



REPORT

RESOURCING PRACTICAL SCIENCE IN PRIMARY SCHOOLS

BACKGROUND

Taking part in practical work is an integral and essential part of learning the sciences. It provides experiences through which students can develop their understanding, enabling them to make the link between subject content and the physical and living worlds by experiencing and observing phenomena; it teaches techniques and skills for handling equipment and materials safely; and it promotes the development of scientific reasoning, so that students can understand, through experience, the importance of evidence in supporting scientific explanations and theories. Therefore it is essential that practical work is properly resourced and that all students have access to the equipment, facilities and opportunities necessary for a complete and authentic education in the sciences.

In 2008, SCORE published the first of its reports on practical work¹; the associated research revealed concerns about the provision of resources for practical work in schools. With this in mind, SCORE commissioned Pye Tait Consulting to investigate the levels of resourcing in schools and sixth form colleges. This report is a response to their findings, focusing on primary schools².

WHAT IS PRACTICAL WORK?

SCORE defines practical work as learning activities in which students observe, investigate and develop an understanding of the world around them, through direct, often hands-on experience of phenomena or manipulating real objects and materials. In order for enough of these sorts of activities to take place effectively, schools need adequate resources. To assess how many schools in England have sufficient resources, SCORE created benchmarks³ in four areas:

- equipment and consumables and an estimation of quantity required;
- classroom facilities;
- access to outside space;
- technician support (this was not used for the primary survey).

These benchmarks were designed to represent an acceptable level of resourcing, between a bare minimum and an aspirational 'gold standard'. From the equipment and consumables benchmarks, a sample of indicative



items was identified. These represent the minimum requirement for carrying out practical work in the classroom.

METHODOLOGY

SCORE commissioned Pye Tait Consulting to carry out a survey of schools and sixth form colleges in England, to gather evidence on the extent of the resourcing of practical science. The research used a mixed methods approach combining quantitative and qualitative research instruments. It comprised online surveys for primary schools, secondary schools and sixth form colleges, with follow-up telephone interviews and onsite visits to a sample of establishments to explore some issues in greater depth. The surveys garnered a total of 401 responses from 397 unique primary schools.

MAIN FINDINGS

- Many primary schools lack sufficient appropriate resources to teach practical science effectively
- Facilities in many primary schools are not adequate for practical science
- There is large variation in funding for practical science in primary schools
- Low levels of resourcing are accepted as the norm

¹ SCORE's research on practical work can be found at <http://score-education.org/policy/curriculum/practical-work-in-science>

² The full reports from Pye Tait Consulting, *Under the Microscope*, can be found on the SCORE website at <http://score-education.org/policy/curriculum/practical-work-in-science>

³ The benchmarks are available on the SCORE website to assist schools with their resourcing; they can be found at <http://score-education.org/policy/curriculum/practical-work-in-science>

Primary schools lack sufficient appropriate resources to teach practical science effectively

Many primary schools lack sufficient quantities of equipment and consumables, with over 70% of schools having less than 60% of the items needed. The average primary school has only 46% of the equipment and consumables in sufficient quantities needed to teach science.

As *figure 1* shows, there are some items that are particularly hard to obtain, such as data loggers and sufficient supplies of working batteries. In addition, teachers reported finding it difficult to obtain supplies of some types of equipment – such as magnifiers, stopwatches and magnets – that are both fit-for-purpose and sufficiently robust to withstand use by pupils.

Facilities in primary schools are not adequate for practical science

Science in primary schools is most often taught in ordinary classrooms. Nonetheless, teaching science effectively requires specific facilities, including a resources area, safety equipment and dark space. Only around a quarter of respondents indicated easy and regular access to all the items on the list, and more than a fifth said they had no access but it was needed.

While most schools had access to a sink, only around 50% had easy access to dark space. Creative items such as polymers, smart materials, heat sensitive toys, UV beads, puppets and various science games, all of which can help with engaging primary school children with science, were also reported as being in short supply, and needed by schools (see *figure 2*).

Lack of storage space for science equipment and consumables is a problem for nearly a fifth of respondents, and can mean that items are not purchased even when money is available, as there is nowhere to store them.

Although access to outside space was less challenging than other areas of resourcing, the average primary school was still only able to access two-thirds of the indicative outside learning experiences (including ponds, varied habitats and environments with varied rock and soil types), and no schools were able to report easy access to all of them.

There is large variation in funding for practical science in primary schools

Per capita spend on practical science varies between £0.04 and £19.08 per year.

The average per capita spend on science for the academic year 2011/12 in primary schools was £2.89. However there is considerable variation, with per capita spend ranging from £0.04 to £19.08. Spend varied by size of school, with average annual budgets ranging from £1352.79 for large schools (>350 pupils), to £717.89 for medium schools (200-349 pupils) and £531.91 for small schools (<200 pupils). Holders of, or those working towards, the Primary Science Quality Mark (PSQM) tended to allocate more money to science, with average budgets of £1288.78 compared to £713.59 for non-holders of the award. Schools also reported high levels of variation in funding allocations from year to year, making it difficult to plan ahead in relation to the resourcing of practical science.

Over three-quarters of respondents reported that there was no formal allocation of part of the science budget specifically for practical work.

Low levels of resourcing are accepted as the norm

“There is just not enough money to properly maintain a good stock of everything that is needed to fulfil the requirements of the curriculum and to stimulate and excite children about science”

Assistant head teacher and science co-ordinator, maintained school

Nearly a third of respondents reported being very or quite dissatisfied with the amount of funding available for science, with those in smaller schools generally being less satisfied than those in medium or large schools. However, when asked about levels of resourcing, in terms of the equipment and consumables they had available, nearly half the respondents reported being quite satisfied, and only a fifth said they were quite or very dissatisfied.

This was underpinned by the qualitative feedback, which pointed to a culture of tolerance and coping with the levels of resources available. Staff in primary schools also reported supplementing budgets out of their own pockets, with very few expecting to be reimbursed; 37% of respondents stated that they contributed to normal curricular spending from their own money.

Figure 1: Level of resourcing of equipment and consumables

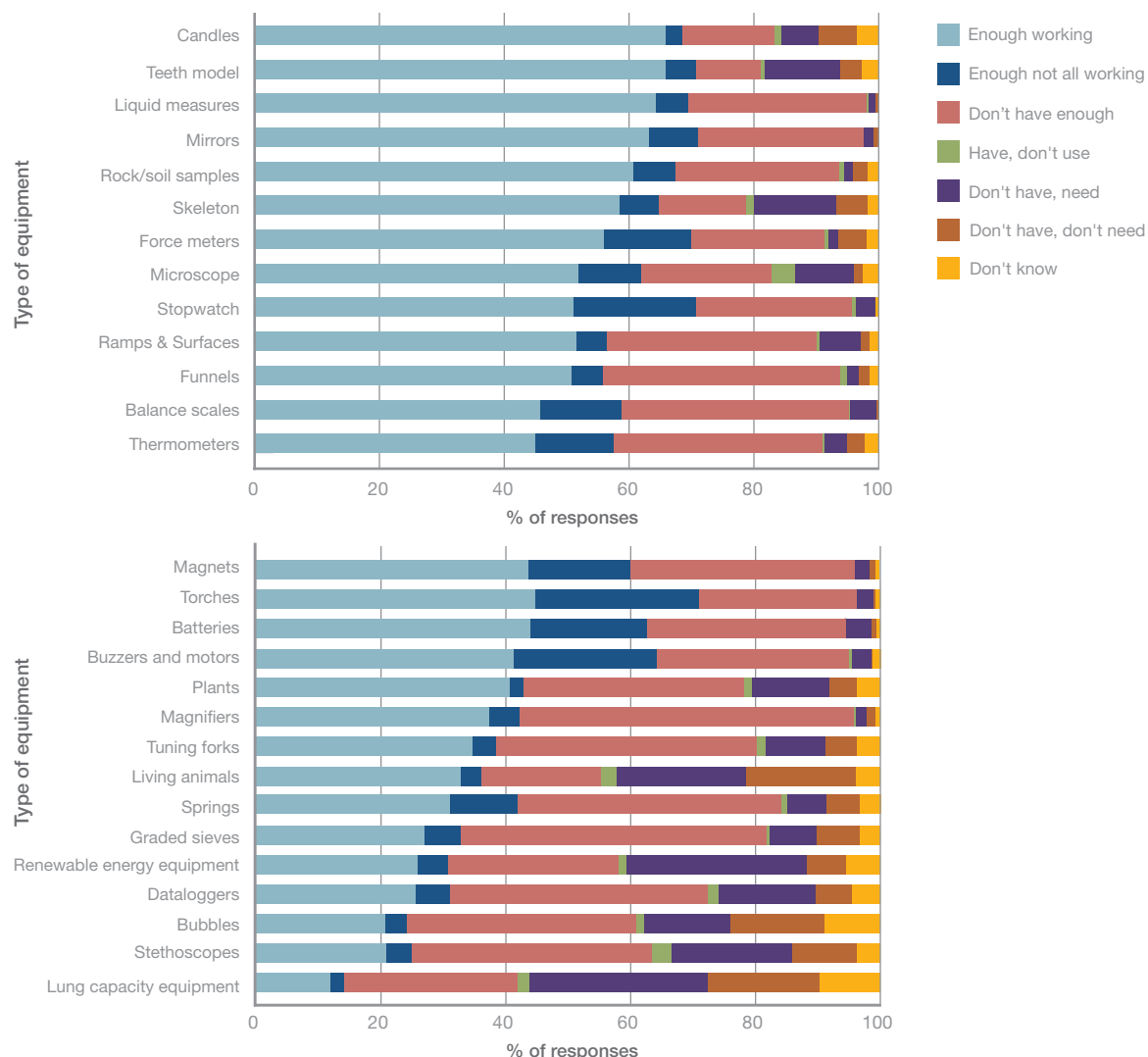
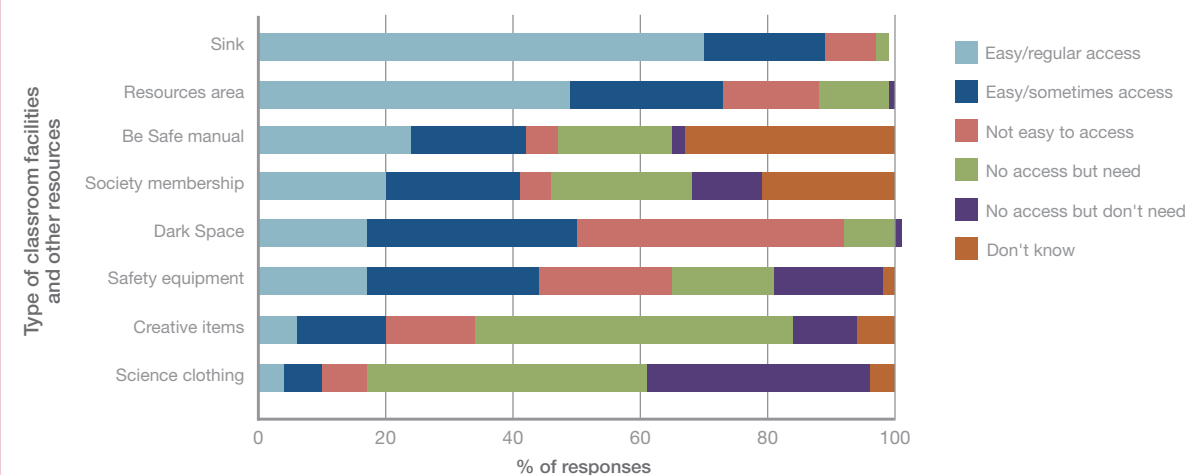


Figure 2: Level of resourcing of classroom facilities and other resources



Drivers influencing the resourcing of practical science in primary schools

1. Removal of National Curriculum tests in science at Key Stage 2

Around 45% of respondents stated that the removal of the National Curriculum tests had resulted in less emphasis on science. This was both in terms of the time allocated to the teaching of science and the money available for resourcing science. There was some concern that this has resulted in science having a lower status within some schools.

2. Economic drivers

Over 40% of respondents reported static or decreasing budgets, and this was perceived by schools to depend on which Local Authority was responsible for allocating funding. Funding cuts had also led to a reduction in the role of Local Authority science advisors. This had very

real impact on schools' ability to offer practical science, for example with the removal of loan systems for some equipment, and reduced access to science purchasing via the Local Authority, which saved time and money.

3. Attitude of head teacher towards practical science

The priority given to practical science within primary schools was largely dependent on the attitude of the head teacher and/or senior leadership team, since this could influence the amount of time and money devoted to the subject.

4. Changes to the National Curriculum

Many respondents were apprehensive about changes to the National Curriculum, and whether budgets would be increased to reflect any additional resourcing needed to deliver it.

RECOMMENDATIONS

1. Many primary schools lack sufficient basic equipment and access to outside space necessary for carrying out practical work in science. SCORE recommends:

- 1a. Those responsible for setting resourcing levels in primary schools should be expected to use the benchmarks provided by SCORE to determine their schools' resourcing needs.
- 1b. The adequate resourcing of practical science and its impact on the quality of teaching and learning should form part of Ofsted inspections. There should be high expectations of 'outstanding' schools, and it is anticipated that 'good' schools will have met the benchmark criteria outlined by SCORE.
- 1c. Primary schools should be encouraged to make more effective links with their colleagues in secondary schools to maximise on expertise and facilities.
- 1d. The new National Curriculum should emphasise the importance of practical work to ensure it is given sufficient priority within schools.

2. Many primary schools lack appropriate storage space for science equipment, which can make carrying out practical science difficult. SCORE recommends:

- 2a. Architects and suppliers who have responsibility for designing new primary schools should consult teachers to ensure the designs meet their – and the legal – requirements.

3. There is a lack of specialist subject knowledge in many primary schools, which has an impact on the amount and quality of practical work. SCORE recommends:

- 3a. Initial teacher training should support the use of practical work in science teaching, and include managing the resources of practical work and identifying opportunities for effective learning outside the classroom.
- 3b. There should be a designated science curriculum leader in each school who has access to science-specific continuing professional development (CPD), and who has influence over the science curriculum budget.
- 3c. The Government must keep to its commitment to encourage more people to train to become primary science specialist teachers.¹

¹ <http://www.education.gov.uk/schools/careers/traininganddevelopment/a0078019/training-outstanding-teachers>

Impact of inadequate resourcing

Insufficient resources for practical science can impact on the teaching and learning experience. For example, teachers may choose to perform demonstrations of equipment rather than enabling pupils to experience this themselves singly or in pairs. They may also find that they need to be creative in making equipment they cannot afford to buy. This results in practical science experiences that may be less engaging for pupils in primary schools.

Where respondents have experienced diminishing or static budgets, impacts on science teaching and learning have included an inability to maintain stock levels of all the equipment and consumables needed to teach practical science effectively, and a reduction of the amount of practical science experiences provided to pupils from external speakers.



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SCORE, a collaboration of organisations working together on science education policy:

Association for Science Education
www.ase.org.uk

Institute of Physics
www.iop.org

Royal Society
www.royalsociety.org

Royal Society of Chemistry
www.rsc.org

Society of Biology
www.societyofbiology.org