

Senedd Cymru  
Y Pwyllgor Plant, Pobl Ifanc ac Addysg

Ymchwiliad i effaith argyfwng Covid-19 ar  
blant a phobl ifanc yng Nghymru

COV 129  
Ymateb gan: Royal Society of Biology

Welsh Parliament  
Children, Young People and Education Committee

Inquiry into the impact of the Covid-19 outbreak on  
children and young people in Wales

COV 129  
Response from: Royal Society of Biology

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## **Introduction**

The Royal Society of Biology (RSB) is a single unified voice for biology: advising Government and influencing policy; advancing education and professional development; supporting our members, and engaging and encouraging public interest in the life sciences. The Society represents a diverse membership of individuals, learned societies and other organisations. Individual members include practising scientists, students at all levels, professionals in academia, industry and education, and non-professionals with an interest in biology.

The Royal Society of Biology is committed to supporting and encouraging the study of biology at primary, secondary and tertiary levels across the UK, working in coordination with our member organisation and with the broader scientific community. Steered by our Education and Science Policy Committee, we aim to do this through bringing together the education and science communities, informing policymakers, providing impartial, evidence-based advice and being seen as the leading voice for biology. Our education priorities 2017-2022<sup>i</sup> underpin our policy work, and outline important factors that contribute to an excellent biology education for all students.

This response is informed by specific views of primary and secondary teachers, initial teacher training providers, and those involved with undergraduate teaching and learning via a survey open 5 – 13 May 2020. The points that follow are also informed by wider conversations before and since the survey with individuals from these groups, colleagues, existing policy positions and discussions with other learned societies in the sciences. The Royal Society of Biology's Council, Education and Science Policy Committee, Membership and Professional Affairs Committee, Accreditation Committee, Biology Education Research Group, Curriculum Committee, Diversity and Inclusion Working Group, Education Policy Advisory Group, Heads of University Biosciences and Member Organisations have also provided input on the impact of COVID-19 on education settings.

Our main concerns and recommendations are listed below, and we would be happy to engage further on any of these matters.

## **Impact on primary science education**

We do not yet have a sense of the impact of disruptions this year on next school year's planning. The Wellcome Trust's 2017 State of the Nation<sup>ii</sup> report of UK science education found that on average UK primary schools teach science for 1 hour and 24 minutes a week, and only 42% teach science for the recommended two or more hours a week.

The Royal Society of Biology is concerned that some schools may further reduce **science curriculum time in 2020/21** to catch up on missed teaching and learning in other subjects due to 2019/20 disruptions. We would urge primary leaders to ring-fence the time usually allocated to science in a given school year and encourage primary science subject leaders to spend time re-engaging their pupils with the sciences. The consequences of several primary cohorts disengaging with the sciences due to lack of access could have significant impact on future progression to A level, further and higher education in the sciences.

**Practical activities** are an integral part of primary science education. It is important that pupils and teachers are supported in providing alternative activities to experience these skills during times of disruption and school closures, and that a return to full practical activity in school, or field work outside the classroom, is phased in as soon as is safe to do so. This should include consideration of: health and safety of teachers and pupils, availability of personal protective equipment, social distancing requirements, suitability of individual activities, level of student competence, and teacher expertise, as detailed below in “Impact on practical activities in primary and secondary”

#### **Impact on secondary science and biology education**

**Practical activities** are an integral part of secondary education in the sciences both for students progressing from school into higher education in the sciences, and for students that finish their science education at the end of the compulsory stage as citizens and as they become members of the workforce. It is important that students and teachers are supported in providing alternative activities to experience these skills during times of disruption and school closures, and that a return to full practical activity in school is, or field work outside the classroom, is phased in as soon as is safe to do so. This should include consideration of: technical support, health and safety of teachers and students, availability of personal protective equipment, social distancing requirements, suitability of individual activities and level of student competence, as detailed below in “Impact on practical activities in primary and secondary”

A further concern in the sciences is **reduced teaching and learning time** during this year and possible continued reduction next year. The Royal Society of Biology is aware that teachers already report difficulties in squeezing the vast Biology GCSE specification into two years of teaching time, the Society is concerned that there will be an increase in the perceived difficulty of the sciences in the next two years of GCSE cohorts, due to the need to cover more of the curriculum in less time, subsequently leading to a reduction in numbers progressing to A level.

Teachers responding to our survey on the impact of Covid-19 disruptions on bioscience education were supportive of a slimming down of examinable content in 2020/21, or a similar approach to this year with students awarded calculated grades in GCSE and A level qualifications 2020/21.

Teachers have further concerns about insecure content knowledge due to lack of access during this period, reduced motivation to study, uncertainty about whether another lockdown will occur and whether qualifications will be awarded as normal in 2020/21. By 15<sup>th</sup> June 2020, year 10 and 12 students will have already missed nine weeks of face-to-face teaching, which is around one eighth of a regular two-year programme of study (assuming a two week Easter break and one week May half term). As a return to full time teaching is unlikely by summer, this will rise to one fifth of a GCSE or A level course by the end of this school year and we expect further disruption in the autumn term. The Royal Society of Biology encourages the Welsh Government and Qualification Wales to consider either

- A reduction in examinable content to be assessed in summer 2021 exams, with recommendations to awarding bodies developed with support from subject organisations.
- A commitment to calculated grade awards in place of summer 2021 GCSE and A level exams, recognising that students have missed a significant portion of teaching time in the first year of their qualification studies.

To recognise the ongoing disruption to learning has not only reduced the effectiveness of teaching and learning for pupils during 2019/20, but also for the start of 2020/21 as GCSE and A level option courses often begin teaching before summer breaks. Along with other scientific learned societies, the Royal Society of Biology has supported consideration of such an approach in Scotland, as stated in a letter<sup>iii</sup> to the Scottish Government COVID-19 Education Recovery Group in May and is raising in discussions with the Department for Education and Ofqual in England.

**Remedial programmes** should be considered, as students return to schools, these will need to be developed on a local level, with a particular focus on students due to sit qualification exams next academic year (current Year 10 and 12), students who have not been able to engage with any available remote teaching at their school, and schools that have been unable to provide any support beyond initial school closure announcements. Support for non-specialists teaching the sciences will be critical in ensuring remedial curriculum approaches are informed by depth of knowledge and disciplinary expertise.

Welsh Government could consider the following **approaches to support students and teachers next year**:

- A framework or guidance for remedial programmes developed by Welsh Government in consultation with awarding bodies and subject organisations.
- Guidance on returning to school practical and laboratory work, including increased health and safety and prioritisation of topics and skills in coordination with subject organisations and CLEAPSS.

It is vital for our disciplines that any recommendations or resources including subject-specific advice or content are developed or quality assured by those with disciplinary and pedagogical expertise in that subject area.

### **Impact on practical activities in primary and secondary school**

It is clear that all students have experienced, and will continue to experience, significant disruption to their education. Schools are expected to be open for some students, currently children of keyworkers and vulnerable students, and an increasing number of year 1 and 6 since 1 June. CLEAPSS, who support practical science, D&T and art in primary and secondary schools and colleges, have produced some guidance to help teachers and technicians during this period of partial school closure.

CLEAPSS advice P104 Organising and managing hands on activities in science<sup>iv</sup>, D&T and art in a partially reopened primary school suggests additional considerations in choosing activities, planning for activities and risk assessment, and in advice P097 suggest **practical activities for primary aged children attending school during extended periods of closure**<sup>v</sup>.

CLEAPSS advise that **standard practical activities in secondary schools during periods of extended closure** are not appropriate activity – particularly if groups of children supervised are of mixed age groups or from different schools. In their GL338 advice on practical activities for pupils attending school during extended periods of closure<sup>vi</sup>, CLEAPSS state in these situations it is likely that there will be:

- No technical support – teachers must not help themselves to chemicals from the chemical store
- Limited knowledge of the practical skills of the individual students
- No access to immediate remedial measures or First Aid

- No suitable disposal route for surplus chemicals and/or the products of reactions.

However, **practical activities intended for use in primary schools** are intrinsically safer, use resources available from around the home or readily available from high street stores, and do not require specialist disposal arrangements. In their GL338 advice CLEAPSS suggest that these resources could be used by an appropriately qualified member of staff to explore complex underlying scientific ideas with secondary students, beyond the primary level they are intended for. CLEAPSS also list unsuitable activities – those that would require more technical support or equipment, or raise health and safety concerns.

When students **return to schools**, the sciences will be further affected if social distancing requirements are still in place as practical activities in the classroom generally involves pair or group work. Engaging with practical activities and developing laboratory skills are vital parts of our discipline, but should only be reintroduced into the classroom when it is safe for teachers and pupils to work in close proximity. It has been reported by schools that they have donated protective eyewear to front line staff, this piece of equipment is critical to health and safety in the school laboratory and schools may now struggle to replace at short notice.

Where individual equipment is available for every student, the Royal Society of Biology hopes that some practical science can be reintroduced via Biology fieldwork outdoors earlier than laboratory work. For example, in school grounds, playing fields, a local park, where the risks of infection are substantially lower and social distancing may be easier to achieve.

The Royal Society of Biology recommends that Welsh Government develops a similar framework for teachers of the sciences and school technicians in coordination with CLEAPSS who have already published advice GL343 – Guide to doing practical work in a partially reopened school<sup>vii</sup> and GL345 Guidance for science departments returning to school after an extended period of closure<sup>viii</sup>. Guidance should be accessible to all schools, teachers and technicians detailing clear recommendations and requirements, including:

- Entry into the lab, maximum number of pupils per lab and per laboratory work station – dependent on social distancing requirements during any given phase of the UK's pandemic response.
- Managing practical activities, Heads of department in coordination with senior technicians must ensure there is adequate staff coverage and

expertise to ensure suitable preparation, lab scheduling and social distancing.

- Length of lessons – practical activities are likely to take longer to complete as students will be working individually.
- Equipment – schools should only carry out laboratory work where there is enough equipment for one set per student. This should be set up in advance, requiring more lab time to be used for set up, clearing and cleaning by socially distanced staff members.
- Health and Safety of students – socially distanced teachers may not be able to supervise individual activity as normal. Teachers, Technicians and Heads of Department must take this into health and safety and student competency into consideration via a risk assessment.
- Where there are any doubt new rules, cleaning procedures, social distancing can be observed, practical activity should be halted and an alternative sought to experience these skills in the short term.
- Availability of Personal Protective Equipment, and sanitisation or disposal of this equipment after each use, and personal bottle of hand sanitiser allocated to every student and teacher carrying out practical work.
- Risk assessment of individual vulnerabilities of staff and students e.g. risk factors and demographic of the community.

Many of these recommendations will entail increased expenditure by schools for the sciences. The Royal Society of Biology recommends that the Welsh Government considers making available additional funds to ensure that students are able to safely access laboratory and field work activities as part of their compulsory science education.

### **Impact on undergraduate bioscience students**

The Royal Society of Biology supports the **adoption of no detriment policies** by Higher Education Institutions. In March, a statement<sup>ix</sup> was shared with all institutions with degrees accredited by the Society to reassure life science departments that changes to teaching and assessment that prove necessary due to COVID-10 disruptions should not impact on the accreditation of their degrees. Universities and life science departments are responsible for ensuring that their approach to this situation upholds overall standards and mitigates impact on their students and overall learning outcomes of their programmes.

The Royal Society of Biology's survey on bioscience education impacts due to COVID-19 disruptions received 23 responses from those involved in undergraduate

teaching and learning. Some individuals reported they expect significant reduction in **laboratory skills opportunities for current undergraduate students** next semester and beyond. Where institutions were confident that most hands-on practical classes had been completed ahead of closures, it was noted that some students will have missed specific skills that they would not normally not have an opportunity to experience again during their degree. Available laboratory space will be a concern if social distancing requirements further impact current undergraduates, and some institutions are already planning for lab closures and delivery of virtual laboratory practicals for at least the first semester of 2020/21. This may include novel approaches, such as moving practical modules into later years of an undergraduate course, use of a pyramid system that prioritises labs that cannot be delivered online and for students who are closest to the end of their degree.

The Royal Society of Biology recommends that Higher Education Institutions review the time left in an undergraduate degree programme and seek novel approaches so that students are given the opportunity to experience and achieve competence in any laboratory skills that have been missed due to physical building closures. The Society is working with accredited institutions to ensure that any adjustments made to accredited programmes remain in line with the overall learning outcomes and experience expected for bioscience graduates.

The Royal Society of Biology considers the delivery of practical skills an essential element of a biosciences degree and recognises that the COVID-19 crisis presents significant challenges for the **teaching of technical laboratory and fieldwork skills in 2020/21 and beyond**. Some of these skills can be successfully experienced via online or virtual activities, with some institutions already excelling at such delivery in their normal modules. The Society's Accreditation Committee have produced discussion paper<sup>x</sup> for HEIs on this topic to provide clarity on the importance and practicalities of technical skills teaching. At the time of submission to the Education Select Committee, RSB's Accreditation Committee were awaiting feedback from bioscience departments on how they intend to meet this challenge. The Royal Society may provide further advice in this area as it expects, for the next two years at least, health and safety in laboratories, laboratory teaching and field work may be very different to pre-Covid-19 arrangements.

The Society's Accreditation Committee has considered the education purpose of practical classes and field work, including:

- Learning by doing, not just listening and watching
- Providing students with an experience of being a practical scientist

- Giving a context to the theoretical understanding of the subject
- Generation of original data that can be processed and interpreted by the students, including pooling of individual student results to increase sample size
- Some experience of experimental design and testing of a hypothesis
- Practical understanding of the requirements of health and safety
- Experience and understanding of team-working, including strengthening cohort identity and forging of friendships
- Enhancement of transferable skills such as time-keeping, self-management and problem solving
- Close collaboration between students and staff
- An introduction to some of the job opportunities to graduates
- Competence in technical skills

The Royal Society of Biology aims to support life science departments in meeting the above purposes, and supports increased use of theoretical approaches, virtual methods and simulations while students are unable to safely travel or work in close proximity. HEIs may choose to increase the use of such approaches longer term, beyond restrictions caused by the COVID-19 pandemic. The Royal Society of Biology supports the use of approaches that benefit student experience and augment access to and engagement with the purposes listed above. Experience of being practical scientist, practical understanding of the requirements of health and safety, an introduction to job opportunities and competence in technical skills will be the most challenging aspects to achieve while disruptions to regular laboratory sessions and field work remain.

A return to laboratory sessions and field work should be supported by HEIs and government. The Royal Society of Biology would encourage the Government to produce guidance for Universities specifically considering learning and teaching in a laboratory and its alignment with other advice e.g. reopening of Halls of Residence.

Evidence from our members points to a wide variety of approaches being considered by Universities for adjustments to the 2020/21 academic year or admissions processes, following cancellation of spring open days and summer exam series, and student and parent uncertainties as to whether another lockdown will occur in autumn. This is likely to cause significant anxiety for students and teaching-focused staff, and may have knock on consequences for student deferrals and staff retention. In 2021/22 competition for university places is likely to be increased due to increased deferrals. The UK could look to good

practice in Hong Kong and Germany, both of which underwent periods of double cohort entry to University due to changes in the length of schooling pre-higher education in the last ten years.

Universities have reported admissions cycles are likely to be impacted, with some institutions already delaying entry and considering multiple start points. The Royal Society of Biology notes that increased deferrals to 2021/22 may have a disproportionate effect on student places in the sciences next year, due to limited laboratory space unless alternative online provision can be facilitated.

The Royal Society of Biology expects to see online teaching in all universities for at least the first semester, delays to the start of the academic year, blended approaches, and significantly different laboratory and field work experiences.

## **Impact on trainee teachers and Newly Qualified Teachers (NQTs) in the sciences**

School closures have had a huge **impact on the 2019/20 cohort of trainee teachers (NQTs in 2020/21)** – trainees have missed a significant portion of their second placement, or main teaching practice during March – June. During this period of their training trainees are expected to progress to a fuller timetable, taking on additional responsibilities with the support of their training provider. This second placement normally provides an opportunity for trainees to further develop their practical skills, and subject specific pedagogy, including for example, teaching laboratory skills and behaviour management in practical lessons. New teachers in September 2020 may experience a drop in confidence after an unusually long period between their last placement in a science classroom and their first day as a new teacher. As such, the second placement in a PGCSE is vital in preparing our next cohort of teachers.

2020/21 NQTs will also be expected to take on an 80% timetable with reduced support from mentors. Where possible, the Royal Society of Biology would recommend that head teachers consider allocating NQTs a reduced 70% timetable for at least the first term, and ensure that NQT timetables are sympathetic to their existing skills base and to pair classes – for example, three Year 7 classes in the area of their disciplinary expertise, rather than a Year 7, 8, 9 class across the three science disciplines. This will allow NQTs time to further develop their planning, subject pedagogical and practical skills. Without a reduction in timetable for at least the first term in 2020/21 and increased mentoring support, the Royal Society of Biology is concerned that attrition rates in the sciences will increase further next year.

The Royal Society of Biology recognises that this may be a challenge for some schools, and could be impossible for others within their current budgets. We would encourage Welsh Government to consider whether funds may be made available in the form of a grant to schools that could commit to a 70% timetable and increased mentor support for 2020/21 NQTs, allowing schools to hire additional NQT staff or retain those who may have intended to retire at the end of this year in addition to the new NQT hires. Buying out 10% of an NQTs timetabled workload costs around £3000 per year, however the actual time benefit to the NQT would be more than this 10%, as the associated planning, marking and administrative time for those classes would also be gained. The cost of this could be weighed against the cost of another round of recruitment, or training another teacher, should an NQT leave the profession earlier than expected due to this unusual start to their teaching career.

The Royal Society of Biology is concerned that reduced confidence of 2020/21 NQTs and NQT+1s, and reluctance of school leadership to hire from this cohort, may lead to further recruitment and retention issues in the sciences. Increased mentoring and additional financial support to maintain links with previous training providers may be key to ensuring good teachers are not lost from this cohort due to the disruptions in 2020. Training providers themselves will not have capacity to support NQTs and their new cohort of trainee teachers without additional funding.

We also expect that there will be fewer recruitment opportunities for this cohort; with the uncertainties around lockdown and school closures during a time schools may be interviewing new staff it is likely fewer staff will move to a new school after summer. SchoolDash have reported<sup>xi</sup> a rapid year-on-year decline of teacher recruitment advertisements since March.

The impact **on 2020/21 cohort of trainee teachers** remains to be seen and will be dependent on whether school placements can resume in autumn 2020. Social distancing in schools and phased return of students may limit the number of placements on offer through ITE providers and schools direct. Institutions providing teacher training must be supported to return to a full initial teacher education programme as soon as it is safe for them to do so. Where adjustments are made in 2020/21 each school and institution should consider how best to support trainees through both placements.

The Royal Society of Biology acknowledges that there is no simple solution to the issues outlined above, but encourages the Welsh Government and Education Workforce Council to consider how this cohort of NQTs can best be supported to progress and thrive as teachers, and suggests there is an increased need for subject specific content knowledge and subject pedagogy to support the affected cohorts of trainees and NQTs.

### **Long term impact on primary, secondary and tertiary bioscience education and educators**

It is clear that across all education stages and settings, there is a wide **variation in the support** being provided for pupils and students home learning, and access to and engagement with remote teaching is equally diverse. In the sciences, an added loss due to cancellation of face to face teaching and learning is in

laboratory skills and practical activity. Primary, secondary and tertiary education providers and the institutions that support them, must take action to ensure that these cohorts are re-engaged with the sciences and particularly the practical component of our disciplines, next year and beyond.

The longitudinal ASPIRES and ASPIRES2 research projects<sup>xii</sup> investigated what shapes young people's desire to continue with science qualifications and career ambitions and the factors that influence how young people identify as being "good at science". These projects tracked a cohort of young people from age 10 to 19 through over 40,000 surveys and 660 interviews with young people and parents/carers. This research suggests that science capital is a key factor in shaping young people's science identities and aspirations, and that building science capital as early as possible and challenging dominant representations and notions of STEM as being "hard", "difficult" or for the clever, and the idea of there being a "science brain". Many of these notions may have been reinforced during a period of school closures due to a lack of science capital at home. Combined with the variation in support for pupils, this may have an impact on progression to the sciences as primary and Key Stage 3 cohorts move through formal education and into the workforce.

The Royal Society of Biology is aware that the sciences are particularly affected by **unconscious bias and barriers to progression in formal education** for certain groups of students, including gender, disability, race and socio-economic status. Gil Wyness' 2017 report<sup>xiii</sup> "Rules of the Game" highlights the disadvantages already faced by students belonging to particular groups. Digital poverty is prevalent across primary, secondary and tertiary students. Universities are currently reviewing the extent of this while they consider move to online teaching for the foreseeable future, and as they do so the risk of widening attainment gaps at all levels. We must do everything we can to ensure that pupils and students are not further disadvantaged by the impact of school closures and calculated grades this year, including equality impact analysis of calculated grade awards and progression and attainment data for these cohorts in the next few years. Education institutions must be supported to safeguard disadvantaged students to ensure they are still able to learn in an online environment and progress as expected through their formal education.

The Royal Society of Biology welcomes the confidence that Qualification Wales have placed in **teachers' professional judgements** to ensure that students in Wales receive the grades they deserve and can progress as planned to the next stage of education or employment. This must be communicated to students,

parents and universities; the process for awarding calculated grades in 2020/21 must be seen as transparent and robust. The Society would also welcome a long term approach to solving some of the issues outlined above, with an aim of improving and building more resilience into student and teacher subject knowledge and experience of the sciences, while supporting education institutions in a phased approach in returning to and revitalising practical activities in the science - a vital part of student learning.

During a pandemic, the **need for good science education** of all students is thrown into sharp relief. We must ensure that short term solutions, necessary due to disruptions caused by the pandemic, do not lead to longer term adjustments that are detrimental to education in the sciences and subsequent science skills and literacy of our citizens and workforce.

## Summary of Royal Society of Biology recommendations

1. Primary and secondary schools are supported to provide alternative activities that allow students to experience practical skills, and that a return to full practical activity or outdoor field work is phased in as soon as it is safe to do so.
  - a. Development of a framework for teachers of the sciences and school technicians in coordination with CLEAPSS providing guidance for working safely in school science laboratories and field work, and prioritisation of topics and skills in coordination with subject organisations and CLEAPSS.
  - b. Additional funding in 2020/21 for school science departments to ensure students are able to safely access laboratory and field work activities as part of their compulsory science education.
2. A framework or guidance for remedial programmes and qualifications in 2020/21, developed by the Welsh Government in consultation with awarding bodies and subject organisations.  
Including urgent commitment to either:
  - a. Reduction in examinable content to be assessed in summer 2021 exams, with recommendations to awarding bodies developed with support from subject organisations.
  - b. A commitment to calculated grade awards in place of summer 2021 GCSE and A level exams, recognising that students have missed a significant portion of teaching time in the first year of their qualification studies.
3. A Qualifications Wales commitment to an equality impact analysis of calculated grade awards, progression and attainment data for cohorts affected by the disruptions this year and as they progress.
4. Higher Education Institutions should review time left in an undergraduate degree programme and seek novel approaches so that students are given the opportunity to experience and achieve competence in any laboratory skills that have been missed due to physical building closures
5. Development of Government guidance for Universities regarding learning and teaching in a laboratory in 2020/21
6. Additional support for NQTs in 2020/21

- a. Head teachers should consider allocating NQTs in 2020/21 a reduced 70% timetable for at least the first term, and ensure that NQT timetables are sympathetic to their existing skills base and to pair classes within that timetable to reduce planning workload and increase confidence in disciplinary knowledge and pedagogical skills.
- b. The Welsh Government should secure funds to establish a grant for schools that commit to a 70% (or less) timetable and work with the Education Workforce Council to ensure increased mentor support for NQTs in 2020/21.

## **RSB support and engagement for the bioscience and education communities during COVID-19**

Bioscience education during COVID-19 webpages:

Royal Society of Biology - Education during COVID-19

<https://www.rsb.org.uk/education/education-during-covid-19>

Royal Society of Biology - Advice for students and parents during COVID-19 pandemic

<https://www.rsb.org.uk/education/education-during-covid-19/advice-for-students-and-parents>

Royal Society of Biology- Education announcements during COVID-19 pandemic

<https://www.rsb.org.uk/education/education-during-covid-19/education-announcements>

Other Covid-19 webpages:

Royal Society of Biology COVID-19 bulletin

<https://www.rsb.org.uk/about-us/covid-19/covid-19-bulletin>

Royal Society of Biology COVID-19 resources from the community

<https://www.rsb.org.uk/about-us/covid-19/covid-19-resources-from-our-partners>

All references below accessed on 8 June 2020

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<sup>i</sup> [https://www.rsb.org.uk/images/RSB\\_Education\\_Priorities\\_2017\\_20.06.pdf](https://www.rsb.org.uk/images/RSB_Education_Priorities_2017_20.06.pdf)

<sup>ii</sup> <https://wellcome.ac.uk/sites/default/files/state-of-the-nation-report-of-uk-science-education.pdf>

<sup>iii</sup> <http://www.rse.org.uk/wp-content/uploads/2020/05/LSG-letter-COVID-19-and-examinable-content.pdf>

<sup>iv</sup> <http://primary.cleapss.org.uk/Resource-File/P104-Managing-hands-on-activities-in-a-partially-reopened-school.pdf>

<sup>v</sup> <http://primary.cleapss.org.uk/Resource-File/P097-Practical-activities-for-children-attending-school-during-a-closure.pdf>

<sup>vi</sup> <http://science.cleapss.org.uk/Resource/GL338-Practical-activities-for-pupils-attending-school-during-extended-periods-of-closure.pdf>

<sup>vii</sup> <http://science.cleapss.org.uk/Resource/GL343-Guide-to-doing-practical-work-in-a-partially-reopened-school-Science.pdf>

<sup>viii</sup> <http://science.cleapss.org.uk/Resource/GL345-Guidance-for-science-departments-returning-to-school-after-an-extended-period-of-closure.pdf>

<sup>ix</sup> [http://rsb.org.uk/images/RSB\\_accreditation\\_no\\_detrimet.pdf](http://rsb.org.uk/images/RSB_accreditation_no_detrimet.pdf)

<sup>x</sup> [http://rsb.org.uk/images/TL\\_lab\\_and\\_field\\_during\\_COVID-19\\_May\\_2020.pdf](http://rsb.org.uk/images/TL_lab_and_field_during_COVID-19_May_2020.pdf)

<sup>xi</sup> <https://www.schooldash.com/blog.html#20200506>

<sup>xii</sup> <https://www.ucl.ac.uk/ioe/departments-and-centres/departments/education-practice-and-society/aspires-research>

<sup>xiii</sup> <https://www.suttontrust.com/wp-content/uploads/2017/12/Rules-of-the-Game.pdf>