



Great science leadership at primary school





**For excellent primary science,
schools need the time,
expertise and resources to
deliver engaging and thought-
provoking science lessons.**

Why should we care about science?

Good leadership of science is essential at primary school. Here's support for you as a science leader.

The short answer is because science is a core subject in the national curriculum (in England). But science is much more than just a compulsory subject: science inspires children, encouraging them to be inquisitive about the world, nurtures their innate curiosity and enables them to develop a range of skills that are useful across their learning.

By the end of primary education, children start to make up their minds about whether science is for them. We think science is for everyone, not just those who want to continue into science-based careers; having an understanding of science allows people to make informed decisions about new technologies, their health and other important matters.


We should all champion primary science and make sure that every child has a positive experience of science throughout their primary school education.

Good leadership of science is essential at primary school. This booklet provides support for you as a primary science leader (PSL), based on good practice in schools that value science.

In 2013 we conducted an online survey to find out how PSLs are deployed in schools. The responses and follow-up case studies, written up in a report available on our website¹, released a wealth of information and advice that can help support you as a science leader, whether you are new-in-post or at a school that is looking to improve its science teaching.

We know that taking on responsibility for leading science may be your first taste of leadership, and that like many primary teachers you may not have a strong science background. However, this need not be a barrier to leading exciting primary science – there is support to help you develop expertise in both teaching and leadership.

This booklet will help you get started by leading you to reflect on science in your school and begin planning its improvement. You'll think about your shared vision, how you should develop and use your science expertise, and how you can evaluate the science curriculum.

A photograph of a female teacher with blonde hair in a ponytail, wearing a black long-sleeved top and a watch, leaning over a desk. She is holding a white spoon with a yellow liquid dripping from it into a small blue cup held by a young boy. Other students in blue school uniforms are visible in the background, looking on with interest. The scene is set in a bright classroom with blue chairs and tables.

**“The model chosen
(for science teaching
and leadership)
makes the best use
of the skills of each
member of staff.”²**

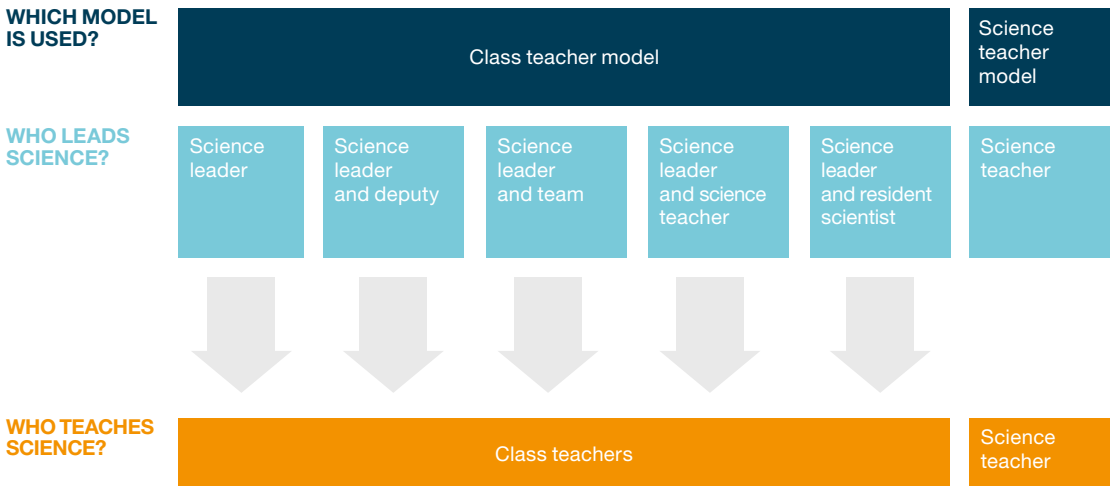
How is science led in primary schools?

Very few schools employ a specialist science teacher who leads and teaches all the science in the school.

In most schools science is taught by class teachers, one of whom takes on the role of science leader. But there are variations of this model, which reflect different schools' contexts and priorities for strategic improvement in science.

Schools that give science a high profile use rigorous self-evaluation to choose which leadership model is most appropriate for them. Our report, *The Deployment of Science and Maths Leaders in Primary Schools* (2013), explores the advantages of the different models in detail³.

Models for science delivery and leadership



What expertise does a good science leader need?

“It’s the science leader’s responsibility to stay up to date on CPD and to identify appropriate courses.”⁴

A PSL should value science, understanding the importance and relevance of science in our lives and recognising that teaching and learning science develops skills and ideas that can be either specific to science or applied across the curriculum.

They should:

- keep up to date with broad developments in science and science education, and consider how to share these with colleagues and pupils when appropriate
- be aware of, and take responsibility for, developments that affect school science policy, including health and safety
- be aware of, and take responsibility for, addressing gender stereotyping in science lessons and enrichment activities
- implement a whole-school vision for science, and advise and support colleagues on the pedagogy and appropriate resources to achieve it
- ensure that they access continuing professional development (CPD) for leadership of science, and that colleagues access CPD to address their requirements too
- monitor provision of science and pupils’ progress, and contribute to the strategic development of learning in school.

Subject knowledge

A PSL should have a deep understanding of the scientific concepts within the primary science curriculum, supported by an understanding of progression into the next phase of education. They should identify any gaps in their knowledge or weaker areas of understanding of the scientific method, and address these through appropriate sources, including good CPD.

They should understand the different methodologies for science enquiry and when to use them, including appropriate methods for recording and presenting different types of data. They should be confident in the use of scientific vocabulary related to the curriculum and able to explain these terms to colleagues.

Pedagogical knowledge

A PSL should have secure knowledge of, and be able to apply and model, an appropriate range of methods suitable for teaching across all phases in their school. Their knowledge should include enquiry-based teaching and learning methods, practical activities, out-of-classroom learning, independent and group work, problem solving, and digital technologies. They should have secure understanding of both formative and summative assessment practices for primary science, and evaluate outcomes to monitor the impact of science teaching and learning on pupils.



What does a good science leader do?

A good science leader ensures that all pupils can develop their understanding of the big ideas of science, and learn the skills needed to work like a scientist, because their teachers are confident practitioners who deliver an enquiry-rich curriculum with access to appropriate resources.

They plan improvement that:

- builds their school's science curriculum
- raises standards for pupils
- leads colleagues to teach science better.

Most science leaders manage resources, support science curriculum development, monitor teaching quality and pupil achievement, and lead staff meetings to share ideas and skills. But less than a third are involved directly in strategic planning and development within their schools, despite this being essential to raising the profile of science and the achievement of pupils. Science leaders are able to develop a whole-school vision for science when school leadership teams value science as a core subject that builds skills across the curriculum and include it fully in strategic planning.

Questions on science leadership

- What is the whole-school vision for science?
- How do you monitor it?
- How does it link strategically with the school improvement plan?
- How is science expertise used in your school to teach and to lead science?
- What provision do you need to develop your expertise and keep your skills up to date?

“Children love the hands-on nature of the subject and the opportunities to really get involved in big, practical experiments using scientific equipment.”⁵



How does good science leadership improve science teaching?

Many new science leaders tell us that their first task is to organise their current resources. It's a good place to start – you need to know what you have – but there's more to it than that.

Children need to develop independent learning skills and the ability to design their own investigations and take measurements with increasing accuracy. They should be able to select the resources and equipment they need to do this. Teachers also need to have confidence in using the resources themselves and know how to do so safely.

Science doesn't just take place in the classroom either. Children need to explore different environments – this is vital for all strands of science, not just biology. Access to a suitable range of environments is essential.

Some schools make use of partnerships or schemes to help them develop outdoor learning environments or enrich their curriculum⁶. Free loans of equipment, such as microscopes, and visits from local scientists provide a rich experience for children too.

Our published case studies⁷ highlight the strategic ways that science leaders have developed their curricula beyond the statutory minimum, making science exciting and inspiring for pupils, teachers and parents⁸. These schools have a vision for science that is shared by the whole school community.

Raising standards for pupils

Monitoring teaching, pupil achievement and progress in science is essential, but the outcomes of this monitoring should be used strategically to secure even better science.

- **data analysis**
- **learning walks**
- **moderating assessment**
- **observing lessons**
- **planning**
- **pupil focus groups**
- **team meetings**
- **work scrutiny**
- **other ideas**

Many teachers worry about assessment in science. If a teacher is not secure about science concepts, can their assessment be accurate? A child might use a key word that suggests understanding but unless probed further, mastery cannot be confirmed. When assessment is inaccurate children may develop misunderstanding or be put off science, thinking that it is too hard.

Assessment needs to be planned carefully and must be integral to teaching; science leaders need dedicated management time to work with colleagues, both in school and in local networks, to develop robust practice.

Sometimes science leaders deliver specialist lessons in a trade-off with a teacher leading another subject area so that pupils have challenging science lessons. While this ensures better quality teaching for some lessons, it does not allow pupils to develop their learning across other subjects or enable teachers to develop their skills in subjects that they are less confident to teach.

Team teaching is preferable as it shares teachers' expertise and develops skills that will raise pupils' achievement. Where opportunities for team teaching are included in strategic planning, teachers are enabled to teach science well and pupils benefit.

Questions for reflecting on the science curriculum

- How does your science curriculum ensure pupils develop conceptual understanding and science skills?
- Is the curriculum flexible enough to encourage children to ask lots of questions and investigate?
- Does it match skill development in maths and English?
- How is assessment incorporated into planning?
- Does it make science seem relevant to the children attending your school?
- What does your science curriculum say about your vision for science?

Questions for reflecting on resources and environments for teaching science

- How do science resources in your school compare with recommended benchmarks?⁹
- Do you have what is needed to teach the statutory curriculum and enable pupils to work scientifically?
- What message about science is given by the state of the resources?
- Are they age-appropriate?
- Are some resources not used because teachers aren't sure how to use them?
- Do resources and environments enrich and enhance learning?
- Do you prepare an annual budget for science that accounts for consumable items and the replacement and enrichment of resources?

Questions on pupils' experiences

- Does science teaching reflect your whole-school vision for science?
- How do pupils develop science skills through working scientifically?
- Are pupils enthusiastic about learning science? How does attainment in science compare with other core subjects for all pupils?
- What strategic actions would improve learning?



“Ensuring that each class teacher has the best subject knowledge possible is the priority for the science leader.”¹⁰

How does a science leader guide colleagues to teach science better?

Science leaders recognise that a whole-school vision for science encourages consistency throughout the school, through shared ownership and strategic planning. But they also say that anxiety over weak subject knowledge and low confidence in teaching in a scientific way are barriers to science being as good as it can be; access to high-quality science CPD is the factor most likely to help them improve science in their schools.

New science leaders want to access CPD that will equip them with good subject knowledge and pedagogical skills that they can share with their colleagues. They need time out of the classroom to coach other staff to teach science and mentor them to increase confidence. One school told us that after completing high-impact Science Learning Centre courses¹¹, their science leader would be timetabled for one school year to teach science alongside all other

teachers, to raise science to an 'outstanding' level in the school. This school valued subject-specific CPD and expected that it would have a significant impact. A range of CPD is available; you need to audit your needs against the expected impact to select the most appropriate provision.

Science leaders frequently network with one another to do learning walks or to moderate assessments. Including colleagues from secondary schools helps everyone to understand how children progress in science and can prevent the overuse of some practical investigations. Online networks are great for sharing ideas and solving queries.

Questions on leading others in teaching science

- Which areas of subject knowledge do colleagues need most support with?
- How confident are teachers with assessment of science?
- What methods of support have the greatest impact on pupils' science? How do you know?
- How does support for colleagues link with all other aspects of your leadership role?

What other support is out there?

Free resources

National STEM Learning Centre

(stem.org.uk)

Primary Science Teaching Trust

(pstt.org.uk)

Wellcome Trust (wellcome.ac.uk)

School support

Association for Science Education

(www.ase.org.uk)

Primary Science Quality Mark

(www.psqm.org.uk)

1. Wellcome Trust. The Deployment of Science and Maths Leaders in Primary Schools. London: Wellcome Trust; 2013. wellcome.ac.uk/sites/default/files/wtp056231_1.pdf

2. Wellcome Trust. The Deployment of Science and Maths Leaders in Primary Schools. London: Wellcome Trust; 2013, 29. wellcome.ac.uk/sites/default/files/wtp056231_1.pdf

3. Wellcome Trust. The Deployment of Science and Maths Leaders in Primary Schools. London: Wellcome Trust; 2013. wellcome.ac.uk/sites/default/files/wtp056231_1.pdf

4. Wellcome Trust. The Deployment of Science and Maths Leaders in Primary Schools. London: Wellcome Trust; 2013, 14. wellcome.ac.uk/sites/default/files/wtp056231_1.pdf

5. Wellcome Trust. The Deployment of Science and Maths Leaders in Primary Schools. London: Wellcome Trust; 2013, 26. wellcome.ac.uk/sites/default/files/wtp056231_1.pdf

6. Join the Primary Resources community group at stem.org.uk

7. Wellcome Trust. The Deployment of Science and Maths Leaders in Primary Schools. London: Wellcome Trust; 2013. wellcome.ac.uk/sites/default/files/wtp056231_1.pdf

8. stem.org.uk/primary-science

9. SCORE (Science Community Representing Education) has produced a set of resourcing benchmarks for teachers and school practitioners to use when planning science budgets and equipping classrooms. score-education.org/reports-and-resources/publications-resourcing-benchmarks

10. Wellcome Trust. The Deployment of Science and Maths Leaders in Primary Schools. London: Wellcome Trust; 2013, 26. wellcome.ac.uk/sites/default/files/wtp056231_1.pdf

11. stem.org.uk/primary-science

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