Questions for governors
A framework to facilitate discussions between governors and school leaders

Focus: science and maths in primary schools in England

This framework can be adapted to other curriculum areas or other types of school
Questions for governors to ask about science and maths in primary schools in England

A set of challenging questions on science and maths education for primary school governors to discuss with senior leaders, including evidence, benchmarks and ideas for improvement.

Primary schools have the opportunity – and a responsibility – to engage and inform their pupils through inspiring science and maths teaching. Science education should enable pupils to make well-informed decisions in our increasingly high-tech world and give them access to a wide range of rewarding careers.

“We need better science education to secure a strong foundation for a successful and technological society” – Ofsted, 2013.

The questions in this framework can help governing bodies identify areas to celebrate or challenge in science and maths, enabling them to work with their senior leaders to drive improvement. Governing bodies are increasingly monitored on how well they carry out their roles and responsibilities; unless school leadership is deemed outstanding by Ofsted, a school cannot be judged outstanding.

We have identified four overarching question areas and in each of these areas are several specific questions, cross-referenced so you can dip into them in any order, showing

- why each question is important
- information on how to measure performance in this area and national benchmarks to compare against where possible
- ideas for what a school might do to improve its performance.

About

The questions in this framework can help governing bodies identify areas to celebrate or challenge in their schools, enabling them to work with their senior leaders to drive improvement. Governing bodies are increasingly assessed on how well they carry out their roles and responsibilities – unless a governing body is deemed outstanding by Ofsted, a school’s leadership and management cannot be judged outstanding. We hope that this framework will enable governors to perform at their best, exemplifying an approach which could benefit all curriculum areas, although the main focus is on science and maths education.
Questions for governors to ask about science and maths in English primary schools

What are the questions?
We have identified over-arching question areas for primary and secondary schools that will help governors build up a rich picture of all aspects of their school.

Primary: Teaching; Assessment; Curriculum; Resources
Secondary: Teaching; Results; Choices; Facilities; Enrichment

Under each of these over-arching question areas are some more detailed questions with benchmarks to help senior leaders and governors see how their school compares nationally for different aspects of science and maths education. Questions are cross-referenced and you can dip into them in any order. It may be useful to look at one area at a time, depending on the priorities of your school.

Each question has information on:

- why it is important
- how you can measure your school against national benchmarks (it is important to note that these benchmarks show national averages, not necessarily ideal performance)
- ideas for what a school might do to improve its performance – these include ideas for actions governors could take, and those for senior or subject leaders.

For a downloadable version of all questions, evidence, benchmarks and ideas for improvement click here: Questions for Governors PDF [850 KB]

How to use these questions

We expect that each school will develop and use the questions in its own way, to suit its own situation and needs. One way you might like to use these questions is:

1. decide as a governing body to look at the questions – you may choose to focus on particular areas or look at them as a whole
2. identify a governor who will ask the questions – for example, a science, maths or curriculum link governor
3. share the questions with the headteacher or science or maths subject leaders in advance of meeting with them or visiting the school
4. collate the relevant data in response to the questions – most of this will be from the school leaders, and sometimes pupil surveys, but governors might also gather information from learning walks
5. have a discussion between the governors and subject leaders, using the collated data and considering ideas for improvement
6. report back to the governing body on key findings and areas to celebrate or improve, and identify next steps.

Background

These questions have been produced by the Wellcome Trust in consultation with experts from scientific, mathematics and education communities, including the Advisory Committee on Mathematics Education, the Campaign for Science and Engineering, the Education
Questions for governors to ask about science and maths in English primary schools

Endowment Foundation, the Gatsby Charitable Foundation, the Institute of Physics, the National Governors' Association, the National Science Learning Centre, the Royal Society, the Royal Society of Chemistry and many other organisations. We aim for them to be updated as the school environment changes, and new opportunities for improvement arise.

We welcome feedback and ideas for improvement and will be continually updating content to reflect any changes.

This work builds upon the Framework for Governance [PDF] published by the Wellcome Trust in 2015. The Framework is a flexible guide to strategic planning, with guidance on how to set a strategic vision, a self-assessment tool and high-level performance indicators governors should use to monitor progress in their school.
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<th>Resources and environments</th>
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<td>R1</td>
<td>What resources are available for teachers to use for science and maths teaching? Are the resources adequate to teach a broad curriculum?</td>
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Teaching and teachers: What is the quality of science and maths teaching in your school?

Effective leadership of high-quality teaching enhances pupils’ enjoyment and achievement in all subjects (T1). In order to achieve high-quality science and maths teaching, a school should have a thought-through model for subject leadership (T2). Subject leaders, teachers and teaching assistants must have good subject knowledge and related pedagogical skills, with existing expertise in the school being used to best effect (T3). Expertise should be kept up-to-date and developed through a range of subject-specific professional development opportunities (T4).

T1. Do all pupils enjoy science and maths? How do teachers inspire and engage all pupils?

Why this is important

- School lessons should be enjoyable and interesting to pupils and capture their imaginations – teachers play a huge role in inspiring pupils.
- Pupils who enjoy a subject are more likely to try to achieve the best results possible, continue with that subject through their education and see its relevance in their lives.

Benchmarks

The 2011 TIMSS report surveyed Year 5 pupils’ interest in science and maths in English schools.

Science results:
- 79% of pupils liked or somewhat liked learning science.
- 91% of pupils were classed as engaged or somewhat engaged in science lessons.
- 29% of pupils were not confident in science.¹

Maths results:
- 81% of pupils liked or somewhat liked learning maths.
- 92% of pupils were classed as engaged or somewhat engaged in maths lessons.
- 19% of pupils were not confident in maths.²

Asking questions used in the TIMSS report will allow comparison to these benchmarks, or your school may wish to carry its own survey and compare answers across years and groups of children.

Ideas for improvement

Questions for governors to ask about science and maths in English primary schools

If pupils are not enjoying science or maths, increasing the range or quality of their hands-on work might help (see question C3 and the Resources and environments section).

Pupils may also enjoy science and maths more if they engage with them informally, for example through extracurricular activities, such as clubs and school trips (C4). Pupil enjoyment can also reflect teaching quality. See T3 and T4 for ideas for improvement.

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**T2. What is your school’s strategy for leading and teaching science and maths?**

**Why this is important**

All core subjects depend on good strategic leadership\(^3\) for pupils to achieve their best:
- school leadership teams (including governors) should agree to a strategic plan
- subject leaders are responsible for creating a more detailed plan for their subject and implementation of that plan.

**Benchmarks**

The Wellcome Trust argues: “A Primary Science Leader should have a whole-school vision for science and be able to lead its development by instigating appropriate initiatives, including providing continuing professional development to colleagues, monitoring progress and contributing to the strategic development of learning in school.”\(^4\) This also applies to maths leaders.

Unfortunately, Ofsted found that some school managers fail to understand the role of a science subject leader as something much more than a coordinator of resources\(^5\) (T3).

The Wellcome Trust’s study into ’The Deployment of Science and Maths Leaders in Primary Schools’ describes a number of models for science and maths teaching and leadership, as shown (for science) in Figure 1.

**Figure 1:**

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\(^3\) ’The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.


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School governors are responsible for setting the strategic direction for their school and the Framework for Governance can help them develop the school’s strategy. As part of their responsibility to determine the school’s staffing and management structure, school governors should carefully consider how each subject is led taking into account advice from school leaders. Subject leaders should have a high level of subject expertise but can be deployed in different ways (e.g. as a specialist subject teacher only or also as a class teacher).

Different models of leadership have their own benefits and drawbacks – the most important thing is that the model chosen by each school is the best fit for its particular needs and resources. The Wellcome Trust has produced a guide for developing great science subject leadership.

School and subject leaders should regularly report on science and maths within the school development plan and individual subject plans where appropriate to the school leadership team including school governors. The Primary Science Quality Mark is a structured way to increase the strategic priority of science within the school.

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6 'Primary science: is it missing out? Recommendations for reviving primary science’, Wellcome Trust, 2014.
7 ‘The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.
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T3. How is science and maths expertise identified within the school, and how is it used to best effect?

Why this is important

School leaders should know the strengths and weaknesses of their teachers' subject knowledge and pedagogical and leadership skills. This enables them to deploy expertise strategically for maximum impact (see T2), and to increase it where needed in appointing new staff and through CPD (continuing professional development) – proven to be effective in improving teacher confidence and pupil outcomes (see T4).

All teachers

All teachers must have the necessary subject expertise and related pedagogical skills and knowledge to confidently teach inspiring and relevant science⁸ and maths⁹.

Evidence has linked pupils' attitudes to science with their teacher's initial subject knowledge¹⁰, although qualifications rarely define current knowledge levels – for instance, a recent study found that primary science leaders and class teachers, all with GCSE grade C or above in science, had current knowledge around the Key Stage 3 level.

Weak subject knowledge can be associated with low confidence in teaching science¹¹; this can lead to teachers avoiding topics they lack confidence in. There is also evidence that anxiety concerning subject knowledge in female teachers may be reflected by anxiety felt by female students¹².

Subject leaders

Subject leaders need a high level of subject knowledge to cover the whole curriculum and associated pedagogical knowledge and leadership to support all staff with teaching¹³. Many maths leaders find it difficult to "support the mathematical development of colleagues… as they themselves are not 'mathematicians'"¹⁴. A subject leader who is knowledgeable and enthusiastic about science and maths can inspire others.

Teaching assistants

A 2009 report found that support from teaching assistants in science lessons permitted teachers to engage their pupils in more practical activities. Many schools have reported that

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¹³ ‘Evaluation of the impact of a continuing professional development course for primary science specialists’, University of York, 2015.
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their science and maths subject leaders need additional support – this could come from teaching assistants.15

Benchmarks

Teachers
The Department for Education school workforce census identified 25,000 primary school teachers with a science-related degree16 – that is just over one, on average, in every primary school.17 However in reality, many primary schools will not have any teachers who have studied science or maths further than GCSE; teachers must have access to the necessary CPD to develop and sustain their skills and knowledge (see T4).

Leaders
The Wellcome Trust has defined the skills required to lead science in a primary school, which are listed below and have been endorsed by the Education Committee of the Royal Society18. The Trust has also produced a guide for developing great science subject leadership.

- **Subject knowledge**: “A Primary Science Leader should have a deep understanding of the scientific concepts within the Key Stage 1 and 2 National Curriculum, supported by a working understanding of the scientific concepts within the Key Stage 3 National Curriculum. A Primary Science Leader should be confident in the use of scientific vocabulary and know how to research science topics and guide their students to do the same.”

- **Pedagogical content knowledge**: “A Primary Science Leader should have knowledge of an appropriate range of teaching methods suitable for the content concerned. Their knowledge should include enquiry-based pedagogies, practical activities, out-of-classroom learning, group work and problem solving, digital technologies, and formative assessment practices. It should also include an understanding of the key features that result in the successful implementation of these pedagogies and how to evaluate the impact of these on their students.”

- **Subject leadership**: “A Primary Science Leader should have a whole-school vision for science and be able to lead its development by instigating appropriate initiatives, including providing continuing professional development to colleagues, monitoring progress and contributing to the strategic development of learning in school.”19

Teaching assistants
According to the November 2014 School Workforce Census, on average, teaching assistants constitute just below one-third of each school’s workforce.20

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15 ‘The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.
16 A science-related degree includes a wide range of subjects. See https://www.gov.uk/school-workforce-census for more information.
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**Ideas for improvement**

School leaders could audit the skills, expertise and interests of all staff, including teaching assistants, to identify areas for improvement.

Schools can improve their teaching expertise through professional development (see T4) or through recruitment. Schools may find it easier to recruit and retain teachers and subject leaders with science or maths expertise if they show that they prioritise these subjects, such as through working towards the [Primary Science Quality Mark](#) and offering adequate resources, environments and subject-specific professional development.

Reports suggest that teaching assistants require effective support, such as training, to ensure they have a positive impact on pupil progress.\(^{21}\) The Education Endowment Foundation has produced [seven tips](#) for making the most effective use of teaching assistants.

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**T4. How are staff encouraged to pursue continuing professional development (CPD) focused on science or maths?**

**Why this is important**

CPD can help teachers to develop: in-depth, contemporary and relevant subject knowledge; engaging teaching techniques; understanding of how topics connect; and up-to-date teaching practices, for example in hands-on work or the use of digital technologies. Research shows that effective CPD has a positive impact on teachers, their quality of teaching, and their pupils. 22232425

- 99% of teachers, teaching assistants and technicians on Science Learning Centre courses reported impact on their own teaching practice, with 77% of these reporting a direct impact on pupils.26
- 93% of participants on National Science Learning Centre courses reported a direct impact on their pupils, and 95% of participants reported having shared their learning with other colleagues.27
- After taking part in the Maths Specialist Teacher (MaST) programme, 92% of teachers reported that their teaching quality had improved to a great extent, and all teachers reported some impact.28

The Royal Society 2014 ‘Vision’ report recommends that subject-specific professional development should be a core requirement for teachers.29

Ofsted says school leaders have a responsibility to ensure that teachers receive the relevant training to assess pupils in science and maths, give effective feedback and set challenging targets.30 There was a significant association between accessing science CPD and being judged to have outstanding primary science in Ofsted’s ‘Maintaining Curiosity’ report.

Ofsted’s ‘Mathematics: Made to Measure’ report recommended the development of staff expertise by schools in a number of areas, including understanding the progression over time of different maths topics and providing professional development to staff, to support the guidance they are given.31

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The Wellcome Trust’s report on science and maths leadership in primary schools suggests that high-quality science-specific CPD opportunities are important for teaching assistants, particularly in schools following the class teacher model (see Figure 1). Teachers also said that they would value having better-trained teaching assistants.

Benchmarks

The Schools Financial Benchmarking website allows schools to compare their income and expenditure with other similar schools. Schools can find out the expenditure of other schools on staff development and training per pupil and compare it with their own.

Ideas for improvement

CPD includes:

- subject-specific professional development courses
- engagement with subject associations
- keeping up-to-date with science and maths through reading, networking and online communities
- developing ideas with colleagues, for example peer-to-peer observation, coaching or mentoring
- taking part in research or keeping up-to-date with evidence-based practice; NFER has produced a tool to help schools become better engaged with research.

Governors play a vital role in ensuring appropriate CPD is accessible:

- Governors must ensure that sufficient resources and time are devoted to CPD, including subject-specific CPD, and that this is available to subject leaders, class teachers and teaching assistants. Governors should consider whether CPD should be on the school’s strategic priorities, and ensure sufficient funding for CPD is put aside when deciding the budget. The governing board must then assess the impact of CPD and discuss this with senior leaders.
- Schools should have a system in place to internally assess teaching quality and governors should be aware of how this process takes place. Identifying weaknesses in teaching quality can highlight areas in which CPD for teachers could be beneficial, allowing prioritisation of budget. See the NGA’s briefing note Knowing your School: Governors and staff performance for more information.

School or subject leaders may find it helpful to know about the following:

- The National Science Learning Network (NSLN) is the largest source of high-quality CPD courses for science education in the UK. There are generous bursary schemes to help class teachers, science leaders and teaching assistants from publicly funded primary schools to access these courses: Project ENTHUSE supports residential courses and Impact Awards support other NSLN courses.

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32 ‘The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.
33 ‘The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.
34 See https://www.education.gov.uk/sfb/.
35 See http://www.nga.org.uk/getattachment/14497c9b-cf71-4986-9749-1c1375dfaf2/Knowing-Your-School-Performance-management-and-pay
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• **Pedagogical information** provided by the National STEM Centre for teachers on areas of the primary science curriculum, which the National Curriculum Science Expert Group has identified as particularly difficult to teach.\(^{36}\)

• The **Association for Science Education** offers a range of CPD units to support teachers’ knowledge. The **Primary Science Teaching Trust**’s **Primary Science Teacher College** is a network of primary science teachers who gained **Primary Science Teacher Awards**, and the Trust also offers CPD courses.

• Working towards the Bronze, Silver or Gold **Primary Science Quality Mark** allows schools to evaluate and strengthen their science provision.

• The National Centre for Excellence in the Teaching of Mathematics website offers tools for **auditing** and **self-evaluation** of subject knowledge, tools for **monitoring professional development**, and a **professional development calendar** for maths-specific CPD, listing opportunities across England.\(^{37}\)

• The network of **Mathematics Hubs** offers National Collaborative Projects and local professional development opportunities, led locally by outstanding schools.

• Most schools have policies and practices to encourage teachers to share ideas and learn from each other through activities such as mentoring and peer coaching. Increasing use is being made of school networks, where subject leaders in a particular subject come together to moderate assessment and share expertise.

• The Teacher Development Trust has produced a **CPD quality framework** for self-evaluation purposes – a detailed structure to rate the quality of CPD across several areas.

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\(^{36}\) See http://www.nationalstemcentre.org.uk/stem-in-context/support-for-science-ite.

\(^{37}\) See https://www.ncetm.org.uk/cpd/professional-development-calendar.
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Assessment and achievement: How well do your pupils achieve in science and maths?

Effective assessment (A1) is an important aspect of high-quality teaching, and pupils’ achievement (A2) reflects the quality of teaching in a school. The achievement of all groups of pupils (A3) should be considered to ensure that no child is left behind.

A1. How do teachers assess the progress of their pupils in science and maths?

Why this is important

Effective assessment methods can help teachers to see gaps in pupils’ knowledge and plan lessons accordingly.

The Department for Education (DfE) stated in March 2014: “Assessment levels have now been removed and will not be replaced. Schools have the freedom to develop their own means of assessing pupils’ progress towards end of key stage expectation.”38 However, the DfE added that “schools will be expected to demonstrate (with evidence) their assessment of pupils’ progress, to keep parents informed, to enable governors to make judgements about the school’s effectiveness, and to inform Ofsted inspections”.39

 Benchmarks

Over the next few years assessment in primary schools will change. The DfE’s core assessment principles state that effective assessment:

• gives reliable information to parents about how their child, and their child’s school, is performing
• helps drive improvement for pupils and teachers
• makes sure the school is keeping up with external best practice and innovation.40

Performance descriptors are currently being developed and full details will be included here as soon as they are available. Pupils in Key Stage 1 will complete statutory tests marked by the school. Pupils in Key Stage 2 will continue to complete statutory tests, including maths, marked externally. In science, biennial sample tests will be used from 2016 to estimate national performance.42

Schools should track pupils’ performance and benchmark it, where possible, against previous years’ results, national performance data (see A2 for national benchmarks) and across different groups of pupils.

40 Each of these principles is described in greater detail in the original document.
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Ideas for improvement

School governors should understand school leaders’ plans for assessment of pupil progress throughout their school years – including how it is moderated and how the data are used. They need to be confident that these assessment systems are robust and provide accurate information about pupil’s progress which is effectively communicated to parents.

School leaders should check that new models for assessment under consideration meet the DfE’s core assessment principles. School leaders may also find it useful to read about nine schools that secured funding from the DfE to develop and share their assessment methods.

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A2. How well do pupils achieve in science and maths, and what is the trend over time for achievement?

Why this is important

Science, maths and English are all core subjects and the importance of achievement in all three subjects should be recognised by governors, school leaders and teachers.

Looking at pupils’ achievements and trends over time allows school leaders to identify areas of success and any which require improvement. Performance can be compared to national benchmarks and should also be monitored across different groups of pupils. One of the governing board’s core functions is to hold the headteacher to account for the educational performance of the school and its pupils, and to do this effectively governors need to know how well pupils are achieving over time.

Benchmarks

Chart 1 below shows the percentage of pupils achieving at least level 4 and at least level 5 in statutory tests for maths and in national sampling tests for science between 2007 and 2012. (Until 2009, children in England completed statutory written science tests at the end of Key Stage 2; from 2010 to 2012, national sampling tests were used to monitor science.)

No sampling tests were completed in 2013 and in future they will take place in alternate years.

More information on the results achieved, separated by gender, can be found in the benchmarks for A3.

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45 The data used in this chart come from the Department for Education, which provides information on the confidence intervals: https://www.gov.uk/government/publications/national-curriculum-assessments-at-key-stage-2-in-england-2012.
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Chart 1: Percentage of pupils achieving level 4 and above, and level 5 and above, in Key Stage 2 statutory tests and national sampling tests

<table>
<thead>
<tr>
<th>Year</th>
<th>Science Level 4+</th>
<th>Maths Level 4+</th>
<th>Science Level 5+</th>
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<tr>
<td>2007</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
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<td>2011</td>
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<tr>
<td>2012</td>
<td>85</td>
<td>75</td>
<td>65</td>
<td>55</td>
</tr>
</tbody>
</table>

Chart 2 shows the percentage of pupils at level 4 or above between 2007 and 2013 according to teacher assessment.

Chart 2: Percentage of pupils achieving level 4 and above according to teacher assessment

Teacher assessment is a different kind of measure from statutory or sampling tests, involving ongoing assessment and monitoring as opposed to a single written test; this means that percentages of pupils deemed to be achieving each level will tend to differ between these different types of assessment, as reflected by the different patterns seen in Charts 1 and 2.
Questions for governors to ask about science and maths in English primary schools

Ideas for improvement

School governors should be aware of the whole-school improvement strategy developed by school leaders and subject leaders, designed to maximise the achievement of pupils.

Governors may find the FFT Governor Dashboard useful to get a full picture of achievement in their school. They should also receive internal data from teacher assessments throughout the year, and use this to monitor how well pupils are progressing. If pupils are not making expected progress, governors should ask the headteacher why this is, and what is being done about it.

Most importantly, as discussed in C2, school leaders should ensure that adequate time is given to the teaching of both science and maths in all years, so that pupils can be taught a broad and balanced curriculum.

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A3. Do different groups of pupils make equally good progress in science and maths?

Why this is important

According to the National Curriculum in England for Key Stages 1 and 2, teachers must set high expectations for all pupils, including stretching those who are most able and planning lessons for those who have low levels of prior attainment or come from disadvantaged backgrounds. There should be no barriers stopping any child from achieving.46

Ofsted inspectors consider how assessment information is used to identify those pupils who require additional support and ensure all pupils make expected progress, including challenging more able pupils.47 They also look specifically at how Pupil Premium funding is spent to support pupils from disadvantaged backgrounds. Unfortunately, Ofsted has reported that schools often do not sufficiently differentiate between pupils to allow them all to build on their prior learning and make good progress in science and maths.4849

Both boys and girls have the potential to achieve well, but their performance according to tests and teacher assessments is sometimes different.

- If girls and boys are achieving equally at the end of Key Stage 2, then they are on a level playing field for beginning secondary school.
- Students can be put off certain subjects at a young age so it is important for girls and boys to have equal opportunities to enjoy subjects and understand their relevance to their lives.
- Research shows certain groups can be under-marked by teachers, who should be aware of this and try to ensure their judgements are as objective as possible.50
- There is evidence that teacher anxiety in mathematics is linked to pupil anxiety, and this may be especially the case between female teachers and students51. This may impact on a pupil’s attitude towards the subject, making the development of teacher confidence in all subjects vital (see T4).

Benchmarks

School self-evaluation material52 published by the Fischer Family Trust (FFT) identifies groups based on the following characteristics for governors and school leaders to consider when looking at relative achievement:

- gender
- prior attainment (lower, middle, upper)
- SEN
- free school meals

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50 Journal of Social Policy, 2015
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- absence
- language/ethnicity
- mobility.

A school may identify additional groups of pupils from its school data and contextual information.

*Table 1* shows that in 2013, pupils who were eligible for free school meals, had a first language other than English, were disadvantaged or had special education needs were less likely than average to achieve level 4 or above in maths at Key Stage 2.53

According to the data below, more than a quarter of pupils receiving free school meals enter secondary school below the expected level. This can impact on their progression and achievement later in education.

<table>
<thead>
<tr>
<th>Table 1: Achievement at level 4 or above and making expected progress in maths in Key Stage 2 by pupil characteristics in state-funded schools in England in 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>First language</td>
</tr>
<tr>
<td>Not English</td>
</tr>
<tr>
<td>English</td>
</tr>
<tr>
<td>Free school meals (FSM)</td>
</tr>
<tr>
<td>FSM</td>
</tr>
<tr>
<td>Not on FSM</td>
</tr>
<tr>
<td>Special educational needs (SEN)</td>
</tr>
<tr>
<td>All SEN</td>
</tr>
<tr>
<td>No identified SEN</td>
</tr>
<tr>
<td>Disadvantaged pupils</td>
</tr>
<tr>
<td>Disadvantaged</td>
</tr>
<tr>
<td>Not disadvantaged</td>
</tr>
<tr>
<td>All pupils</td>
</tr>
</tbody>
</table>

Your school will get its own data to use for comparison from RAISEOnline and the FFT.

The Department for Education provides access to data on the percentage of pupils in state-funded schools in England achieving level 4 or above and achieving level 5 or above in both Key Stage 2 tests and teacher assessments.54

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Table 2 shows that boys are more likely than girls to achieve at higher levels (level 5 or above) in maths, but not in science.

<table>
<thead>
<tr>
<th></th>
<th>Level 4+</th>
<th>Level 5+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maths test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>86%</td>
<td>44%</td>
</tr>
<tr>
<td>Girls</td>
<td>86%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Maths teacher assessment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>87%</td>
<td>46%</td>
</tr>
<tr>
<td>Girls</td>
<td>89%</td>
<td>43%</td>
</tr>
<tr>
<td><strong>Science teacher assessment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>87%</td>
<td>38%</td>
</tr>
<tr>
<td>Girls</td>
<td>90%</td>
<td>39%</td>
</tr>
</tbody>
</table>

Chart 3 and Chart 4 below show that in the 2012 science national sampling tests, boys also slightly outperformed girls at higher levels (level 5 or above).
Questions for governors to ask about science and maths in English primary schools

Ideas for improvement

All school staff members should work to ensure that they do not reinforce negative stereotypes relating to specific groups, and be aware of and work against any subconscious biases that may perpetuate stereotypes or lead to under-assessment of pupil performance.

School leaders should consider the individual circumstances of all pupils on the roll of the school to identify any groups which require additional support. Information on how teachers may assess their pupils can be found in A1.

Governors may find the FFT Governor Dashboard useful to get a full picture of achievement in their school.

Ofsted provides a good-practice resource, ‘Improving girls’ attainment in mathematics’, using a school that performs well in this area as a case study. The measures which the school put into place to successfully increase pupils’ attainment include: girls’ maths clubs, assessment procedures, careers education and focused single-sex teaching.55

There is information for teachers to support the teaching of particular groups of pupils:

- The Primary Science Teaching Trust provides online continuing professional development (CPD) focusing on teaching English as an additional language in primary science.56
- The National Science Learning Centre offers CPD on providing differentiation for all pupils in teaching, including training on the new code of practice in SEN and recommendations on the use of pupil premium.57

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Questions for governors to ask about science and maths in English primary schools

- The National Centre for Excellence in the Teaching of Mathematics produced a series of microsites, covering topics including ‘High Attaining Pupils in Primary Schools’ and ‘Special Educational Needs Mathematics Teachers’. The Education Endowment Foundation toolkit is an evidence based tool to help raise the achievement of disadvantaged pupils.

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57 See https://www.sciencelearningcentres.org.uk/cpd/ondemand/8161596b-d005-4308-8c49-7cb6e30f7804/differentiation-visible-progression-for-all/.
58 See https://www.ncetm.org.uk/resources/Microsites.
Questions for governors to ask about science and maths in English primary schools

**Curriculum: How do science and maths fit into the wider curriculum?**

It is important to think about what the school’s science and maths curricula are and how they fit into the school’s wider curriculum (C1). Pupils should be engaged with science and maths from a young age, with sufficient time (C2) dedicated to their teaching, including hands-on and investigative work (C3). Pupils should have the opportunity to study enriched curricula, take part in extracurricular activities (C4) and be supported when moving between different Key Stages (C5).

**C1. How are the school’s science and maths curricula developed to provide pupils with a rich and broad learning experience?**

**Why this is important**

Science and maths are both core subjects and form an important part of the school curriculum. School leaders, including governors, should be confident that the curriculum taught in their school is fit for purpose and allows pupils to benefit from a broad and inspiring programme of study.

School governors should be aware of whether their school follows the National Curriculum, and if not, why not; they should have viewed their school’s curriculum and be aware that in a classroom, this can be broken down further into a taught curriculum.

**Benchmarks**

The National Curriculum covers the minimum of what pupils should be taught and forms only one part of the school’s curriculum.

The Department for Education states that all maintained schools in England must teach the National Curriculum. Academies and free schools, although not required to follow the National Curriculum, “must teach a broad and balanced curriculum including English, maths and science”\(^59\), as well as religious education.

The aims of the National Curriculum for maths and science can be found on the Department for Education’s website.\(^60\) In a “significant minority” of schools Ofsted has found that leaders were failing to ensure full coverage of the National Curriculum due to their perception that science was not a priority.\(^61\)

**Ideas for improvement**

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\(^59\) See https://www.gov.uk/national-curriculum/overview.
Questions for governors to ask about science and maths in English primary schools

Governors should question whether the school’s curriculum offers pupils a rich and broad learning experience. This could include understanding how much time pupils spend completing hands-on activities in science (see C3).

School leaders, including governors, should be aware of the overarching aims of the National Curriculum, in order to ensure teaching and assessment focuses on these.

Subject leaders should ensure that they are highly familiar with the National Curriculum, where followed, to guarantee its full coverage.

- The National Science Learning Centre provides a number of continuing professional development courses on implementing the new science National Curriculum.
- The National Centre for Excellence in the Teaching of Mathematics provides and endorses a number of continuing professional development courses on implementing the new maths National Curriculum.

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Questions for governors to ask about science and maths in English primary schools

C2. How much time is spent teaching science and maths and how frequently? Does this differ across different age groups?

Why this is important

Adequate time needs to be dedicated to the teaching of science and maths for all year groups, to ensure that pupils are taught the broad and balanced curriculum required by the National Curriculum (see C1). Neither subject should become lower-priority, shown through less time dedicated in the timetable in certain years. If pupils do not receive broad and high-quality science and maths teaching throughout their primary education, they are at risk of developing a skills gap and may find their transitions between Key Stages hindered, as discussed in C4.

Benchmarks

There is no statutory requirement for the number of hours for which science and maths should be taught, and the delivery of science and maths in schools will depend on unique school contexts.

In a 2015 report from the Confederation of British Industry, 200 UK primary schools were surveyed. 17% of English primary schools spent 3 hours or more on science per week, 48% spent 2 hours a week, 28% spent 1 hour a week and 7% spent less than an hour.

Science was timetabled once per week in the majority of schools visited for a report by Ofsted. A significant minority of primary schools visited showed a lack of time set aside for the regular teaching of science through enquiry-based learning. Reduced teaching time for science was found to be one shortcoming in schools where achievement was weaker.

Maths and literacy are likely to be taught on a daily basis.

Ideas for improvement

School leaders, including governors, should be monitoring the structure of the school’s current timetable for each year group and ensuring science and maths have an adequate place.

School leaders should have considered the strengths and weaknesses of different timetabling options to ensure the current iteration is the best for all pupils’ learning in science and maths.

The incorporation of science into mathematics, literacy and other subjects can be used to extend teaching time for each subject. According to Ofsted’s ‘Maintaining Curiosity’ report,

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65 ‘The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.
Questions for governors to ask about science and maths in English primary schools

“Teachers who coupled good literacy teaching with interesting and imaginative science contexts helped pupils to make good progress in both subjects.”\(^{66}\)

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Questions for governors to ask about science and maths in English primary schools

C3. How are working scientifically and working mathematically embedded in the school's science and maths curricula? How often do science lessons include hands-on activities?

Why this is important

According to the National Curriculum, one of the aims of studying science is “working scientifically” to develop pupils’ “understanding of the nature, methods and processes of science through different types of science enquiries that help them to answer scientific questions about the world around them.” 67

“Working scientifically” is a statutory part of the National Curriculum for Key Stages 1 and 2 and must be taught throughout the science programme of study. 68 If pupils are not taught how to work scientifically they may be disadvantaged by a skills gap later on in their education.

- An enquiry-based approach to learning science helps pupils develop scientific understanding, “by collecting and using evidence to test ways of explaining the phenomena they are studying”. 69
- Ofsted reports that science achievement was the highest in schools where pupils could get involved in the entire scientific process of an investigation. 70
- The benefits of hands-on work were recognised by subject leaders themselves (taking part in Primary Science Quality Mark); they noted the importance of practical work for engaging pupils and increasing their enjoyment of science, as well as fostering other skills, such as working collaboratively and communicating effectively. 71

“Working mathematically” can be summarised by the aims of the National Curriculum for Key Stages 1 and 2, where students should 72:

- become fluent in the fundamentals of mathematics
- be able to reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof
- be able to solve problems by applying their mathematics to a variety of routine and non-routine problems.

A hands-on approach to mathematics is endorsed by Ofsted as good practice, noting that successful schools “ensure consistent approaches and use of visual images and models that secure progression in pupils’ skills and knowledge lesson by lesson and year by year”. 73

71 ‘Primary science quality mark: learning from good practice in primary science’, Wellcome Trust, 2013.
73 ‘Evidence from 20 successful schools’, Ofsted, 2011
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Practical activities and resources, including computer software, aid conceptual understanding and make learning more interesting.74

**Benchmarks**

There is no statutory requirement for the amount of time which should be dedicated to the teaching of hands-on science or maths. As stated in C2 it is important that an adequate amount of teaching time is set aside for these subjects. Ofsted’s ‘Maintaining Curiosity’ report states that a significant minority of primary schools visited showed a lack of time set aside for the regular teaching of science through enquiry-based learning.75

**Ideas for improvement**

Teachers’ low confidence and incomplete subject knowledge can affect the type and quality of hands-on experiences pupils get:

- attempting only the most simple activities and using only apparatus that is unlikely to go wrong
- relying on pupils to follow instructions, reducing the need for teacher intervention.76

Improving teachers’ confidence and understanding might improve opportunities for working scientifically and hands-on learning – this links to T3 and the importance of all teachers receiving science-related training.

To find out more about hands-on science in their school, governors may like to ask the following questions of the senior leadership team:

- Do teachers have sufficient equipment and access to outdoor environments (see R2 and R3 for more information)? If not, how can this be built into future budgets and strategic plans?
- Are teachers able to access enough professional development to improve their science and maths pedagogical content knowledge (see T3 for more information)?

Subject leaders and teachers may like to look at the following:

- The Wellcome Trust’s study on the deployment of science and maths leaders gives case studies which discuss how hands-on science is taught in different models of subject leadership (see T1 for more information on models for science leadership and delivery).77
- When reviewing planning, subject leaders and teachers might look for ways to strengthen hands-on learning and enquiry. Resources from the Primary Science Teaching Trust and the National STEM Centre may be useful.

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77 The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.
Questions for governors to ask about science and maths in English primary schools
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C4. How are the science and maths curricula enriched? What extracurricular opportunities are available for pupils?

Why this is important

Informal learning experiences – such as clubs in schools or external trips to zoos, science centres or festivals – can build pupils’ knowledge and skills and improve attainment. They can stimulate interest in science and maths, widen knowledge, and provide social, cultural and historical context. It has been argued that “Informal learning should become an inherent part of the science and mathematics curriculum.”

- 74% of pupils who visited a hands-on science exhibition reported increased interest in science afterwards.
- After visiting a science centre 18% of boys and 22% of girls changed their minds to agree with the statement “I would like to be a scientist.”
- External visits, such as to universities and colleges, local businesses and industries, can help pupils to see the real-world links to what they are studying in classes.

Engagement with scientists and engineers also impacts on teachers. STEMNET works with primary schools by helping them to make links with STEM professionals in their area.

For teachers, key impacts of engaging with STEM Ambassadors included personal development (for example changes in confidence, motivation, enthusiasm, attitudes, aspirations) and an increased ability to relate STEM lessons to real-world applications.

Benchmarks

According to an Ofsted report on science education in schools, the majority of primary schools invited science visitors and had science clubs.

A Science Community Representing Education report found that in a sample of primary schools, 69% invited external speakers to give pupils practical science experiences in the classroom one to three times per year. Some schools invited external speakers 10 or more times per year.

These figures should not be taken as the optimum target to reach, but they may give school leaders an idea of what other schools do.

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82 It should be noted that for the telephone survey of 500 teachers used to collect information, 10% were primary school teachers and the remaining 90% secondary teachers.
Questions for governors to ask about science and maths in English primary schools

**Ideas for improvement**

Governors should be aware of how much enrichment and extracurricular activity is going on at their school, both internally and externally. This could include looking at the range of activities on offer, but also how many pupils are attending them and whether any pupil groups in particular are underrepresented. If this is the case, it’s worth considering why this might be and how the school can overcome any barriers to participation.

It can be useful for governors to use their own professional networks to support these experiences. An audit could be carried out of governors’ links with businesses, schools, colleges and universities, and other STEM organisations. This may help to find external speakers or STEM role models for pupils, as well as facilitating opportunities for pupils outside of school.

The following are examples of extracurricular activities that may be of interest to school leaders, subject leaders or teachers:

**STEM clubs**

- STEMNET has supporting information to help people wanting to set up STEM clubs, much of which is aimed at Key Stage 3 but can be adapted to use with Key Stage 2 pupils.
- Some parents may have STEM expertise that they could share with pupils, and the STEM Ambassador website can help schools to connect with STEM professionals for talks, help with STEM clubs, and all sorts of support. Likewise, Primary Futures provides access to volunteers from a range of backgrounds, including STEM.
- The Primary Science Teaching Trust provides online professional development to give teachers ideas and guidance on running a science club.
- The National STEM Centre website hosts numerous resources that can be used to enrich science and maths teaching, as well as discussion groups in which teachers can share ideas.

**Awards and competitions**

- The British Science Association offers CREST star awards to recognise pupils’ achievement in STEM projects outside of the classroom.
- The NRICH website hosts a range of mathematics challenges, puzzles and problems which can be used to enrich mathematics teaching.
- The acquisition of a PSQM award requires (to varying degrees) strategic planning and integration of extracurricular activities into whole-school initiatives, and as such can help to promote STEM enrichment in the school.

**Outside the classroom**

- Pupils can benefit from science learning experiences outside of school, such as visits to science centres and museums or trips to science fairs, many of which are free, for example the Big Bang Fair. The UK Association for Science and Discovery Centres provides a list of its members, many of which run activities for school groups.85

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85 See http://sciencecentres.org.uk/centres/.
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- Most universities have access and outreach programmes, some of which include local primary schools.
- Approaching local secondary schools, sixth-forms and colleges can lead to links being built with their science and maths departments, and their pupils.

Funding

- The Royal Society of Chemistry’s Biological and Medicinal Chemistry Sector runs educational grant schemes, including funding extracurricular science club activities in primary schools. Applications can be made for up to £1,000.
- The Royal Society runs a scheme of Partnership Grants, providing grants of up to £3,000 for STEM projects run in schools in partnership with a professional scientist.
Questions for governors to ask about science and maths in English primary schools

C5. How does the school aid with transitions between phases of education in regard to science and maths?

Why this is important

At the end of each educational stage, pupils should be well prepared for the next one.

The National Curriculum states that schools must “prepare pupils at the school for the opportunities, responsibilities and experiences of later life”. It also notes that secure understanding of all key concepts and knowledge at each stage in science is required in order to progress to the next stage, so that pupils do not “struggle at key points of transition (such as between primary and secondary school)”.

Effective transitions between different stages can help to close gaps between pupils.

- Children start school with varying levels of mathematical understanding, often creating a gap that is never overcome.
- Ofsted’s ‘Mathematics: Made to Measure’\(^{86}\) report suggests that pupils’ attainment at 16 often relates to knowledge and skills acquired by the age of 7. It is important that children are tracked and that their knowledge and understanding are continually assessed (see A1).

Benchmarks

The Department for Education provides data on the percentage of pupils in state-funded schools in England making the expected progress (two levels) between Key Stage 1 and Key Stage 2 in maths. These data are given in Table 3 and show that the percentage of pupils making expected progress in maths rose steadily between 2009 and 2013.\(^{87}\)

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>83%</td>
<td>83%</td>
<td>88%</td>
<td>88%</td>
<td>90%</td>
</tr>
<tr>
<td>Girls</td>
<td>81%</td>
<td>82%</td>
<td>86%</td>
<td>88%</td>
<td>89%</td>
</tr>
<tr>
<td>All</td>
<td>82%</td>
<td>83%</td>
<td>87%</td>
<td>88%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Table 3: Percentage of pupils making expected progression in maths between Key Stages 1 and 2 in state-funded schools in England

Questions for governors to ask about science and maths in English primary schools

You may like to look at the transition matrices for maths, both from Key Stages 1 to 2 and from Key Stages 2 to 4, produced by RAISEonline. The data show what percentage of pupils achieving a certain level at one Key Stage go on to achieve different levels at a later Key Stage.

Ideas for improvement

Governors may like to ask what tracking systems are in place to monitor pupils' progression across Key Stages.

School leaders should consider how pupils' progress is tracked across the main transitions and what is done to make sure that these transitions occur smoothly.

School leaders may like to consider any potential or current links with local secondary schools, to investigate if visits can be made by Key Stage 2 pupils to improve their transition from to Key Stage 3.

Teachers may want to access the Expert Subject Advisory Group for Science's ‘Preparing Your Child for Year 7 Science’. This may be a useful resource to distribute to parents.

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Resources and environments: What science and maths resources are available?

For a high-quality science education, it is essential to give pupils plenty of hands-on science experiences (see C3). To do this your school needs to have adequate resources (R1) and environments (R3) to work scientifically and carry out fieldwork projects, as well as a reasonable amount of the school’s budget allocated (R2) to provide them.

R1. What resources are available for teachers to use for science and maths teaching? Are the resources adequate to teach a broad curriculum?

Why this is important

In order for pupils to work scientifically (C3) and be engaged by a broad and rich curriculum, teachers must have access to resources. Hands-on science experiences may be less engaging for pupils when teachers lack resources.88

The availability of resources needed for teaching a broad curriculum can be impeded by a lack of storage space, even if funding is available. A lack of storage space can also mean that new resources are at risk of being poorly maintained or stored in an unsafe manner.

Benchmarks

Science Community Representing Education (SCORE) has produced detailed information on the equipment and consumables which it considers to be reasonable for the teaching of the new science curriculum, from September 2014.89

According to Pye Tait and SCORE, of the primary schools questioned for their ‘Under the Microscope’ report, the average school had only 46% of the equipment and consumables necessary to teach practical science.90

The National Centre for Excellence in the Teaching of Mathematics, NRICH and the Primary Strategy offer some guidance on maths equipment; more comprehensive advice on the use of manipulatives is currently being researched.

Ideas for improvement

For governors and senior leaders:
Access to and use of resources can be maximised through collaboration and sharing between primary schools within local areas, and through links with local employers, secondary schools, colleges and universities.

For school leaders:

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Questions for governors to ask about science and maths in English primary schools

The information provided by SCORE is likely to be most useful to science leaders, and could be used to audit the scientific equipment available in their school. It is important that school leaders are made aware if your school is found to lack essential equipment.

There are many organisations that offer free scientific equipment or the free loan of scientific equipment to support schools’ teaching of hands-on science.

- The Royal Microscopical Society offers free term-long loans of its Microscope Activity Kits for use in lessons or afterschool clubs.91
- A free In the Zone science kit, including scientific equipment, curriculum-linked teaching resources, experiments and planning guides, was sent to every UK school by the Wellcome Trust in 2012.92

A tool which may help subject leaders in their conversations with governors about available resources is the National STEM Centre website. This website contains and catalogues information about resources for both science and maths.

School leaders and teachers may want to consider whether there is enough storage space for the necessary resources to provide high-quality teaching in science and maths.

- CLEAPSS has produced many guides on a range of topics covering hands-on science in primary schools, including storage of resources, plants for classrooms and caring for small mammals.93
- The Primary Science Teaching Trust provides useful guidelines on storing science equipment, in an online professional development unit for science subject leaders and teachers.94
- The Association for Science Education has produced a ‘Be Safe!’ booklet with advice and guidance on health and safety for hands-on science in schools.

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92 See http://www.getinthezone.org.uk/schools/.
93 See http://www.cleapss.org.uk/.
Questions for governors to ask about science and maths in English primary schools

R2. How is the school budget allocated to ensure staff have access to the resources required to teach a broad curriculum?

Why this is important

A reasonable amount of the school’s budget needs to be allocated for resources to provide pupils with a high-quality and engaging science and maths education. This is needed to cover costs such as scientific and mathematical equipment, consumables, facilities, and training and development.

A broad science education should include well-resourced hands-on activities, using scientific equipment where appropriate (C3 and R1). In a 2013 report on primary science, 41% of survey respondents stated that more money would improve resourcing for science.95

Benchmarks

Schools have different approaches to spending on science and maths. This may or may not include dedicated science and maths budgets. As school budgets differ, the figures below can only give an idea of the amount of money that other schools spend, and averages included are not indicative of best practice or model spends. Irrespective of how much is spent per student, this budget should be allocated and prioritised according to the needs of the school.

A report on the resourcing of science in primary schools found that the average annual spend per pupil on practical science for 2011/12 was £2.89.

- The report showed considerable variation between schools, with the annual spend per pupil ranging from £0.04 to £19.08.
- The average spend on consumables in 2011/12 in the schools which responded was £224.78.
- 37% of respondents indicated that staff spent their own money on resources and often did not get this money back.96

A Wellcome Trust report on the deployment of primary science and maths expertise found that many of the schools responding to a survey had science budgets in the region of £300 to £500. There were only a few schools which reported science budgets equivalent to those for maths and English.97

Ideas for improvement

School leaders, including governors, need to decide together how to allocate the school’s budget between competing priorities.

- School leaders should ensure that it is clear how expenditure on science and maths resources, including consumables, is allocated in the budget.

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97 ‘The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.
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- The [Schools Financial Benchmarking](https://www.education.gov.uk/sfb/) tool can be used to determine the spend per pupil on all learning resources in similar schools.\(^98\)

It may be useful to perform an audit of available resources:
- This will help subject leaders identify any gaps or needs.
- These needs may then be addressed strategically, through discussion with school leaders, including governors, by the allocation of reasonable and realistic funds to fill these gaps over time.

There are sources of funding available outside of the school’s budget.
- The Royal Society of Chemistry’s Biological and Medicinal Chemistry Sector runs [educational grant schemes](https://www.rcsb.org/funding/grants), including an enhanced equipment strand. Applications can be made by teachers for between £100 and £500 for the funding of science equipment which enriches pupils’ learning, but cannot be purchased through the normal budget.
- The Royal Society runs a scheme of [Partnership Grants](https://royalsociety.org/research/grants/partnership-grants/), providing grants of up to £3,000 for STEM projects run in schools in partnership with a professional scientist.
- The [Rolls-Royce Science Prize](https://www.rolls-royce.com/science-prize/) is an annual awards programme to help teachers implement science teaching ideas in their school.
- Schools have reported securing additional funding through social responsibility schemes run by some companies and also via competitions.\(^99\)

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\(^{98}\) See [https://www.education.gov.uk/sfb/](https://www.education.gov.uk/sfb/).

\(^{99}\) ‘The Deployment of Science and Maths Leaders in Primary Schools’, Wellcome Trust, 2013.
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R3. Do pupils have access to outdoor environments and how are they used for teaching science and maths?

Why this is important

Outdoor environments are an important resource. Use of the local environment is mentioned explicitly in the non-statutory notes and guidance of the new National Curriculum for science.

Outdoor learning can help pupils recognise the real-world applications of what they are studying and aid their understanding of scientific and mathematical concepts. Ofsted’s ‘Maintaining Curiosity’ report cites how the use of outdoor environments in an extracurricular setting gives pupils the opportunity to see science in action.100

A report from King’s College London indicated that after learning in natural environments, pupils demonstrate greater motivation to learn science and also perform better in maths and reading.101

Benchmarks

Benchmarks have been produced by Science Community Representing Education, listing the habitats to which access is required for the teaching of the new primary science curriculum. The benchmarks give the following information:

• a description of the habitat access required
• an explanation of how each habitat can be used and its curriculum links.

According to a 2013 report, on average, the outdoor environments mentioned in these benchmarks were accessible to at least 75% of the schools surveyed. 96% of respondents reported easy access to at least one form of outside learning environment.102

Ideas for improvement

For subject leaders:
Identify any potential local environments which could be used to further pupils’ learning experiences and help them to see the real-world applications of their work. Outdoor spaces can be used to great effect, no matter their size, so long as they are used strategically.

It may be useful for subject leaders and teachers to be aware of various continuing professional development (CPD) resources available to support the teaching of science and maths in outdoor environments.

• The National Science Learning Centre provides a CPD course on ‘Leading Science in the Outdoor Classroom’, which includes as a part of its focus identifying areas for development in the new primary curriculum.
• The National Centre for Excellence in the Teaching of Mathematics provides an online CPD module on ‘Learning Maths Outside the Classroom’.

101 ‘Understanding the diverse benefits of learning in natural environments’, King’s College London, 2011.
Questions for governors to ask about science and maths in English primary schools

There are many organisations interested in outdoor learning that offer resources for teachers, a few of which are listed below.

- The Association for Science Learning’s Outdoor Science Working Group lists resources which may be useful to teachers when thinking about outdoor education, such as the 2006 ‘Out-of-Classroom Learning’ booklet published by the Royal Society for the Protection of Birds, as part of the Real World Learning Partnership.  

- Learning through Landscapes provides ideas, resources and advice on outdoor learning activities to enhance children’s learning outside of the classroom.

Other examples of providers of outdoor education and outdoor education resources include: Forest Schools, the Wildlife Trusts, the Royal Horticultural Society, the Field Studies Council and Forestry Commission England.

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103 See http://www.ase.org.uk/resources/outdoor-science/.
Questions for governors to ask about science and maths in English primary schools

### Glossary

| **Benchmarks** | Facts, figures and more information, which can help compare your school to other schools |
| **Consumables** | Supplies and material which will be used up during teaching |
| **ASE** | Association of Science Education |
| **CPD** | Continuing professional development |
| **FFT** | Family Fischer Trust |
| **ITT** | Initial teacher training |
| **Learning walks** | Short, structured, observations around the school, allowing non-judgemental information gathering |
| **NSLC** | National Science Learning Centre |
| **NCLN** | National Science Learning Network |
| **Pupil premium** | |
| **SEN** | Special Educational Needs |
| **SLC** | Science Learning Centre |
| **STEM** | Science, technology, engineering and maths |
| **Working scientifically** | What children do in order to answer scientific questions about the world around them. They do this by using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests, and finding things out using secondary sources of information. |