



A review of Ofsted inspection reports: science

This document describes Wellcome's review of how Ofsted school inspections comment on science. It places the review in the context of Ofsted's own *Maintaining curiosity* report in 2013 (a survey into science education) and a follow-up exercise by Ofsted in 2016 in which inspectors took a closer look at science in primary schools. Our analyses led us to make the following recommendations, drawing upon those put forward by Ofsted itself.

Recommendations

- Ofsted inspections should contribute to the raising of the quality of science in all schools. **Every Ofsted full school inspection report should comment on science.** Ofsted's consideration of science should be guided by the recommendations in *Maintaining Curiosity* regarding:
 - sufficient weekly curriculum time for science
 - subject-specific continuing professional development for subject leaders and teachers that improves the quality of assessment and feedback for pupils in science
 - regular monitoring of pupils' progress in science to ensure they are supported effectively to reach their potential.
- Practical science is an invaluable part of science education. **Ofsted reports should mention a school's provision of practical science with respect to both its quality and quantity.**
 - *Maintaining Curiosity* highlighted the importance of laboratory space so that individual pupils develop good scientific enquiry skills as well as the knowledge they need to pass examinations. It drew a direct link between limited opportunities for 'illustrative and investigative scientific enquiry' and achievement.

Science in the national curriculum

Science is a core subject alongside English and mathematics for primary and secondary schools in England and is studied until the age of 16. English and mathematics are the foundations of learning. Science is essential too. It enables young people to develop their understanding of science concepts and make sense of the world around them. It develops transferable skills including problem-solving, reasoning and enquiry, and reinforces learning in English and maths. Science qualifications open the door for young people to a rich range of fulfilling careers, and at a societal level it is vital to the UK's future prosperity.

Wellcome believes that science should be given the same focus as English and mathematics in Ofsted school inspections. Attainment is strongly associated with motivation to learn, and many students are uninspired by science at school. The quality of science education, including the opportunity to undertake meaningful practical work, is crucial to addressing this.

In 2013 Ofsted published '*Maintaining curiosity: a survey into science education in schools*'.¹ It found that:

- 50% of primary schools set no science targets
- a significant minority of leaders in primary schools were failing to ensure full coverage of science national curriculum²
- pupils from Key Stage 1 to Key Stage 4 were found to have limited opportunities to work independently, particularly to develop their individual manipulative skills in practical work³.

These findings were concerning. The report made a number of recommendations to schools and governing bodies about how to improve, including ensuring:

- sufficient weekly curriculum time and, in secondary schools, laboratory space so that individual pupils develop good scientific enquiry skills as well as the knowledge they need to pass examinations
- subject-specific continuing professional development for subject leaders and teachers that improves the quality of assessment and feedback for pupils in science
- regular monitoring of pupils' progress in science regularly to ensure they are supported effectively to reach their potential.

We wanted to see whether the findings and recommendations from *Maintaining Curiosity* informed and were reflected in Ofsted inspection reports that followed this publication. To check whether this was happening, in 2015 we reviewed a sample⁴ of Ofsted full school inspection reports (Sept 2014 – July 2015), and found the following:

- Primary schools - only a quarter of reports mentioned science, while 100% mentioned mathematics. In comparison, in Wales 100% of primary school reports sampled mentioned science, reflecting the Welsh schools' inspection guidance which specifically states that inspectors should consider results and trends in science.
- Secondary schools – two thirds of reports mentioned science, again far short of the 100% that mentioned maths.

As well as having a vital role in the accountability system, it is clear that Ofsted is a key influencer of what schools do; this why we think it is so important for Ofsted reports to reflect the status of science as a core subject in the national curriculum.

Ofsted: a focus on science in primary schools (2016)

Between January and February 2016 Ofsted collected specific evidence on science in primary schools during 234 inspections.⁵ The inspectors found that:

- in nearly three quarters of schools inspected, pupils carried out practically based investigations in at least half their science lessons
- in these schools pupils often told inspectors they like science because they get to carry out experiments and that they love investigating.

¹ *Maintaining Curiosity: A survey into science education in schools*. (Ofsted: Manchester, 2013); Wellcome Trust. *Primary Science Survey Report*. (London: Wellcome Trust; 2011); Primary science: Is it missing out? London: Wellcome Trust, 2014; Tomorrows World: Inspiring Primary Scientists, CBI and Brunel University London, 2015.

² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/379164/Maintaining_20curiosity_20a_20survey_20into_20science_20education_20in_20schools.pdf p7

³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/379164/Maintaining_20curiosity_20a_20survey_20into_20science_20education_20in_20schools.pdf p7

⁴ 100 reports from the year 2014 were sampled. A search was carried out for any term containing "scien" – all of which were verified to be referencing science. Of the schools that did not mention science, 16% were outstanding, 33% were good, 14% were requires improvement and 2% were inadequate.

⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/524559/Foreign_languages_and_science_in_primary_schools.pdf

However:

- in half of schools inspected scientific evaluations and conclusions made by pupils were limited
- there was little feedback or guidance focused on science knowledge and understanding
- there was a lack of time allocated to the study of science - the vast majority of primary schools inspected spent four or more hours teaching English and mathematics, but not one devoted a similar amount of time to science
- two thirds of the schools spent one to two hours on science teaching and a fifth of schools spent, on average, less than an hour a week⁶)
- there were inadequate 'transition arrangements' between Key Stages 2 and 3; inspectors found pupils were well prepared for studying science at Key Stage 3 in only one third of schools.

As a result, Ofsted's Chief Inspector Sir Michael Wilshaw acknowledged in May 2016 that a strong emphasis on reading, writing and numeracy had pushed compulsory subjects such as science to the margins of the curriculum in many primary schools. He tasked inspectors with putting 'as sharp a focus' on science and modern foreign languages as they did on English and mathematics.⁷

Despite this, the Ofsted School Inspection Handbook (updated August 2016) makes just three references to science (compared to 46 for mathematics). It states that 'the key subjects in primary schools are English and mathematics.'⁸ For secondary schools, it states the key subjects to be 'English, mathematics, science and any subjects studied by a high proportion of pupils.'

Wellcome's Review of Ofsted inspection reports (2016)

We repeated our review in more depth in September 2016. We compared all Ofsted inspection reports of primary schools from January 2014 onwards. We focussed on key moments during the 2015/16 school year, such as the period of four months before Ofsted began its in-depth look at science, and any difference before and after the Chief Inspector's statement in May 2016. We were interested in whether there had been any changes to:

- the focus on science generally
- the focus on practically based investigations which we know inspire and enthuse pupils.

As illustrated in Figure 1, there is an encouraging rise in the percentage of reports mentioning science and practical science over the period from January 2014 to stabilise at around 50% from January to July 2016. It is notable, that there has been no decline in the number of science mentions in the period after the focus.

However, science is a core subject at primary level and these percentages are far behind the 99% of reports that mention mathematics over the same period. Furthermore, a significant number of reports mention science only in relation to how it is being used to reinforce writing skills, failing to mention important aspects of the subject. As the above charts indicate, less than half of reports that mention science refer to practical investigation.

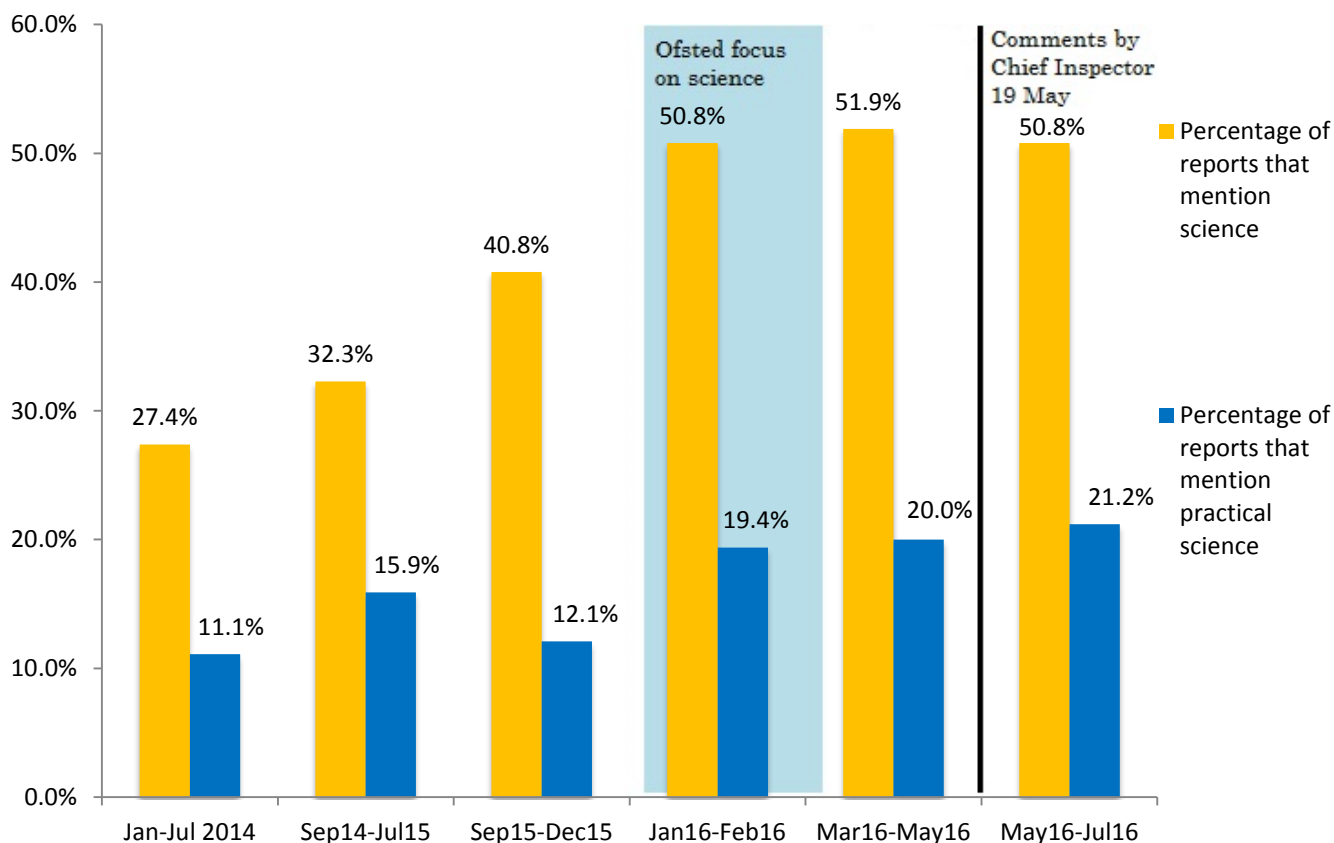
⁶ This is consistent with research Wellcome commissioned in March 2016: one fifth (19%) of primary school teachers reported that they spent 30 minutes to one hour per week teaching science, while 48% taught between one and two hours. Teacher Voice Omnibus Survey Data (Wellcome Trust – NFER), 2016, available at <https://wellcome.ac.uk/sites/default/files/nfer-teacher-voice-omnibus-survey-data-apr16.pdf>

⁷ <https://www.gov.uk/government/speeches/hmcis-monthly-commentary-may-2016>

⁸ The Ofsted School Inspection Handbook (September 2015), p58

Practical science enthuses and inspires pupils. It is a vital element of learning science, helping pupils to develop inquiry skills and gain scientific knowledge. As *Maintaining Curiosity* noted, the ‘best schools ensured that pupils had sufficient time to be taught and subsequently develop the skills of scientific enquiry.’⁹

Figure 1: Percentage of Ofsted inspection reports of primary schools in England that mention science and practical science¹⁰



As illustrated in Figure 1, there is an encouraging rise in the percentage of reports mentioning science and practical science over the period from January 2014 to stabilise at around 50% from January to July 2016. It is notable, that there has been no decline in the number of science mentions in the period after the focus.

However, science is a core subject at primary level and these percentages are far behind the 99% of reports that mention mathematics over the same period. Furthermore, a significant number of reports mention science only in relation to how it is being used to reinforce writing skills, failing to mention important aspects of the subject. As the above charts indicate, less than half of reports that mention science refer to practical investigation.

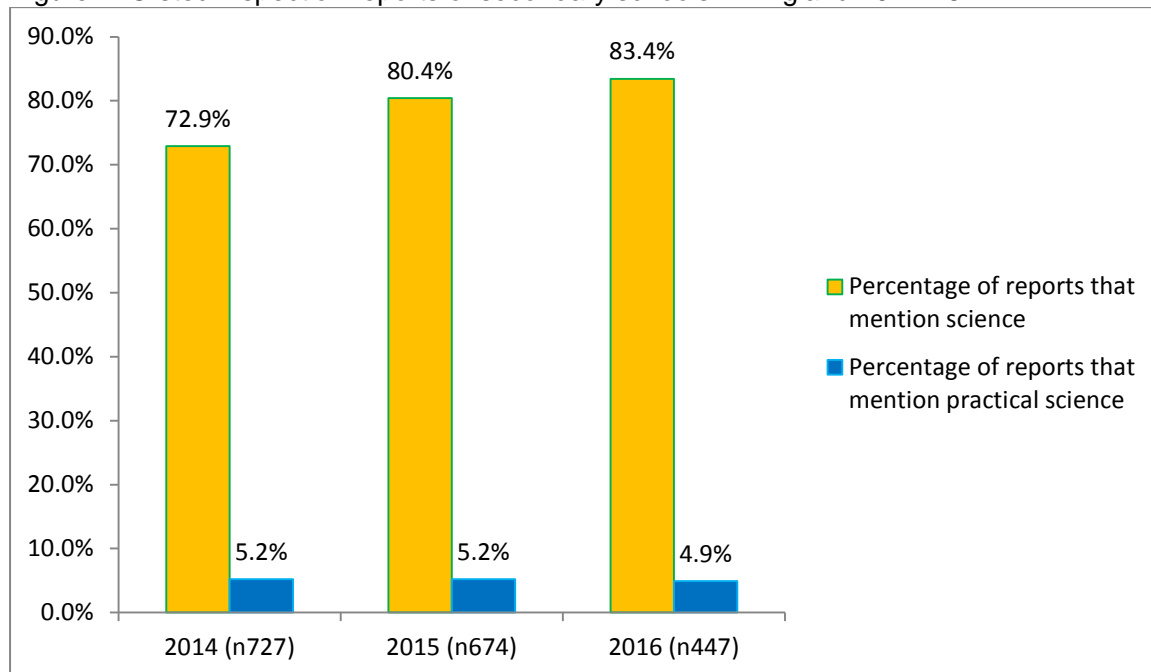
⁹ *Maintaining Curiosity: A survey into science education in schools.* (Ofsted: Manchester, 2013), p44 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/379164/Maintaining_20curiosity_20a_20survey_20into_20science_20education_20in_20schools.pdf

¹⁰ Methodology: We downloaded PDF versions of all Ofsted inspections reports for primary and secondary schools in England between 1 January 2014 and 31 July 2016. We then searched these reports for mentions of “scien”, “practical”, “investigat”, “enquiry” and “experiment”. We then checked whether “practical” and “investigat” were used the context of discussing science education

Practical science enthuses and inspires pupils. It is a vital element of learning science, developing inquiry skills and gaining scientific knowledge. As *Maintaining Curiosity* noted, the ‘best schools ensured that pupils had sufficient time to be taught and subsequently develop the skills of scientific enquiry.’¹¹

Secondary Schools

Figure 2: Ofsted inspection reports of secondary schools in England 2014-16¹²



Ofsted reports on secondary schools are far more likely to mention science than reports on primary schools. However, the percentage of reports that mention science remain low compared with those that mention English and mathematics (100%). Of additional concern is the lack of focus on practical science, which receives fewer mentions than in reports on primary schools. Observations and recommendations on practical science would be two key mechanisms for Ofsted to improve science in schools, especially important at a time of great change in delivery and assessment of practical work.

Notes on methodology

We used the following script to download and search inspections on Ofsted’s website (<https://github.com/jdkram/ofsted-report-scraper>). Instructions <https://github.com/jdkram/ofsted-report-scraper/blob/master/README.md>

¹¹ *Maintaining Curiosity: A survey into science education in schools*. (Ofsted: Manchester, 2013), p44 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/379164/Maintaining_20curiosity_20a_20survey_20into_20science_20education_20in_20schools.pdf

¹² Methodology: We downloaded PDF versions of all Ofsted inspections reports for primary and secondary schools in England between 1 January 2014 and 31 July 2016. We then searched this reports for mentions of “scien”, “practical”, “investigat”, “enquiry” and “experiment”. We then checked whether “practical” and “investigat” were used the context of discussing science education.