



## **Broadening the Practical Science experience for students from Early Years to Higher Education**

### **Report from the 11 July 2022 Workshop**

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**Funded by Durham University ESRC Impact Acceleration Account**



<https://eise.webspace.durham.ac.uk/>

## Table of Contents

<b>Introduction.....</b>	<b>3</b>
<b>Overview of the second workshop.....</b>	<b>4</b>
<b>Discussion of perceived barriers to providing a broad practical science experience.....</b>	<b>5</b>
<b>Tackling key barriers: Identifying practical actions and suggestions of key stakeholders .....</b>	<b>6</b>
<b>Feedback and Actions .....</b>	<b>7</b>
<b>Conclusion and Next Steps.....</b>	<b>8</b>
<b>Appendix 1 .....</b>	<b>10</b>

## Introduction

The workshop held in July 2022 was the second in a series of workshops funded by the Durham University ESRC Impact Acceleration Account to act upon the key findings from the Monitoring Practical Science in Schools and Colleges study published in 2019<sup>1</sup>.

The workshops were convened to address two particular key findings from the 2019 study, which were that:

- Practical science experiences for 11 – 18 year olds are narrow and limited to lesson-length experiments that require “following instructions”. Students do not carry out long-term open-ended practical work.
- Post-16 teachers do not know what practical work currently occurs in university laboratory settings, basing this on their own experiences of university.

With these challenges in mind, the first workshop focussed on practical science in the 11-18 age range. However, following the discussion at the first workshop, the education phases covered in the second workshop were expanded to include Early Years through to Higher Education. It was considered that there were similarities in challenges, and the opportunity to collaboratively act upon the challenges more effectively, if there was a shared understanding and the opportunity to share good practice across education phases.



*Figure 1. Attendees at workshop 2 during the round table discussion session.*

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<sup>1</sup> Helen Cramman, Vanessa Kind, Andrew Lyth, Helen Gray, Kirsty Younger, Adam Gemar, Paivi Eerola, Rob Coe & Per Kind (2019). Monitoring practical science in schools and colleges. Durham, Durham University. Retrieved from <https://www.dur.ac.uk/research/directory/view/?mode=project&id=934>

The report details the findings of the three-year longitudinal project monitoring the impact on practical science in schools from the changes to the GCSE and A level science qualifications in England. The study was funded by the Gatsby Charitable Foundation with a contribution from Wellcome.

## Overview of the second workshop

Building on the 2019 workshop<sup>2</sup>, the second workshop aimed to discuss the barriers to providing a broad practical science experience further. It also considered actionable solutions that could be taken to remove these barriers. The impact of the COVID-19 pandemic on practical science in schools was a major feature of the presentations and discussions.

The workshop took place on 11 July 2022 at the National STEM Learning Centre in York and consisted of eight presentations from delegates, followed by two round table discussions (see Appendix 1 for the agenda of the workshop). Discussion focussed around two points:

1. Perceived barriers to providing a broad practical science experience.
2. Tackling perceived barriers: Identifying practical actions and suggestions of key stakeholders to address identified barriers.

The workshop was attended (in person and remotely) by 30 delegates from:

- Examination Awarding Organisations
- Science professional bodies/learned societies
- Funders/education charities
- University science education research groups
- School and University teachers
- The government examinations regulator.

### Key findings

Three key findings from the second workshop were that:

- Collaboration across all sectors (primary and secondary schools, Higher Education institutions, awarding bodies and educational organisations) is an extremely useful forum to share resources, best practice and achieve alignment across all sectors.
- This forum would be particularly helpful to further articulate the purpose and value of practical work in schools, with a consistent set of vocabulary across all sectors.
- The COVID-19 pandemic has impacted practical work in schools, with many citing teacher confidence and resourcing as major challenges.

A detailed summary of the analysis of responses from the round table discussions are presented in the following two sections.

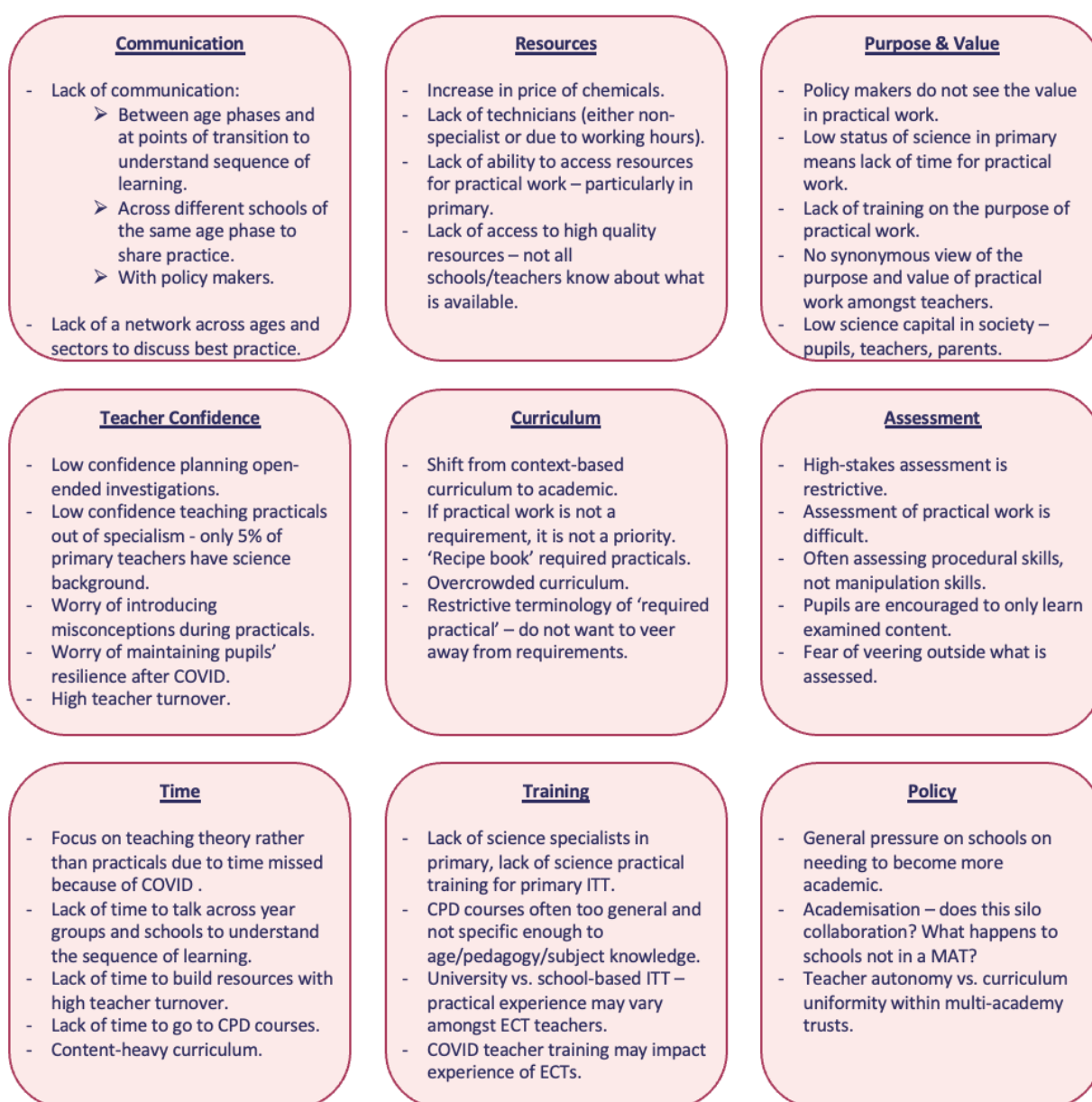
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<sup>2</sup> The report from the 2019 workshop can be downloaded [here](#)

## Discussion of perceived barriers to providing a broad practical science experience

The perceived barriers to providing a broad practical science experience in schools are outlined in the graphic below. These ideas were drawn from delegates' own experiences as well as thoughts provoked from the presentations in the morning sessions. Ideas were analysed thematically and organised into nine key themes: *communication, resources, purpose and value, teacher confidence, curriculum, assessment, time, training and policy.*

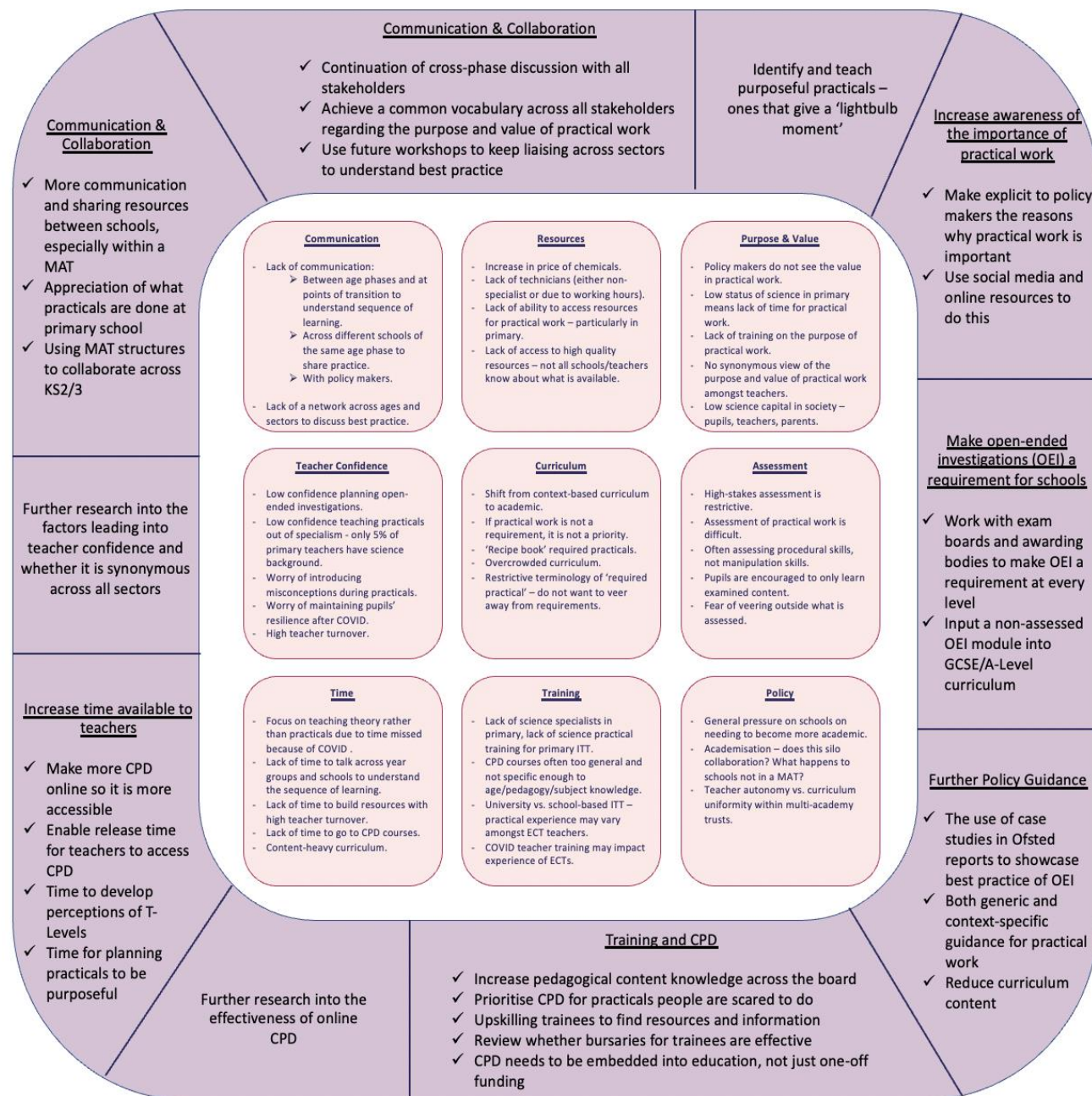
### Perceived barriers:



## Tackling key barriers: Identifying practical actions and suggestions of key stakeholders

Following the first round table discussion, delegates discussed practical actions and suggestions that key stakeholders could take in order to address the barriers identified. These have been analysed for common themes and are shown in the purple outline.

The original barriers are included in the central pink squares for context.



## Feedback and Actions

Stakeholders were asked to write down one to three actions that they would take away from the workshop, whether that be food-for-thought or action points. Four key themes were identified, which are shown below with example quotes.

1. Further collaboration within this group of stakeholders

*'more of these meetings'*

*'use this group to liaise with... learned [societies] to discuss practical science policy'*

2. Focus on transitions between KS3 and KS4 to consider the whole learning journey

*'look back more on what children have already done rather than just looking forwards'*

*'focus future work on the KS3 to KS4 transition and how one informs the other'*

*'Discuss with Head of Department [in a school] to implement more outreach/collaboration with MAT primaries'*

3. Implement more open-ended investigations into the curriculum

*'contact [delegate] for more information about ways into open-ended investigations'*

*'the importance of open-ended investigations that don't need to be assessed'*

*'increase...the use of investigations at KS5 to count towards A-Level'*

4. Use upcoming research/reports to further inform best practice in practical science

*'consider how the feedback today can be applied, where appropriate, to future primary guidance from the EEF'*

## Conclusion and Next Steps

As with the first workshop, the scope and scale of the barriers facing schools in providing a broad practical experience was clear from the discussions in the workshop and the presentations in the first part of the day. Five of those main barriers were:

1. **A lack of clarity in the purpose and value of practical science teaching**, which has been heightened during the pandemic in a time where the ability to conduct practical work decreased in schools.
  - a. **A lack of science capital** was cited as another reason for this, with many pupils feeling ‘science is not for them’ and only 5% of primary teachers having an academic background in science<sup>3</sup>.
2. **Lack of teacher confidence to teach practical lessons**, whether that be due to teaching out-of-specialism, managing behaviour or planning open-ended investigations.
3. **Changes in the curriculum and assessment of practical work**, with open-ended investigations not being a priority for schools because they are not in the curriculum.
  - a. The difficulty of assessing practical skills was another barrier for conducting practical work, as often pupils prefer to learn exam responses.
4. **A lack of time** for teachers to attend CPD, talk to other colleagues to share best practice, or to build a bank of resources, often due to the high levels of teacher turnover in some schools. The move to more CPD being online due to the pandemic had been a positive in some cases for reducing the time needed away from the classroom to attend CPD.
5. **A lack of resources** facing schools, including technicians and chemicals.
  - a. Delegates did discuss teachers as being gatekeepers of knowledge and resources, and due to the high turnover of teachers this can pose a problem.

The key message from delegates at the end of the workshop was how useful it had been to share a common understanding of the issues facing the science education sector as a whole regarding practical work, and the COVID-19 pandemic, which was something they had not been able to do as effectively over the last two years. There was a strong desire to continue meeting as a group to continue a common understanding, with some delegates suggesting a further workshop on articulating the purpose and value of practical work.

Other delegates said they were going to take action back at their own organisations. Those across different organisations said they were going to focus attention on the sequence of learning by liaising

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<sup>3</sup> Vision for science, mathematics and computing education, The Royal Society Science Policy Centre report (2014), <https://royalsociety.org/-/media/education/policy/vision/reports/vision-full-report-20140625.pdf>



with teachers from different Key Stages. Others noted how useful it had been to learn about the value of open-ended investigation and were going to take active steps to learn more about how this could be implemented and prioritised.

The organisers of the workshop would like to thank the attendees for their valuable input into the workshop, and for the actions that have been taken away to discuss and implement. The next steps from the organising team will be to seek funding to enable attendees to come back together to discuss the topics highlighted, and also to continue communication across the community to share updates on the actions taken away from the workshop.

## Appendix 1

### Agenda

Location: National STEM Learning Centre, York

Date: 11 July 2022

Time	Topic
10:00	Welcome and introductions
10:15	<p>Latest research on the practical science experience for students and staff in primary and secondary schools and Higher Education during and beyond the COVID-19 pandemic</p> <ul style="list-style-type: none"><li>• Overview of the Wellcome Trust report on the impact of COVID-19 on primary science education</li><li>• Assessing students' knowledge and understanding of practical work through examination questions: Practical Assessment of School Science (PASS) project</li><li>• Students' experiences and perceptions of practical science as they transition from A-Level to HE during COVID-19</li><li>• Future of practical science: Teacher training during the pandemic and long-term impact on practical work in schools</li></ul>
11:15	Q&A with speakers
11:30	<p>Examples of innovative practices being undertaken by schools, academy trusts, universities and education-linked organisations to rethink how the curriculum and practical science are delivered</p> <ul style="list-style-type: none"><li>• A case study exemplifying teaching for and with creativity to develop primary students' practical science skills</li><li>• Improving outcomes in science through collaboration between primary and secondary schools</li><li>• How does the Teacher Assessment in Primary Science (TAPS) project support practical science?</li><li>• Curious teachers: open-ended investigations post-16</li></ul>
12:45	Q&A with speakers
13:00	Lunch
13:45	<p>Round table session 1: Discussion of perceived barriers to providing a broad practical science experience</p> <p>Feedback and group discussion</p>
14:30	<p>Round table session 2: Tackling key barriers from session 1 – Identifying practical actions and suggestions of key stakeholders to address barriers</p> <p>Feedback and group discussion</p>
15:15	Action planning and next steps