

Written evidence submitted by Association for Science Education (ASE)

ASE response to the Education Select Committee's call for evidence on the impact of COVID-19 on education and children's services

The **Association for Science Education (ASE)** is the largest subject association in the UK. Members include teachers, technicians and others involved in science education. The Association plays a significant role in promoting excellence in teaching and learning of science in schools and colleges. Working closely with the science professional bodies, industry and business, ASE provides a UK-wide network bringing together individuals and organisations to share ideas and tackle challenges in science teaching, develop resources and foster high quality Continuing Professional Development. The Association for Science Education can trace its origins back to 1900. Incorporated by Royal Charter in October 2004, the ASE operates as a Registered Charity.

This response focuses on evidence gathered by ASE on the impact of Covid-19 on practical work in secondary science education to date, and the anticipated impact in the coming academic year 2020/21.

Background

The Covid-19 crisis has touched on all aspects of school life and across all subject areas. As an intrinsically practical subject, science education has been particularly impacted by the current school closures, with difficulties in carrying out practical work set to continue as students return. Discussions with ASE Committee members and our broader community have already highlighted the pressure on teachers to catch up on missed content when schools return and our recent examinations webinar¹, confirmed that there were no plans for exam boards and regulators to amend GCSE or GCE specifications for the 2021 exam season. Inevitably this will result in the squeezing out of other activities, such as practical work and classroom discussion. Added to this pressure is the need for social distancing within classrooms and school laboratories and difficulties for science leaders, teachers and technicians in identifying what types of practical work remain possible, as well as the fact that many schools have donated PPE equipment to the NHS and may have difficulty ordering new stock. All of these issues will further reduce the likelihood and frequency of practical work being carried out when schools re-open, particularly at Key Stages 3 and 4, without the accountability provided by the A-Level Practical Endorsement.

Key questions for those working to support the science education community include how to support schools where they are not able to carry out practical work, while still advocating for a return to more frequent, varied and effective practical science in the longer term, what the implications and risks may be for school science teachers and technicians, and how to avoid losing the gains already made through the *Good Practical Science* report from the Gatsby Foundation² and associated projects³.

¹ *Impact on examinations and assessment - Expert insights*, 05/05/2020 <https://vimeo.com/415404168> (password ASECOVID1)

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Evidence data collection and representation

An online survey of science leaders and teachers and a second survey of science technicians were carried out over a two week period from 22 June 2020. There were 410 responses from science leaders and teachers and 472 responses from science technicians. Both surveys provided a good representative sample of respondents (by geographical location including Opportunity Areas and Local Authority categories 5 or 6, school or college type, Ofsted grading and range of roles within the science department) which enables us to have some confidence in the findings. The surveys took place when most schools and colleges were beginning to open again to some students, and to work with new guidance on enabling safe practical work with social distancing. This guidance, provided by CLEAPSS, has been updated since the surveys were completed.⁴ This survey work was supported by the Gatsby Foundation, and a report on the main findings will be published shortly on the ASE website.

Learning from the lockdown period

Students both at home and in school, of all ages, were working with simulations more than other types of practical activities. Experiments and practical activities, and external demonstrations were also popular activities set by some teachers for students working at home; particularly for the 11-14 age category. Whilst there is a place for simulations in engaging students through an exploratory environment, learning is likely to be more meaningful alongside teacher led discussion. In many schools and colleges, this teacher interaction is likely to have been limited.

Almost 60% of respondents (science leaders and teachers) were not satisfied with their school or college provision for practical work during lockdown and 55% did not feel their science team is well prepared to support practical work in the event of a future lockdown.

It is important to recognise that for many teachers and technicians, there have also been some positive outcomes and opportunities arising from the Covid-19 crisis. Key messages highlighted by the 100 science leaders and teachers, and over 300 technicians who responded to an open question on positive outcomes and opportunities arising included:

- Some science teams have used the lockdown period to work more collaboratively than previously in planning new schemes of learning for an effective online (or blended) learning offering, and for more effective practical activities when students are in school.
- Some technicians have played a valuable role in these planning and development activities which they enjoyed and appreciated their recognition, alongside tackling neglected tasks that have always been on the back burner due to time constraints. Time constraints apply particularly to technicians employed on term time only contracts.
- Many teachers and technicians have capitalised on their time working from home to undertake valued professional development, such as ASE's Covid-19 science education support webinar series⁵, IOP's Covid-19 support⁶ and RSC's online CPD⁷ and they hope that

² <https://www.gatsby.org.uk/education/programmes/support-for-practical-science-in-schools>

³ <https://www.ase.org.uk/resources/good-practical-science-making-it-happen>

⁴ <http://science.cleapss.org.uk/>

these professional learning opportunities, together with the time and energy involved, may continue in the future. ASE has also received a record-breaking number of CSciTeach applications over this period.⁸

Planning for September, the new academic year

Frequency, focus and impact on students' attainment

Schools and colleges are anticipating a big reduction in the frequency of practical science taught from September to all age groups, and there are likely to be 20% of examination classes (GCSE and A level) experiencing no practical science at all. This raises concern. Whilst we appreciate that schools and colleges will inevitably undertake less practical work, our expectation is that 'hands-on minds-on' practical work is an entitlement for all young people as part of a rounded science education experience. Over 60% respondents (science leaders and teachers) will focus on teaching content and will minimise practical work. Nearly 90% of respondents are concerned about the pressure to catch up on missed content during the lockdown period (and potential further periods of lockdown during the next academic year). Over 60% feel that practical work will be restricted to 'required' practicals for 14-16 and post 16 students and over 60% feel that reduced practical work will have an impact on students' attainment in 2021 exams (14-16 and post 16). We note that the two week Ofqual consultation on the 2021 examinations is closed and decisions will be announced shortly. Schools and colleges have limited time remaining before the start of the Autumn term to refine their planning as a result of these decisions.

Planning for safe practical work with social distancing

There is considerable anxiety caused by a lack of clarity and guidance on managing a safe return to schools. About 40% of respondents (science leaders, teachers and technicians) indicated that their schools and colleges have been unable to plan for the start of next term, and as term draws to an end the opportunities for departmental planning are reduced. Schools and colleges need more clarity over the provision of PPE and its appropriate use, safe distancing in teaching spaces and when providing services in laboratories, provision of additional equipment for practical science, and how equipment and learning materials can be sterilised or quarantined. As the situation continues to evolve, it is important that regularly updated guidance is readily accessible.

Purpose and types of activities

Teachers have managed to maintain some practical science during lockdown, with a focus on practical work for underpinning theoretical understanding. Survey responses indicate this purpose will continue to have a major emphasis from September onwards. Other purposes such as practical

⁵ <https://www.ase.org.uk/news/ase-coronavirus-resources-free-covid-19-science-education-support-webinar-series>

⁶ https://spark.iop.org/supporting-school-and-college-students-learn-physics-during-covid-19?_ga=2.88954267.1452867832.1595264050-1640214603.1585218394

⁷ <https://edu.rsc.org/rsc-education-news/rsc-educations-online-cpd-for-teachers-becomes-free/4011439.article>

⁸ <https://www.ase.org.uk/news/ase-receives-record-breaking-number-of-csciteach-applications>

skills including measurement, observation, confident handling of apparatus, and the development of enquiry skills are likely to be a lower priority, which is a cause for concern when considering the importance of developing these skills and attitudes whilst at school or college in determining the future supply of scientists, engineers and technicians. Survey responses suggest that it's not only examination classes which will be affected, but students of all age groups.

Many respondents (science leaders and teachers, and technicians) are planning to use microscale chemistry techniques, with the benefits of improving the speed, costs and safety of practical work as well as reducing cognitive load for students. Teacher respondents are also planning to carry out more demonstrations. This is to be welcomed as interim findings of the Practical Assessment in School Science project⁹ suggest that teacher demonstrations can be effective when facilitated by high quality, purposeful discussion. However considerable experience is required to generate learning opportunities from these discussions and guidance for effective demonstrations will be valuable, particularly for less experienced teachers.

Over 30% of respondents (science leaders and teachers) are not planning for fieldwork and outdoor science work in the next academic year, and only 25% set fieldwork or citizen science activities during the lockdown period. This is a missed opportunity as the evidence suggests a reduced risk of spreading the Covid-19 virus in outdoor environments, and the extent and quality of fieldwork at all ages of secondary education is already less than desirable.

Staffing – science leaders and teachers

Eighteen percent of respondents (science leaders and teachers) felt that their school or college does not have adequate teachers with biology, chemistry and physics experience to support safe practical work. Twenty five percent of respondents (science leaders, teachers and technicians) do not feel that their school or college has adequate technicians with experience to support safe practical work.

Sixteen percent of respondents (science leaders and teachers) felt that their science team does not have plans in place to support NQTs, early career teachers and those teaching outside of their specialism. We are concerned about the disruption to teacher training and the impact on NQTs starting in September. This year's cohort of postgraduate trainee teachers have missed what is probably the most crucial part of their preparation. Trainees in the science subjects are additionally impacted by being away from school. They are lacking crucial opportunities to hone the skills needed to lead practical activities safely. Our concerns and recommendations for high quality subject specific professional development and mentoring, reductions in workload through timetabling repeat lessons with a focus on the science discipline in which they are most confident, and additional funding to enable schools and colleges to provide a reduced teaching load, have been articulated in letters (June 2020) to the Chair of the Education Select Committee and the Secretary of State for Education.

Staffing - technicians

⁹ <https://www.kcl.ac.uk/events/assessing-practical-skills-through-written-examination-questions>

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Over 80% of technicians have some concerns over an increased workload or changes to working practices and 25% of technicians anticipate that their workload will not be manageable within their normal hours. Approximately 25% of technicians have been furloughed (in the independent sector) and, anecdotally, some technicians are fearful of redundancy. We are concerned that school leaders need to be reminded of the importance of technicians in implementing the curriculum and ensuring that students experience a variety of high quality, effective practical activities. This is particularly important at this time when some school leaders are responding to a perceived reduction in practical work as a potential saving and making technicians redundant. In the short and longer term, this is a false economy that increases the pressures on teachers. Replacing an experienced and knowledgeable technician workforce in the future, when attempting to return to normal expectations around practical work, would be difficult to achieve. We note that recent research by SchoolDash¹⁰ indicates that there has been a 55% reduction in school science technician job vacancies from mid-March to July 2020 compared to the same period in 2019. This may be explained by technicians not leaving their current roles but could also reflect reluctance to recruit technicians during this time of uncertainty about practical work.

Recommendations

1. Clarity and reassurance is needed from DfE and Ofqual that practical work remains an essential component of science education and that they continue to emphasise their commitment to assessed practical science in the longer term. Such messages will serve to remind school and college leaders of ensuring that frequent, purposeful and impactful practical work characterises their rich science curriculum offering for all students.
2. Ofqual decisions about the content of science examinations and the role of practical science need to be announced swiftly and communicated to school leaders. Nearly 90% of respondents (science leaders and teachers) to our survey were concerned about the lack of certainty around 2021 examinations (14-16 and post 16). The interim arrangements should be regarded as such and messages from Ofqual should not inadvertently signal a change in policy about the importance of practical work as experienced directly by students. Any interim arrangements around the A level Practical Endorsement should be monitored throughout this academic year.
3. School and college leaders as well as science subject leaders need to be well informed about appropriate safeguards for science teaching and examination requirements for 2021. This guidance needs to be regularly updated as situations develop, such as appropriate actions in case of local lockdowns or encouragement to return to more practical work when it is safe to do so.
4. It is widely recognised that science teachers and technicians experience heavy workloads. It will be important to monitor workloads and changing work patterns during this academic year and to provide guidance to support those that are experiencing difficulties with

¹⁰ <https://www.schooldash.com/blog-2007.html#20200720>

managing their time effectively, for example using frameworks such as the ASE's Science Teacher SOS¹¹.

5. Teachers need advice and support to help them teach science effectively in these testing circumstances; for example how to use demonstrations and simulations for maximum learning benefit. DfE should support professional bodies such as ASE to provide further guidance on planning for purposeful practical science, and assessing its impact.
6. We are concerned about the disruption to teacher training and the impact on NQTs starting in September. We recommend that high quality subject specific professional development and mentoring, and reductions in workload through timetabling repeat lessons with a focus on the science discipline in which they are most confident. We make a request that additional funding is made available to enable schools and colleges to provide a reduced teaching load for NQTs, and to over-recruit NQTs in response to research by Teacher Tapp and SchoolDash¹² which identified a reduction of over 5000 advertised job vacancies for teachers. We are concerned that whilst this evidence suggests that teachers are remaining in post during these uncertain times, this reduces opportunities for NQTs seeking their first appointments, and potentially risks losing them from the teaching workforce permanently.
7. We are concerned about the recent decrease in school science technician job vacancies. Technicians play a key role in enabling students to access safe and effective practical science as well as providing vital support to science teachers. It will be important to monitor technician numbers in schools and colleges to ensure that any short term reductions in practical work do not translate into longer term reductions in this important part of the school and college workforce.

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¹¹ <https://www.ase.org.uk/sos>

¹² <https://www.gatsby.org.uk/education/latest/report-indicates-stimulus-required-to-prevent-teacher-recruitment-crisis>