Improving Primary Science

Professional development discussion tool

Education Endowment Foundation

High quality teaching improves pupil outcomes. Recommendation 6 in the Improving Primary Science guidance report advises strengthening science teaching through effective professional development, which is one of the main ways to develop teaching quality and enhance pupils' outcomes in the classroom.

The following vignettes are illustrative scenarios that outline possible challenges in primary science faced by teachers. The relevant vignette could be used to begin a professional development session, opening discussion and reflections from colleagues prompted by the given questions. Page number references are provided to support navigation of relevant sections within the Improving Primary Science guidance report.

Science leaders may want to focus on a particular recommendation from the Improving Primary Science guidance report. It may support educators to revisit prior learning as well as motivating them to dig into what the evidence says to build knowledge and improve teaching strategies in a particular area of science. You may feel that writing your own vignette, relevant to your context and the professional development needs of your staff, may be useful. The EEF's **Effective Professional Development** guidance report can support school leaders to design professional development initiatives.

Recommendation 1: Develop pupils' scientific vocabulary (page 5)

Ms Armstrong, a Year 4 teacher, has been teaching her class about digestion. After their lunch break, she asks the pupils to discuss the journey of the food they have just eaten through their body. She provides a diagram of the digestive system on the board for reference and poses the question: 'Where does our lunch go and why?'

While the pupils are engaged in conversation and actively listening to each other, they frequently use informal terms like 'throat' and 'tummy' instead of employing scientific language such as 'oesophagus', 'stomach', and 'intestine'. Some pupils get the large intestine and small intestine the wrong way around and others use the word 'stomach' to refer to the digestive system as a whole.

Ms Armstrong wonders about the following:

- How can I support my pupils to use scientific language to describe their ideas?
- How can I scaffold their discussions and incorporate approaches to enhance their understanding of digestion?
- How can I make links that promote meaningful understanding while staying focused on the scientific concepts being taught?

Recommendation 2: Encourage pupils to explain their thinking, whether verbally or in written form (page 9)

Mr Nayeni knows that discussion can be an effective way for pupils to share their understanding and develop their thinking. He'd like to try and build in more time for in-class discussion; however, he's uncertain about the best approach.

In a previous attempt to discuss the impact of diet and exercise on health, the class veered off-topic, losing focus. Furthermore, a few pupils were upset due to personal comments made by others. He felt that the process became counterproductive and he wants to avoid this happening again.

Mr Nayeni seeks answers to the following questions:

- How can I keep pupils focused on the topic?
- How can I structure the task to foster understanding through dialogue?
- What measures can I put in place to minimise potential upset caused by controversial topics?
- How can I assess the effectiveness of dialogue in enhancing understanding?

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Recommendation 3: Guide pupils to work scientifically (page 15)

Mr Sharp wants his pupils to apply their scientific skills to observe and record what happens to the brightness of a lamp when the number and voltage of cells is altered. He is excited as he has recently discovered a free app which measures light brightness using a tablet's camera. He wants the pupils to set up circuits with different numbers of cells or cells of different voltage and take accurate measurements of the brightness of the bulb each time using this new app. He asks the pupils to record the data to discuss later.

The pupils enthusiastically work in their groups to set up circuits, changing the number or voltage of cells each time. They measure the brightness of the lamp, but some groups have trouble getting accurate readings as they think the daylight from the classroom window is affecting how the app works. Pupils spend time closing the blinds, reorganising where they work in the classroom, or using card to block exterior light.

Mr Sharp asks the pupils what they have found out. They enjoyed the task, spending a lot of time setting up the circuits and trying to capture light readings using the new technology but, due to time constraints, they approached their recording in several ways and the charts they have drawn vary in relevance and accuracy due to the large value readings. Not all pupils are clear what the readings are telling them and haven't made the link between the number of cells and the lamp brightness.

Mr Sharp wonders:

- What did the pupils learn in this activity? Was it what he wanted them to learn? If not, does the task still have value?
- How could Mr Sharp plan this lesson differently so that it is more purposeful and focused for pupils? How should he adapt his teaching?

Recommendation 4: Relate new learning to relevant, real world contexts (page 20)

Mr Hayes wants to engage his pupils in science so that they are inspired and curious to find out more about the world. His Year 5 class has been focusing on the topic of forces and he wants to make the subject as relevant and meaningful to his pupils as possible.

He heard one of his pupils discuss how he rides his bicycle to school and thought this would be a great way to introduce pupils to the topic of friction. He uses this idea to create a scenario where the pupils must explain what happens to make a bicycle stop moving. However, some of the pupils have never used a bicycle before so the concept of bicycle brakes is unfamiliar to them, others start insisting that a scooter is much more fun than a bicycle, and others feel sad because they don't have a bicycle at home and have never had the chance to ride one. Overall, the scenario didn't have the effect he intended.

It leads Mr Hayes to contemplate the following questions:

- How can I ensure that all of my pupils can engage with the real-world contexts I integrate into my teaching?
- How can I create learning opportunities which are memorable for the right reasons?
- Could I have done anything before, during, or after the scenario to better support learning?

Recommendation 5: Use assessment to support learning and responsive teaching (page 24)

Mrs Thompson, a Year 6 teacher, feels she is struggling with assessment in science. In maths, she's been using short multiple-choice quizzes (with mini whiteboards) during lessons, and regular end of unit assessment questions, with great success. However, the same approach doesn't seem to be working so well in science. Pupils seem to perform well in the short multiple-choice quizzes (on content knowledge) but they really struggle with end of topic assessments where they must apply their knowledge. Overall, she's not confident her assessments are that useful.

Prompted by her concerns, Mrs. Thompson ponders:

- Is my end of topic assessment an accurate reflection of the curriculum covered? Is it allowing pupils to fully show their understanding? Is it a good use of time?
- How can I effectively assess what pupils have learned through working scientifically?
- Should I change anything in my approach to teaching based on the assessment results?

Recommendation 6: Strengthen science teaching through effective professional development as part of an implementation process (page 29)

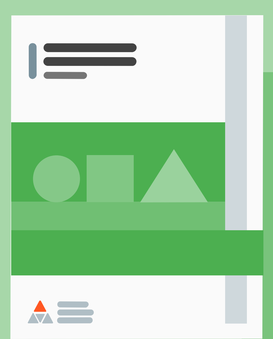
Mrs Kasongo, a Year 1 teacher and the school science lead, sits surrounded by feedback forms from her colleagues. Teachers have expressed difficulties around teaching certain science topics, revealing worries about subject understanding and possibly confidence too. Mrs Kasongo's heart sinks as she sifts through the concerns—evolution, electricity, working scientifically …

She believes every teacher can do an excellent job of teaching science with proper guidance but faced with so many potential areas to support, she is uncertain about what to do next.

Mrs Kasongo reflects on her own professional development experiences: they focused on broader teaching strategies rather than subject-specific content. She feels a little overwhelmed, knowing her decisions could shape not only her colleagues' teaching but the scientific education of their young pupils.

Mrs Kasongo wonders:

- How should I develop an implementation plan which supports high quality science teaching?
- How can I bridge the gap between general teaching skills and subject-specific knowledge in science? Would subject-specific professional development courses benefit teachers?
- How can I monitor and evaluate the impact of these professional development initiatives on teaching and learning outcomes?



Find out more in the Improving Primary Science guidance report