



*Our vision is to see excellent teaching of science in every primary classroom in the UK*

## Guidance for Science Subject Leaders

### 2. Role of the Subject Leader

This information is available on the PSTT website:

<https://pstt.org.uk/resources/curriculum-materials/subject-leader>

From the webpage you can also download:

The Subject Leader Self-evaluation Tool

Whole School Approach

Raising the Profile of Science

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## CONTENTS

Acknowledgements	3
Introduction	4

Section	Page
1 Supporting colleagues	5
2 Monitoring teaching and learning	7
3 Subject leader development	10
4 Resourcing science	12
5 Curriculum enrichment	13

## **Acknowledgements**

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## INTRODUCTION

### Why does my school need a subject leader for science?

A recent [Ofsted](#) report, 'Intention and substance: further findings on primary school science from phase 3 of Ofsted's curriculum research' (2019), states that,

*'Science has clearly been downgraded in some primary schools since the scrapping of the key stage 2 test. This is likely to have a serious impact on the depth and breadth of science understanding and knowledge that pupils take with them into secondary school, which may in turn stifle pupils' later curiosity and interest in the sciences. School leaders need to ensure that teachers have deep subject knowledge and to consider what curriculum design really involves in science.'*

- **Schools need a subject leader to support other teachers in their science teaching.**

Primary teachers (and science subject leaders) are usually not specialists in science and this is certainly not essential to be a good science subject leader or teacher of primary science. It is the role of the subject leader to support teachers to ensure that science is always taught well, throughout the school, and that teachers aspire to excellence. Part of the role of the subject leader is to model good practice in the subject and to lead by example.

- **Schools need a subject leader to ensure that science is taught regularly, taught well and that pupils and teachers are enthusiastic about science.**

You may need to make changes to your school timetable or to the curriculum to ensure that pupils are being taught science.

- **Schools need a subject leader to ensure that the pupils have access to suitable equipment for science.**

You may need to source new equipment. This can be difficult if there is little or no science budget to purchase consumables or larger items. You will need to know where to find free resources and use items that are readily available in school.

Being a subject leader can be a daunting prospect, particularly in science because it covers many abstract concepts and is a practical subject. You cannot tackle everything at once. We have provided five areas for the subject leader to consider and we suggest that you review these individually.

1. Supporting colleagues
2. Monitoring Teaching and Learning
3. Subject Leader Development
4. Resourcing Science
5. Curriculum Enrichment

## 1. SUPPORTING COLLEAGUES

### Do teachers have access to advice from the subject leader and to relevant CPD?

As subject leader, part of your role is to help your colleagues:

- to identify the areas that they need to develop in order to provide excellent teaching in primary science;
- to access quality CPD to address their needs;
- keep up to date with new developments and initiatives for teaching primary science.

To identify teachers' individual needs, you might consider asking colleagues to complete a short questionnaire. A **Teacher Questionnaire** is available to download from the RESOURCES tab. These are some of the questions you might like to ask (this is not an exhaustive list):

- What would teachers like to know?
- What are teachers unsure about?
- Are there certain science topics which teachers struggle with?
- Do teachers cover all types of enquiry during the year?
- Are teachers using the school's outdoor spaces as a learning resource for science?
- Are teachers making links to real life?
- Are teachers confident in their assessment of science (both children's subject knowledge and enquiry skills)?
- Do teachers know where to access safety guidance for practical science?

Having identified teachers' needs, you will need to consider how to address them. You could organise a staff meeting and share your own knowledge and experiences. You may not feel confident doing this and prefer to find CPD offered by an external organisation. Here are some suggestions.

To improve your subject knowledge:

- Visit the guidance on *Common Misconceptions* in PSTT's [Why&How Newsletter](#) (available in issues Autumn 2017 - Summer 2019). Topics covered include: Light, Electricity, Evolution, Science and Fiction, Levers, gears and pulleys, and Time for a change! (states of matter)
- Try [ReachOut CPD](#) (developed with Imperial College London), which is provided free online.
- [Dynamic Labs](#) (funded by PSTT) provides resources to support teaching and learning of sound, light and matter.
- [The Ogden Trust](#) provides a physics CPD programme for primary teachers and a range of curriculum resources for teaching and learning physics.

For CPD on practice or provision:

- There are a range of [CPD Units](#) on the PSTT website that include [Materials Science](#) (create a Materials Trail within your school), [Stories in Science](#) (promoting engagement using puppets and story books), [Dramatic science](#) (using drama to examine scientific objects, ideas and perspectives), and more...

- Our **PSTT Regional Mentor Programme** offers support to schools across the UK. Regional Mentors are able to provide tailored advice via video conferencing and in some instances, depending on locality, they be able to visit you and provide CPD. You can contact our Regional Mentors via the PSTT Office using **info@pstt.org.uk**. There are also opportunities to benefit from Regional Mentor CPD through PSTT webinars and conferences.
- PSTT has a network of **PSTT Fellows** throughout the UK who may be able to recommend CPD in your area. You can ask about this via the PSTT Office using **info@pstt.org.uk**.
- There are many other CPD providers offering to support schools with primary science. You could try [STEM Learning](#), which offers a huge range of courses and online CPD.
- The [Association of Science \(ASE\)](#) organises regional and national conferences that provide excellent CPD opportunities. ASE Teachmeets are also an informal and inspiring way for teachers to share ideas with one another (using an online forum since the COVID-19 pandemic). You can share or just listen.

Other support:

- Are your colleagues aware of the PSTT's [Wow Science](#) website, which provides links to organisations that provide support for science teachers at primary level? Teachers can be assured that materials promoted on this site are high quality. Additionally, Wow Science regularly produces blog posts to support teaching and learning of science, including thought-provoking discussions and practical classroom activities.

## 2. MONITORING TEACHING AND LEARNING

### Does the subject leader review teaching and pupil progress across the school?

There are several ways that subject leaders could monitor science teaching across the school:

**Pupil Voice** (using informal interviews with small groups of children, talking to the school council, or children's questionnaires) enables you to understand children's perceptions of science as a subject, whether they engage with science, and what goes on in their science lessons.

Suggestions for arranging a pupil voice session:

- Invite 2 or 3 children from each class.
- Set aside 20-30 minutes for the session.
- Have a list of questions/questionnaire prepared (see below).
- Have a short science activity/demonstration that will interest the children and will help the children relax and engage with you.
- Let the children know the reason you are talking to them is to find out what they think about science at their school.

Some of the questions that you might like to ask are:

- How often do you have a science lesson?
- What do you like about science lessons?
- What has been your favourite part of science this year?
- Do you work in groups in science lessons?
- Do you use equipment in science lessons?
- What do you find hardest in science lessons?

You can download a **Pupil Voice Questionnaire** from the RESOURCES tab from the PSTT Subject Leader webpage and adapt the questions to suit your audience.

**Book looks** (reviewing a small sample of children's books from each class) will enable you to find out what the children are recording in science lessons, and whether they are using appropriate age-related vocabulary in science lessons. The amount and style of writing in science books might provide an insight into the frequency and types of practical enquiry the children carry out and how the teacher is differentiating science teaching and learning.

Things you might want to look for in a book look:

- Do the children carry out regular practical investigations using a range of types of enquiry?
- When the children write about their investigation, do they focus on writing about one part of the investigation or do they write a full science report (using headings such as diagram, method, results, conclusion)? If the children are required to write a full science report, does this happen in the science lesson or in a literacy lesson? Note: this might tell you how much time is spent writing during the science lesson.

- Does the book show tables and graphs? Are these different for different children (indicating that the children have worked in small groups and collected data themselves) or the same (suggesting that the teacher carried out the investigation)?
- Have the children evaluated their investigation and commented on what they might do differently or next time?
- Have the children used age-appropriate science vocabulary?
- Do children use a variety of ways of recording their learning in a written format, such as a schematic diagram, a newspaper report, a set of instructions, or a story?
- How often do the children complete a worksheet?
- Has the teacher marked the work and have the children been given time to reflect on any feedback from the teacher?
- Has the teacher used a floorbook to record children's ideas and practical work? You can find out more about floorbooks [here](#).

**Learning walks** provide a quick way to review the profile of science across the school. Subject leaders could do this alone or with their colleagues during a staff meeting. Some things to look out for:

- Is there a science display board in every classroom or in corridors?
- Where there are displays in classrooms, do they display age-appropriate science vocabulary?
- Are there pictures or even objects to engage children?
- Are there examples of children's work?
- Are there questions to prompt further questioning and learning?
- Are there links to everyday life?

**Lesson observations** could enable you to see some of the strategies that teachers are using in their lessons. Although lesson observations can provide information about the quality of teaching for the observer (the subject leader or senior leadership), and feedback from the observer can identify strengths and areas for development for the teacher, it can be a stressful process for all concerned. Some subject leaders have preferred to use a team teaching approach as described below.

**Team teaching** (co-teaching) can be a very useful approach for monitoring the quality of science teaching and an opportunity for the subject leader to provide some CPD for the class teacher. To get the most out of a team teaching lesson, it is important to have a professional dialogue with the class teacher before and after the science lesson that you teach together. Some questions that might help you to prepare a team teaching session:

- Is there an aspect of teaching that the class teacher needs to develop? Together, decide on an area for development and how this might be achieved. For example, a teacher may want support on eliciting children's ideas at the start or end of a lesson.
- How could the subject leader address the class teacher's needs? The subject leader should reflect on an appropriate way to address the class teacher's needs. In our example, the subject leader may decide to introduce the class teacher to using a [Bright Ideas Time](#) or an [Explorify](#) activity in his/her teaching. Before the lesson, both parties should agree what will be taught and who will teach each part of the lesson.

- How could the subject leader effectively deliver CPD to their colleague? The subject leader could model using either strategy during the lesson (at the start to elicit children's existing knowledge and understanding and/or at the end to assess children's learning) and the class teacher could observe this.
- How can the class teacher exemplify their teaching and the children's learning? The class teacher could lead part of the lesson. For example, the class teacher could introduce a practical investigation and supervise the children carrying out their investigation. During this time, the subject leader can observe the teaching and talk to the children about their learning. The subject leader might teach the last part of the lesson, perhaps a plenary.
- How can the subject leader make this a positive experience for the class teacher? After the lesson, there should be a professional dialogue in which both parties are able to talk about what they think went well and what perhaps needs improving.

You can read more about co-teaching as a viable model for raising teacher confidence in an article by PSTT Fellow, Kathy Schofield, in the ASE's [Journal of Emergent Science \(2019/20\) Issue 18, 23-28.](#)

### 3. SUBJECT LEADER DEVELOPMENT

#### Does the subject leader have time allocated to the role?

Monitoring teaching and learning across school, collecting assessment data from colleagues, keeping up to date with new strategies and resources, and sharing relevant CPD with colleagues takes time. Subject leaders need to plan and set aside time when these things can happen. This should not be in subject leader's own time or in their PPA time. You may need to have a conversation with your senior leadership to find out how much time is available for your subject leader role and to decide together on the priorities for the school. It is also important that science subject leaders use this time to develop the subject, rather than organising equipment and cupboards. You can download a list of leadership tasks from the RESOURCES tab.

#### Does the subject leader have access to relevant CPD?

Continuing professional development (CPD) covers any activity that prompts reflection on the quality of teaching in a school. For example, further reading to improve your own subject knowledge, working with peers, attending courses or conferences and online discussions. Firstly, you need to identify your CPD needs. This is really important because the CPD you choose may have an impact on your own teaching, your colleagues' teaching, the children's learning and school improvement.

If you are looking to develop your role as a subject leader in science, you may be interested in the [Primary Science Quality Mark \(PSQM\)](#). This is a year-long CPD programme that focuses on developing effective, confident science leadership for whole school impact on science teaching and learning. It is a paid-for programme that offers CPD and expert mentoring for the subject leader who will work with colleagues across the school to audit existing provision, create and implement an action plan to develop teaching and learning across the school, and write a reflective submission to demonstrate the impact of science leadership in school. You can read more about subject leaders' stories about their PSQM experiences in the [ASE Primary Science Special Issue: Primary Science Quality Mark \(PSQM\) January 2019](#).

Remember, you cannot change everything at once. These questions may help you decide what areas to focus on (though this is not an exhaustive list):

- Are there any areas of subject knowledge that I need support with?
- Do I need support to be a subject leader?
- Is our school's science curriculum suitable for our children?
- Am I familiar with different types of enquiry and how these might look in the classroom?
- Am I familiar with the progression of enquiry skills that children should be taught?
- Am I confident in the assessment of primary science?
- How can my school enrich science learning?
- What are the needs of my colleagues and can I support them?

There are many CPD providers offering support to primary teachers for science. Many of these organisations including PSTT now offer online CPD. We recommend the following:

- PSTT's [Why&How Newsletter](#) is for anyone who has an interest in science and offers practical support and updates on news, research, projects and key dates.
- PSTT provides free online [CPD Units](#) which include [Material Science](#) (create a Materials Trail using QR codes within your school), [Stories in Science](#) (promoting engagement using puppets and story books), [Dramatic science](#) (using drama to examine scientific objects, ideas and perspectives), [Datalogging and Eco-monitoring](#) and more...
- PSTT also supports a Regional Mentor Programme, webinars and conferences. You can contact our Regional Mentors via the PSTT Office using [info@pstt.org.uk](mailto:info@pstt.org.uk).
- PSTT has a network of **PSTT Fellows** throughout the UK who may be able to recommend CPD providers in your area. You can ask about this via the PSTT Office using [info@pstt.org.uk](mailto:info@pstt.org.uk).
- The [Association of Science Education \(ASE\)](#) hold regional and national conferences and TeachMeets (informal meetings for teachers to share ideas and good practice).
- [STEM Learning](#) organise courses across the UK which can be funded by Enthuse Awards.
- PSTT's [Wow Science](#) site links to numerous organisations that support primary science education. Teachers can be assured of the high quality of any resources that are linked to this site.

These learned societies and other organisations also have suitable supporting resources that might be useful:

- [The Royal Society of Biology](#)
- [The Royal Society of Chemistry](#)
- [The Institute of Physics](#)
- [The Ogden Trust](#)

### **Is the subject leader aware of PSTT Fellows and any science clusters in their locality?**

Established in 2010, the Primary Science Teacher College is a national network of over 190 award-winning primary science teachers. These teachers, known as *PSTT College Fellows*, are some of the most innovative and outstanding teachers within primary science and have been recognised through the [Primary Science Teacher Awards \(PSTAs\)](#). Award-winning [College Fellows](#) may be supporting primary science teaching in your area.

Working in a collaborative group, we can achieve much more than working in isolation. School clusters provide the opportunity and environment to develop primary teaching, benefit our schools and have a positive impact in the classroom. PSTT encourages schools to join up into clusters so that they can support one another in their development of science teaching and have more resilience to change of circumstances in any one school. PSTT are currently supporting and providing funding to 29 [PSTT Clusters](#) in different areas of the UK, and in Scotland, we support collaborative networks through our partnership with SSERC. All of these PSTT Clusters are built around a PSTT College Fellow. Additionally, PSTT provides advice for all schools interested in creating cluster networks for primary science [here](#).

## 4. RESOURCING SCIENCE

### Do children have a range of suitable equipment for practical science?

Hands-on practical learning is fundamental to science teaching and requires resourcing to be effective. You will need to purchase some equipment from specialist educational suppliers, for example, [TTS Group](#). Other resources such as wool, jam jars, candles, old seeds, etc. could be collected from parents and the local community by sending out a request in the school's newsletter or the website.

A list of science equipment for all the science topics can be found in the PSTT CPD Unit '[Resourcing Primary Science](#)'. This includes advice on storage, labelling, health and safety, developing pupil responsibility and science audit lists.

### Does the subject leader access funding from external sources to support science?

Several organisations provide grants and funding for primary science projects. Below, is a list of some that might be useful. Click on the links to visit their websites and find out more. This is not a complete list. A spreadsheet listing more possibilities can be downloaded from the RESOURCES tab.

- [Royal Society Partnership Grants](#) help schools and colleges to purchase equipment to carry out and investigate STEM research projects.
- The [Institute of Physics School Grants Scheme](#) offers for projects which focus on physics.
- The [Royal Society of Chemistry](#) provides a number of grants for equipment, for running a chemistry club, and also for chemistry-based school engagement activities.
- The [Microbiology Society](#) provides Educations and Outreach Grants which focus on microbiology.
- The [British Ecological Society](#) provides Outreach Grants for the promotion of ecological science.
- [British Science Week](#) provides Kick Start grants for schools to run activities for students at your school.
- [CREST](#) provides funding to run CREST Awards (a nationally recognised scheme for student-led project work in the STEM subjects).
- [The Ogden Trust](#) provides funding for the teaching and learning of physics. Schools would need to become part of the Ogden Partnership.

## 5. CURRICULUM ENHANCEMENT

### Does the curriculum link science to real world applications?

Science and STEM subjects have a massive impact on our modern lives, whether we study these subjects or not. Yet many socio-economic groups remain underrepresented in science and STEM-related jobs. Many people believe that studying science is only important if they want to become doctors or scientists, but this is not the case.

The PSTT has developed two freely downloadable resources that can help teachers to introduce scientists and their work to primary children:

The PSTT's [I bet you didn't know...](#) articles and teacher guides provide access to cutting-edge science research for teachers and young children with links to the primary science curriculum topics. The articles explain what scientists have done and suggest questions for children and teachers to consider in the classroom. The teacher guides (which could be used as classroom presentations) describe activities that children can do to mirror the research.

The PSTT's [Engineering our World](#) resource was designed as a stand-alone resource for a science club. Practical activities for children are linked to the work of 'traditional' scientists and engineers. Four males and four females were chosen. Fact sheets for each famous person focus on their main achievement and provide prompts for further learning. Challenge sheets describe an activity that is linked to what the person was famous for and explain the science behind the work.

There are many ways to introduce scientists and their work to primary children, through visits to museums and science discovery centres, or by inviting visiting scientists into the classroom using the [STEM Ambassador scheme](#).

[Encounter Edu](#) designs and delivers a STEM and global learning programme for primary age children including live lessons with video links, teacher resources, STEM activities, videos and virtual reality content. Many of the resources are freely available. You can catch up on past live events (e.g. World Ocean Day, Fieldworklive, AXA Arctic Live 2020, and many more) or access either the Teacher Resources, STEAM activities or videos directly. Topics covered include: Oceans for beginners, Ocean Plastics, Submarine STEM, and Google Expeditions which explore many themes such as coral bleaching, Mount Everest, Recycling in New York, volcanoes and rivers.

You may also be interested in [Practical Action STEM challenges](#): a range of free resources that can be used for home learning, science lessons, curriculum enrichment days, and science clubs, which engage children in real world issues including climate change, renewable energy, food security and disaster preparedness.

### Does the curriculum link science to your locality?

Linking learning to children's interests and experiences is known to improve outcomes. What science resources do you have in your local area? Here is a list of questions which might help you to make some useful links:

- Are there any parents who work in science-related jobs who would be willing to come and talk to the children about what they do?
- Are there any industries (e.g. engineering companies, solar farms) who would send a representative to school or allow you to visit their workplace?

- What outdoor spaces can you visit to look for evidence of science and its impact on our lives? You will find lots of ideas for taking EYFS, KS1 and KS2 science learning outside in [Let's Go! Science Trails](#) and [Let's Go! STEM Trails](#).
- Are there any famous scientists (historical or contemporary) living in your area?

### **Do children learn about the nature of science and the way scientists work?**

Group-based engineering challenges and classroom practical enquiries can develop an understanding of how scientists carry out their work. The PSTT has produced the following resources which link children's practical science to the work of real scientists:

[Standing on the Shoulders of Giants](#) offers a series of ten investigations based on the work of an influential historic scientist or inventor. It details activities for children that model those carried out by each scientist. By replicating the scientists' methods, children learn about the 'messy' process of carrying out scientific enquiries and how these scientists all worked in different ways (employing different types of enquiry to solve problems).

PSTT's [Engineering our World](#) resource (already mentioned above) provide eight activities linked to the work of a famous engineer or scientist. The approach used (Fact sheets and Challenge sheets) can be used to find out about other scientists or engineers in the world. Other scientists may initially be prompted by the teacher/parent/carer, but children can also be drivers here, taking more ownership of their learning, following their individual curiosity, and consequently fostering stronger connections with science and scientists. We suggest that both teachers and children could take ownership of their science club by brainstorming different scientists that they could investigate in a club sessions, or at home, or in a science week. An example that worked well with children in one school is Tim Peake (a British astronaut who visited the International Space Station in 2015), with linked challenges to create and investigate stomp rockets.

The PSTT's [I bet you didn't know...](#) articles and teacher guides (already mentioned above) link cutting-edge science research to the primary science topics. When the children's investigations mirror the scientists' research, the children see themselves as scientists because they can copy or reproduce an aspect of real research. This fosters a 'can-do' attitude and engages children who may otherwise not have seen themselves in this role.

### **Does the curriculum support the development of science capital?**

There is much evidence showing that children's interest in science is shaped before they leave primary school. This means that primary teachers play a crucial role in developing children's scientific literacy and their enthusiasm for science.

[Science Capital](#) is a concept that is a measure of a person's engagement and relationship with science. Research shows that by growing science capital in individuals, we can help more people to recognise that science is an important part of their lives and cultures, which will help to broaden opportunities and access for STEM-related jobs in the future. Science lessons at primary school may be the first time a child develops an awareness of science and its part in their life.

The [1001Inventions initiatives](#) are great resources to help support children's appreciation of diversity in science. These celebrate the contributions of lesser-known inspirational men and women of different faiths and cultures during the golden age of Muslim civilisation that spread from Spain to China. There are a variety of educational materials (online exhibits, video clips, books, teachers'

guides, activity sheets). Note: 1001 Inventions is a UK based not-for-profit science and cultural heritage organisation founded in 2006.

PSTT's [Wow Science](#) site specifically sets out to identify the best resources for supporting science learning for primary school aged children, through games, videos, experiment/investigation ideas and other activities that they will find engaging. We aim to provide reassurance to parents that these materials contain accurate scientific explanations where applicable and provide a safe environment for their children to explore. The site therefore provides links to excellent primary science learning materials either on the internet or in apps, helping children (and other family members) to enjoy science both inside and outside the classroom and build science capital.

You can read more about science capital in ASE's Primary Science magazine (June 2020), Issue 163A, p30-34: [Increasing science capital by building relationships between industry and the local community](#) (open access).