

Supporting secondary schools to meet the needs of pupils and staff

STEM Learning welcomes the publication of Ofsted's [Finding the optimum: the science subject report](#) – based on the evidence from its routine inspections.

Our role is to support all schools (and staff) on their journey – recognising their individual school contexts and helping them to meet the specific needs of their pupils and staff. The report contains several findings and recommendations, many of which are linked to curriculum, pedagogy and assessment and systems at subject and school level. We have listed some of these below, along with CPD and/or resources we can offer to address these needs. We are confident that our offer will continue to support teacher development and improve student outcomes.

Curriculum	Build on what has been learnt at primary school	<p>“There is also evidence from the schools we visited that many pupils in secondary school spend too much time studying content that they have already learned in primary school.”</p> <p>“Plan the secondary science curriculum to build on what pupils learned in primary school, and not simply repeat it or assume that pupils learned little .”</p>	<p>Developing mastery in a challenging KS3 curriculum</p> <p>Effective transition between Y6 & Y7</p> <p>Designing your science curriculum for success</p>	<p>RP351</p> <p>RX028</p> <p>NY287</p>
	Pupils should learn and remember detailed and connected knowledge	<p>“Where science was strong in the primary and secondary schools that we visited, pupils had learned detailed and connected knowledge of the curriculum, and remembered what they had learned previously.”</p>	<p>Supporting the memory: strategies and techniques to retain and retrieve knowledge in science</p> <p>Leading on secondary curriculum design</p>	<p>RX035</p> <p>RX020</p>
	Curriculum is a ‘path’ that makes learning science easier	<p>“In schools where science was strong, leaders generally saw the purpose of a curriculum as more than just a description of what pupils needed to know and do. They saw the curriculum as a ‘path’ that can make learning science easier. For example, leaders planned the science curriculum to take account of what pupils learned in mathematics , or made sure that pupils had enough time to learn the most important content in a way that they could remember it .”</p>	<p>Maths in secondary science curriculum: algebra</p> <p>Developing shared approaches to maths in science and science in maths</p> <p>Metacognition & self regulated learning in science</p>	<p>RP366</p> <p>MY219</p> <p>RP350</p>
	Curriculum identifies and sequences disciplinary knowledge	<p>“Ensure that the curriculum identifies and sequences the disciplinary knowledge that pupils need to work scientifically. This should not be limited to learning about scientific techniques, data analysis or fair tests. It should include developing their knowledge of all areas of working scientifically, including different types of scientific enquiry, such as pattern seeking, and concepts such as evidence and accuracy.”</p>	<p>Using the Ofsted research review: science to move your curriculum towards excellence</p> <p>Subject leaders network</p>	<p>RP364</p> <p>RP219</p>

Clarity of purpose with teaching activities or content choice

“In schools where science was strong, leaders and teachers were clear about the purpose of any teaching activity or specific content choice. They explained scientific ideas clearly and used assessment carefully to check what pupils had learned . This included disciplinary knowledge (knowledge of how to work scientifically) as well as substantive knowledge (established factual knowledge).”

Designing your science curriculum for success	NY287
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All pupils should take part in high quality practical work

“Ensure that all pupils have enough opportunities to take part in high-quality practical work that has a clear purpose in relation to the curriculum. At secondary school, this should include laboratory work, fieldwork and teacher demonstrations.”.

Maximising learning in practical science	RP358
Effective GCSE practical work (biology , chemistry , physics)	NY316-18
The art of science demos: how to get the best from practical demonstrations	RX047

Use teaching approaches that are subject specific and based on evidence

“Inspectors regularly found considerable differences in how well teachers taught the curriculum. Very few teachers used approaches that were based on evidence or that were specific to science. Other than for physics or practical work where leaders had identified a training need, few schools had developed a systematic plan of how to develop teachers’ knowledge of science and how to teach it.”

Our CPD supports teachers as they progress through different stages of expertise and experience:	
Early career teachers	
Experienced teachers	
Subject leaders	
Non-specialist teachers	
See also EEF’s Improving Secondary Science Guidance Report	

Ensure pupils are secure in their knowledge

“Ensure that pupils have a secure knowledge of what has been taught, before moving on to more content. This should include checking whether pupils have specific misconceptions”

Best Evidence Science Teaching (BEST) is a large collection of free resources for secondary school science. The resources have been developed from the best research evidence we can find on common misunderstandings in science, effective diagnostic questioning and formative assessment, constructivist approaches to building understanding, and effective sequencing of key concepts.	
Diagnostic teaching and dealing with misconceptions in secondary science RX038	

Assessment should check substantive and disciplinary knowledge

“Ensure that assessment checks whether pupils remember the substantive and disciplinary knowledge they have learned in previous years. This includes checking that they can use their substantive and disciplinary knowledge to select, plan and carry out different types of relevant scientific enquiry.”

Introducing assessment for learning	NE711
Maximising learning in practical science	RP358

Prioritise curriculum time

“Support subject leaders to prioritise curriculum time for teaching key scientific knowledge. In some schools, the focus is on making sure that pupils learn and remember what has been taught, so that they develop increasingly sophisticated and connected scientific knowledge. However, too many subject leaders and teachers feel pressured to cover content and move on.”

[Leading on secondary curriculum design](#)

RX020

[Developing mastery in a challenging KS3 curriculum](#)

RP351

Develop the science expertise of staff and leaders

“Create a systematic and continuous approach to developing the science expertise of staff and leaders. This should align with the school’s curriculum and take account of any specific needs and expertise.”

Our CPD supports teachers as they progress through different stages of expertise and experience:

- [Early career teachers](#)
- [Experienced teachers](#)
- [Subject leaders](#)
- [Non-specialist teachers](#)
- [Technicians](#)

Technicians play a crucial role and should be supported

“Science technicians played a key role in supporting teachers to deliver high-quality practical work across schools. This support was particularly valued by teachers new to teaching science and those teaching outside their area of specialism. In schools where technicians were valued staff, supported with appropriate training and CPD, practical work was more likely to be high quality, well resourced and meaningful.”

We provide a range of supportive CPD for [science technicians](#) including:

- Skills for new technicians
- Technicians supporting 11-16, biology, chemistry and physics
- Technicians supporting post 16 science
- Technician network events and conferences

CPD should be a part of an ongoing programme of professional development, not standalone

“Despite teachers valuing the CPD that they received, in many schools teachers did not have access to a high-quality ongoing programme of professional development to improve their subject and pedagogical content knowledge. This was because there was no clear plan for how teachers would develop their expertise over time. Instead, there was an over-reliance on stand-alone training sessions, which often restricted CPD in science to learning about practical work. Our findings suggest that there needs to be a much greater focus on developing teachers’ expertise in relation to specific areas of the science curriculum and engaging with science-specific research.”

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- [Subject leaders](#)
- [Non-specialist teachers](#)

See also EEF’s [Improving Secondary Science Guidance Report](#)

Science leaders need time to engage with local networks and should receive subject-specific training

“Where science leaders were well supported by senior leaders, they had dedicated time to attend local authority or trust meetings as well as external CPD. This allowed them to look beyond their own school. In some schools, leaders were supported to undertake leadership qualifications, such as the national professional qualification for middle leadership, and experience dedicated coaching and mentoring. However, very few science leaders received dedicated subject-specific support to lead a science department.”

[Developing effective leadership in secondary science](#)

RP365/
NY

[Embedding effective leadership of secondary science](#)

NY336

[Subject leaders network](#)

RP219