachers due to start in the autumn will encounter a very unusual first year. Adapting to any Covid-19 related protective measures in schools, as well as supporting pupils who have been out of the classroom for a considerable period will be challenging. Many trainees are extremely anxious about starting their teaching career – they do not feel adequately prepared for the increased contact time of an NQT timetable. We have heard reports that this has led to some

trainees making the decision to postpone their NQT year. The worry for shortage subjects like chemistry is that they will decide not to come back.

18. We have heard of some schools being reluctant to recruit NQTs because of concerns about their curtailed classroom experience. This is compounded by warnings from SchoolDash, Teacher Tapp and the Gatsby Foundation that a drop in teacher vacancies caused by teachers choosing not to leave their current schools during the pandemic, may mean that some NQTs struggle to secure a job for September and consequently decide to leave the profession.⁶
19. Whilst we welcome the Government's announcement that from September an additional 3000 new teachers from schools in disadvantaged areas will benefit from a one-year version of the early career framework (ECF) and all schools will be able to access some ECF support materials,⁷ unfortunately this does not go far enough. To support disadvantaged pupils in the long term, the system needs to nurture good new teachers so that they stay in the profession, and consequently be available to teach in schools serving disadvantaged areas. For this reason, we believe that all of next academic year's NQTs should be eligible for additional support. This will need to be personalised to take account of any development needs arising from the interruption to their initial teacher training.
20. In addition, if as we suspect might happen, less practical work takes place in schools next academic year, NQTs starting in the autumn could again miss out on development opportunities. There is a risk that without practice at the start of their careers, it might take this cohort of new chemistry teachers longer than normal to develop expertise in conducting whole class practical work in a laboratory setting.
21. **To mitigate against an increase in NQTs wanting to leave the profession, and ensure schools have the staff they need the Royal Society of Chemistry recommends that additional support be put in place for NQTs starting in September 2020. This support package will require additional government funding. It should be confirmed as soon as possible to give schools and NQTs the confidence they need to plan for next academic year.**

To this end, we suggest that the following options are considered:

- i) **Encourage schools to implement 'sympathetic timetabling' for beginner teachers in secondary schools.** This simple idea reduces workload associated with lesson planning by allowing teachers to teach the same topic to more than one class. This is particularly important for teachers of the sciences who often have the added pressure of having to teach outside their main area of disciplinary expertise. The Royal Society of Chemistry recommends that schools allow new teachers to focus primarily on teaching their specialist science discipline. These steps could help improve the retention rates of new chemistry teachers and is supported by evidence from the USA, which found that first year teachers who were given a less challenging course load and taught a single subject were less likely to leave.⁸
- ii) **Ensure extra subject-specific (or phase specific for primary) professional development and mentoring is available for NQTs to compensate for the missed time in schools during their ITT year.** This could include online tutorials organised at a national level for each subject/phase.
- iii) **Provision of funding to enable schools to give their NQTs fewer teaching hours for an initial period (perhaps a term).** We suggest that this should be somewhere between the maximum expected teaching time for trainee teachers and the normal expectation for NQTs.
- iv) **Provision of additional funding to allow schools to over-recruit NQTs on a reduced timetable.** ie they might employ two NQTs to cover a vacancy that would normally be filled by just one. This would help if a school needed more teachers because of Covid-19, whilst also giving the NQTs extra time to reflect on their practice and access extra mentoring or support. This will be especially important for shortage subjects such as chemistry.

The impact on teacher training in 2020/21

22. We have concerns about the effect Covid-19 could have on the quality of provision for the cohort of ITT students starting in September. Chemistry is a practical subject. Learning to teach chemistry involves learning how to use laboratory equipment and chemicals safely with groups of teenagers. As schools re-open for all pupils in September, precautions put in place to minimise the risk of the coronavirus spreading are likely to result in reduced opportunities for teachers of chemistry to make use of hands-on practical work or demonstrations in their lessons. This means that there will probably be reduced opportunities for trainees to hone their skills in this area.
23. To add to the problem, pre-ITT Subject Knowledge Enhancement (SKE) courses have all been online for the cohort of initial teacher trainees due to start in the autumn. We believe that this will not provide sufficient preparation for many chemistry SKE participants, especially those without a chemistry background. For them, an element of 'hands-on' practical work is vital. The dilemma for ITT providers has been trying to establish if they can cover this during the training year or if they should reject candidates who they deem need practical work included in their SKE course.
24. In addition, concerns have been raised about how universities will be able to accommodate ITT students for the laboratory-based part of their training if the requirements for social distancing remain in place. Some university-based providers have told us that they can re-arrange their teaching order so that practical work is covered later in the year. However, if social distancing requirements continue past January they will struggle to do this.
25. Many ITT providers are also reporting a reduced capacity for school placements because of Covid-19 as schools are unwilling to take on any 'extra' responsibilities
- 26. The Royal Society of Chemistry recommends that guidance is given to help ITT providers and placement schools ensure that next years' ITT students have adequate training.**

The impact on 11–19 education

27. The impact of the Covid-19 pandemic on 11–19 education has been significant. Since the schools were closed to most students on March 20th 2020, students have lost learning time. There has been great disparity in access to remote and blended learning; some students have been particularly disadvantaged by the shift to remote learning due to their individual circumstances eg no or limited access to a computer or internet, whilst other students have experienced less disruption.²
28. We are concerned that Ofqual's proposals for assessment in 2021,⁹ alongside the school reopening guidance from the DfE,⁵ sends a signal about the relative importance of subjects. Up until the age of 16, chemistry should be part of a core, compulsory curriculum for all learners. This should be a balanced curriculum: chemistry, and the sciences, should not come at the detriment to other subjects.
29. We are concerned that there could be long-term impacts on progression, particularly if there is an ongoing need to make changes to practical work. Depending on the duration and extent of the impacts of Covid-19, further and higher education providers and employers will need to make adjustments to their support for new students and employees.
30. Additionally, we are concerned that impacts may emerge on students' choices in favour of, and opportunities to progress into, chemical science pathways. There are the following risks:
 - Less development of science capital through, for example, outreach activities and work experience, leading to fewer choices in favour of chemistry.
 - Less engagement with chemistry learning due to reduction in practical work and less contact with passionate teachers, leading to fewer choices in favour of chemistry.
 - Stronger 'gatekeeping' around progression, for example through reduced opportunities to provide appropriate advice and guidance, and further squeeze on teaching time increasing

the tendency to only encourage high-attainers to progress. This could exacerbate existing participation gaps that we see at GCSE, A Level and HE.^{10,11}

- Poor pupil experience as a result of insufficient changes to assessment in 2021 may negatively affect the uptake of chemistry.

31. It seems likely that there will be school closures, and potentially local and wider lockdowns during academic year 2020/21. This will lead to disparity in educational experience for students, which needs to be recognised and supported at future stages.

32. **The Royal Society of Chemistry recommends that there is a reduction of overall examinable content, to include a change to practical work requirements for assessments in summer 2021.**

We do not take this position lightly, but we believe that this is the most equitable way of mitigating the effects of Covid-19 for all students in these exceptional circumstances, given our concerns. Implementation of this measure should be done in a way that does not permanently affect the specification, or change the sampling expectation in future years. Any reduction should:

- Be proportionate to the amount of time that has been lost.
- Ensure the core fundamentals of chemistry are taught to support progression into further study in the chemical sciences, whilst also maintaining consistent standards. We believe that in-depth coverage of selected content provides a better basis to support progression and maintain standards than schools having to rush through the full extent of content.
- Be considerate of the probable teaching sequence of topics. Whilst schools have a choice about the order in which topics are covered, it is likely that certain topics are covered before others. We acknowledge that there remains a risk that content not included in sampling will already have been studied by some students. However, observing point (i) should ensure that all students will have sufficient time to cover the full extent of the remaining content prior to assessment.

33. We understand the need to ensure that qualifications are not devalued for this cohort of students. We do not believe that a reduction in examinable content should equate to qualifications being perceived as devalued. We would prefer that students cover less content, allowing more time to develop deeper conceptual understanding, than cramming in the full extent of content and only gaining superficial understanding. The fears of disparate standards for this cohort could be addressed by communication that students would still achieve a good depth of understanding, laying the foundations for progression. We are prepared to support that messaging with communication to our member communities which include HE institutions, teachers and employers.

34. To help ease the assessment burden, and taking into account our recommendations around practical work (paragraph 14) we recognise the need to make changes to the requirements for practical work for assessment in 2021. This should be considered as part of an overall reduction in examinable content rather than a standalone measure. A coherent and considered reduction in examinable content to focus on the core fundamentals of chemistry would likely incorporate the removal of certain practicals.

35. We welcome the DfE case studies on practical work that are being prepared, and we are pleased to have been involved in their development. We will continue to offer support to our community with our resources for remote teaching and learning, and practical work.

36. We strongly disagree with Ofqual's proposals for assessment of science qualifications in 2021. We are very disappointed that there is no move to reduce examinable content. Whilst the impact on a number of different groups of students is acknowledged, the proposals do not go far enough to support these students and we have serious concerns that this will further disadvantage them.

37. **The Royal Society of Chemistry recommends that proposals for assessment of science qualifications in 2021 are reconsidered.** There should be a coherent, and considered, reduction in examinable content focusing on the core fundamentals of chemistry, to support students to become

scientifically literate citizens and progress onto further study in the chemical sciences should they wish. We have developed a curriculum framework for 11–19 chemistry education which sets out the core fundamentals,¹² so are able to offer expertise and insight in this area.

- 38. The Royal Society of Chemistry recommends that Ofqual, or the DfE, commit to conducting analysis of the patterns in summer 2020 grade results compared to previous years in order to determine whether there was an impact on students on the basis of protected characteristics or socio-economic status, for all qualifications with calculated grades. Similarly, we recommend that any changes to assessment in 2021 are also monitored for their impact on students.**
- 39. The Royal Society of Chemistry recommends that the government considers interventions that specifically support disadvantaged students. There should be monitoring of the long term impacts of Covid-19 on disadvantaged students, and if necessary support should be provided to enable transition into further study.** We are particularly concerned about the impact of Covid-19 on disadvantaged students; they are already underrepresented in the chemical sciences and we want to ensure they are well placed to enter the chemical sciences pipeline, if they wish. We will continue to work with our community to monitor the situation as best we can, and provide support and resources where possible.
40. There is no indication of a contingency plan if there is ongoing disruption to education. The short term nature of Ofqual's proposals concern us. We would like to see contingency planning for next year, and longer term plans put in place to support students; we are concerned that there will be an impact on students for a number of years to come. Changes in 11–19 education have a knock on impact elsewhere, for example for HE and training providers. Longer term planning should help to support these providers make appropriate changes to support students as they transition into the next stage of training or education.

The impact on Apprenticeships

41. Conversations with some apprenticeship education providers suggest that there is a proportion of science apprentices who have continued to work, and to access some virtual learning through their colleges. However, we don't have a clear picture of our sector as a whole as to the size of this proportion. Science apprenticeships use a combination of end point assessments and workplace observations, among other assessments, to award apprenticeship standards. While these courses are expected to follow an adapted assessment approach, where this is not possible, some assessments will have to be delayed. We are pleased that furloughed apprentices are able to continue their 20 per cent off-the-job training. DfE guidance allows for flexibility in the timing of end-point assessments, which means apprentices would still be able to complete their training to meet the same standard, albeit potentially over a longer timescale.
42. Many training providers will not be able to access funding where apprentices are on a break in learning, and require support for increased financial strain. The Education and Skills Funding Agency (ESFA) provider relief scheme is a welcome step towards supporting some small and medium-sized enterprise (SME) employers and non-levy funded training providers.¹³ However, the majority of training providers are not eligible to access this funding support, including independent training providers or any providers with levy-funded apprentices.¹⁴ Furthermore, if a provider wants to receive the supplier relief but has already furloughed staff, they must un-furlough them to be eligible.
- 43. The Royal Society of Chemistry recommends that the ESFA provider relief scheme to be applied to all apprenticeships, with funding support extended to levy-funded providers and independent providers.**
44. The Royal Society of Chemistry opposed the recent removal of the knowledge qualification from the level 3 laboratory technician standard in England. We recognise that in these exceptional circumstances, it may be necessary to adjust qualification content and/or assessments. We ask that, unless essential, there is no additional reduction in the knowledge component, and that any change

should only be taken in consultation with key stakeholders, including past and present apprentices themselves. Any change that becomes necessary, should only be taken as a temporary measure.

45. The full impact of the pandemic on numbers of applications to apprenticeships is as yet unclear. As of May 2020, there was a 57 per cent fall in the number of Laboratory Technician apprenticeships from 308 (2018/2019) to 220 (2019/2020).¹⁵ Wider data across all sectors suggests that apprenticeship starts for March and April 2020 are significantly lower than the previous year.¹⁶ From conversations with education providers, concerns have been raised that there are very few new apprenticeship positions opening. The Association of Employment and Learning Providers' Covid-19 impact survey results suggests that approximately 60 per cent of employers have stopped recruiting apprenticeships completely, across all sectors. There is a concern that this may lead to disruption to the pipeline of apprenticeships. We value the importance of apprenticeships as a pathway into the chemical sciences. With laboratory apprenticeship numbers already low compared to other sectors, this could significantly impact the pipeline.
- 46. The Royal Society of Chemistry recommends that the government monitors sector-specific impacts, bearing in mind the importance of laboratory sciences and the value of technicians in furthering future research.**
- 47. We recommend that the government works to reassure employers and prospective apprentices about the importance and viability of apprenticeships, and takes steps to safeguard this sector if necessary.**

The impact on Higher Education

48. The chemical sciences, and chemistry skills and knowledge are essential to global prosperity and make a significant contribution to the economy of the UK, as well as other nations. In the UK:
- The chemicals & pharmaceuticals sector is the UK's second largest manufacturing industry.¹⁷
 - In 2018 the chemical industry contributed £19.2 billion to the UK economy, the pharmaceuticals industry added another £14.3 billion.¹⁸
 - There are 3,608 companies in the UK chemical industry, directly employing 153,000 people.¹⁹
 - In 2017 public and private R&D spending in chemical and pharmaceuticals manufacturing businesses amounted to over £5bn
 - £4.3 billion in pharmaceuticals
 - £0.9 billion in chemicals.²⁰
49. The importance of chemistry graduates to the UK economy extends beyond the chemical and pharmaceutical industries into other areas of manufacturing, research and development, as well as business, finance, and teaching.
50. To maintain this talent pipeline, the viability of university chemistry departments must be protected; however, members of our community have raised a number of concerns about the financial effects of Covid-19 on chemistry departments. Applicant numbers for university have increased compared to last year,¹⁹ but we remain concerned about potential financial implications for the sector, and chemistry courses in particular, if there are a high number of postponements from domestic and international students.
51. Chemistry teaching in higher education is classed as "very high-cost" – estimated to be £10,500 per student each year – and staff, buildings, and resources must be maintained even when student numbers decrease.^{20,21} Before the current crisis, chemistry departments already received insufficient funding to cover the full costs of their teaching and research activities.²²
52. The £48 million decrease in the recurrent teaching grant for the 2020/21 academic year removes some of the money previously set aside for delivering high-cost subjects.²² While this year's Budget promised significant investment in research, there has been a real-terms decrease in Quality Related

funding,²³ and some of our community are reporting concerns about a potential decrease in the numbers of PhD students taking up places in the 2020/21 academic year which could further impact funding for chemistry departments.

53. A significant proportion of universities' income comes from international students, with international undergraduates and postgraduates contributing 47 per cent of teaching income (£8.5 billion) in 2014/15.²⁴ The physical sciences, such as chemistry, are more reliant on international students than the average for undergraduate subjects: for the 2019/20 academic year, 8.3 per cent of undergraduate acceptances were classified as international, while for physical sciences subjects, this figure was 10.1 per cent.²⁵ If there is a drop in international students, we have concerns it will disproportionately affect student numbers for chemistry.
54. The Institute for Fiscal Studies is predicting total losses of between £3 billion and £19 billion for HE institutions.²⁶ We are concerned about the viability of chemistry departments because of the overall financial impact on universities, compounded by the factors outlined in paragraphs 51–53. The cumulative effect remains unclear at the present time as final student numbers are not yet available. However, given there are a number of risk factors that could disproportionately affect the chemical sciences, we believe it is important to raise this as a concern and recommend sector level monitoring.
55. Institutions wishing to fill space on courses absented by international students may seek to replace them with domestic students. While the number of applicants to universities in England has increased this year, the possibility remains that students may choose to postpone their studies due to concerns over student experience or the potential for further outbreaks.²⁷ Concerns over a potential shortage of students led the DfE to institute a cap on domestic students in order to spread the burden of any shortages, and prevent popular institutions filling courses at the expense of “lower-tier” universities. This cap is set at 5 per cent above each university’s forecast attendance figures, plus extra spaces allocated for “subjects of strategic importance”.²⁸ While the Royal Society of Chemistry welcomes the inclusion of chemistry on this list, we are concerned that the large margin on the cap, the restriction of extra places to “high-quality institutions”,²⁹ and the possibility of an overall shortage of students will mean that less popular institutions may still receive too few students to make teaching chemical sciences viable in the 2020/21 academic year. In combination with the high cost of chemistry teaching and the financial losses suffered by universities, we are concerned that this may affect the viability of chemistry departments and lead to a reduction of future chemistry teaching capacity, disrupting the talent pipeline.
- 56. The Royal Society of Chemistry recommends that the impact of the pandemic, and of reductions to the teaching grant, should be monitored at subject level. We ask that additional funding is provided to universities, if necessary, and that this is ring-fenced for high-cost subjects such as the chemical sciences to ensure the viability of chemistry departments and protect teaching capacity.**

References

¹ *Remote Teaching Support*, Royal Society of Chemistry, <https://edu.rsc.org/remote-teaching-support>

² *COVID-19 and Social Mobility*, Sutton Trust (2020), <https://www.suttontrust.com/wp-content/uploads/2020/04/COVID-19-Impact-Brief-School-Shutdown.pdf>

³ *Covid-19: the impacts of the pandemic on inequality*, Institute for Fiscal Studies (2020), <https://www.ifs.org.uk/publications/14879>

⁴ *Guide to doing practical work in a partially reopened school*, CLEAPSS (2020), <http://science.cleapss.org.uk/Resource/GL343-Guide-to-doing-practical-work-in-a-partially-reopened-school-Science.pdf>

⁵ *Guidance for full opening: schools*, Department for Education (2 July 2020), <https://www.gov.uk/government/publications/actions-for-schools-during-the-coronavirus-outbreak/guidance-for-full-opening-schools>

⁶ *Musical Chairs: Understanding and tackling COVID-19 disruption to the teacher recruitment market*, R. Allen,

- T. Hannay & L. McInerney, London: Education Intelligence Ltd. (2020), <https://www.gatsby.org.uk/uploads/education/reports/pdf/report-musical-chairs-teacher-recruitment-during-a-pandemic.pdf>
- ⁷ *Early career framework reforms: overview. Expanded offer for selected schools in autumn 2020*. DfE (23 June 2020), <https://www.gov.uk/government/publications/early-career-framework-reforms-overview/early-career-framework-reforms-overview#expansion>
- ⁸ *The Price of Misassignment: The Role of Teaching Assignments in Teach For America Teachers' Exit From Low-Income Schools and the Teaching Profession*, M. Donaldson & S. Johnson, Educational Evaluation and Policy Analysis 32: 299 (2010), <https://journals.sagepub.com/doi/abs/10.3102/0162373710367680>
- ⁹ *Consultation on proposed changes to the assessment of GCSEs, AS and A levels in 2021*, Ofqual (2020), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897137/Consultation_on_proposed_changes_to_the_assessment_of_GCSEs_AS_and_A_levels_in_2021_020620.pdf
- ¹⁰ *Comparing progression routes to post-16 Science qualifications*, C. L. Vidal Rodeiro, Research Matters: A Cambridge Assessment publication, 16 (2013), pp. 15–23, <https://www.cambridgeassessment.org.uk/Images/466353-comparing-progression-routes-to-post-16-science-qualifications.pdf>
- ¹¹ *ASPIRES 2, Young people's science & career aspirations, age 10-19*, University College London (2020), https://discovery.ucl.ac.uk/id/eprint/10092041/15/Moote_9538%20UCL%20Aspires%20%20report%20full%20online%20version.pdf
- ¹² *The elements of a successful chemistry curriculum: The Royal Society of Chemistry's vision for 11–19 chemistry education*, Royal Society of Chemistry (2020), <https://www.rsc.org/globalassets/22-new-perspectives/talent/chemistry-curriculum-framework/chemistry-curriculum-brochure.pdf>
- ¹³ *ESFA post-16 provider relief scheme (July to October) COVID-19 response: policy document*, Department for Education (2020), <https://www.gov.uk/government/publications/esfa-post-16-provider-relief-scheme/esfa-post-16-provider-relief-scheme-covid-19-response-policy-document>
- ¹⁴ *DfE reveals provider criteria for accessing supplier relief*, FE Week (2020), <https://feweek.co.uk/2020/04/24/dfе-reveals-provider-criteria-for-accessing-supplier-relief/>
- ¹⁵ *Apprenticeships and traineeships: May 2020*, Department for Education (2020), <https://www.gov.uk/government/statistics/apprenticeships-and-traineeships-may-2020>
- ¹⁶ *Monthly apprenticeships update: March starts fall 24% while April plummets by 72%*, FE Week (2020), <https://feweek.co.uk/2020/05/29/monthly-apprenticeships-update-march-starts-fall-24-while-april-plummets-by-72/amp/>
- ¹⁷ *Landscape of the European Chemical Industry 2019: United Kingdom*, Cefic (2019), <http://www.chemlandscape.cefic.org/wp-content/uploads/pdfs/United-Kingdom-83.pdf>
- ¹⁸ *Gross Value Added at Current Prices: "Manufacture of chemicals and chemical products", and "manufacture of basic pharmaceutical products and pharmaceutical preparations*, Office for National Statistics (2019), <https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/ukgdpolowlevelaggregates>
- ¹⁹ *2020 cycle applicant figures – 30 June deadline*, Universities and Colleges Admissions Service (2020), <https://www.ucas.com/data-and-analysis/undergraduate-statistics-and-reports/ucas-undergraduate-releases/applicant-releases-2020/2020-cycle-applicant-figures-30-june-deadline>
- ²⁰ *2017-18 HESA Student post-collection outputs*, Office for Students (2019), <https://www.officeforstudents.org.uk/media/dac645bf-16c4-4731-9ab8-1e21af48848d/2017-18-hesa-student-post-collection-outputs-very-high-cost-stem-subjects-targeted-allocation-method-document.pdf>
- ²¹ *Guide to funding 2020-21*, Office for Students (13 May 2020), <https://www.officeforstudents.org.uk/publications/guide-to-funding-2020-21/>
- ²² *The Finances of Chemistry and Physics Departments in UK Universities: Third Review*, Royal Society of Chemistry & Institute of Physics (2015), https://www.iop.org/publications/iop/2015/page_66517.html
- ²³ *Our response to the Budget announcement*, Royal Society of Chemistry (2020), <https://www.rsc.org/news-events/opinions/2020/budget-response-2020/>
- ²⁴ *University Funding Explained*, Universities UK (2016), <https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2016/university-funding-explained.pdf>
- ²⁵ *UCAS Undergraduate sector-level end of cycle data resources 2019*, Universities and Colleges Admissions Service (2020), <https://www.ucas.com/data-and-analysis/undergraduate-statistics-and-reports/ucas->

[undergraduate-sector-level-end-cycle-data-resources-2019](#)

²⁶ *Will universities need a bailout to survive the COVID-19 crisis?* Institute for Fiscal Studies (2020), <https://www.ifs.org.uk/publications/14919>

²⁷ *2020 cycle applicant figures – 30 June deadline*, Universities and Colleges Admissions Service (2020) <https://www.ucas.com/data-and-analysis/undergraduate-statistics-and-reports/ucas-undergraduate-releases/applicant-releases-2020/2020-cycle-applicant-figures-30-june-deadline>

²⁸ *Student Number Controls*, Department for Education (2020), <https://www.gov.uk/government/publications/student-number-controls>

²⁹ *Details of English student number controls unveiled*, Times Higher Education (2020), <https://www.timeshighereducation.com/news/details-english-student-number-controls-unveiled>

July 2020