

Science: Information

Introduction

The National Curriculum Science Programmes of Study (2014) begin with the assertion that “Science has changed our lives and is vital to the world’s future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena.”

Ofsted’s Education Inspection Framework (2019) asserts that the Intent of a school’s Quality of Education will require leaders to construct a curriculum that ambitious and designed to give all learners, particularly those with SEND or high needs, the cultural capital they need to succeed in life. This statement resonates profoundly with teachers of Science who are aware of that “a high-quality science education provides the foundations for understanding the world.” The attainment gap in science may not be as well-documented as the gap in English and maths, but it is just as pervasive. Research by the Education Endowment Foundation has shown that disadvantaged pupils start to fall behind in science in Key Stage 1; the gap only gets wider throughout primary and secondary school and on to A-level.

Science and SEND

Best practice for teaching for pupils with SEND and best practice for teaching Science has significant overlap. Below find an explanation of how, broadly speaking, best practice for all Science learners is best practice for pupils with SEND.

Preconceptions: Build upon prior learning

Pupils encounter aspects of science all the time through their sensory experiences and social interactions; each learner’s unique interaction with their environment provides the context to their learning in science. It is widely established that relating new learning to prior knowledge and real life makes it more meaningful and therefore more memorable. The link between real-life experiences and learning is particularly effective for pupils with SEND.

Self-regulation

This three-part process provides pupils with SEND a structure and routine to learning that will, with practice and revision, potentially reduce cognitive load. It should not be assumed that pupils will learn how to plan, monitor and assess themselves; explicit instruction will be required. For all pupils, including pupils with SEND, this process will improve metacognition.

Modelling

Modelling is essential best practice in all subjects and particularly Science given the constant movement between observation and explanation. Models can effectively link observations to explanations to aid understanding and reasoning. For pupils with SEND, modelling will allow greater opportunity to repeat key content of learning and confidence in what is expected as a learning outcome.

Memory

Pupils with SEND may often find that their working memory is overloaded. Cognitive overload will increase the likelihood that content may be misunderstood and not effectively encoded in the long-term memory. The Science curriculum lends itself to spaced review or distributed learning. Spaced review involves revisiting a topic after a 'forgetting gap' and strengthens long-term memory. A simple way to manage this is to build in review time, including reviewing learning from the previous lesson at the start of the next one or over longer periods (at the end of each week, month, or topic). This also links with retrieval practice, and combining spaced review and retrieval practice can lead to great benefits in retention in the long-term. Retrieval practice involves retrieving something you have learnt in the past and bringing it back to mind. You can use retrieval to review past learning before introducing new related learning. Elaboration involves describing and explaining in detail something you have learnt. This approach supports learning by integrating new information with existing prior knowledge, helping to embed it in the long-term memory. This is useful as pupils progress in their understanding of a concept.

Spaced learning, retrieval practice and elaborative interrogation provide routine, structure and effective conditions to improve working memory; key features of effective classroom strategies for pupils with SEND.

Practical work

For some pupils with SEND, not necessarily all, practical science is one of the best ways to help improve understanding of theory. Scientific methodology also provides helpful structures to structure and record practical work, promoting the use of writing frames and structures. Like other types of learning, practical work should be adapted and differentiated as required.

Pupils with some types of SEND will need significant adaptation ('reasonable adjustments') to practical tasks to make them accessible – this may be through additional adult support or peer-working (where a pupil with a physical or sensory disability can perhaps direct the practical activity, and/or contribute those practical elements which are within their control, allowing a peer/adult to complete others if necessary). It may sometimes be necessary for practical participation to be achieved by observation rather than direct participation, but aim to minimise this as much as possible and be creative in your approach to practical activities to enable maximum accessibility.

Make sure that the safety of pupils with disabilities is paramount, as they may need reasonable adjustments to ensure their safety during practical sessions. Ask the SENCO for advice if you are unsure about this; some pupils may need individual risk assessments.

Language of science

The unique vocabulary of science often means that most pupils are learning new subject-specific vocabulary alongside their peers. Best practice in science suggests that use of vocabulary is planned and that vocabulary is introduced systematically and in a structured way. Explicit and direct instruction have a key place here, meaning that all pupils should have a word bank/ science dictionary. As with other subjects, it is important that texts pupils are reading are at an appropriate level and suit any particular learning needs; adaptations must be made/ provided for pupils who cannot access scientific knowledge due to weaker literacy skills.

Feedback

Structured feedback to move on pupil's thinking is advocated as best practice in science teaching. Research recommends that feedback provided as comments, rather than marks can show high and low attainers alike how they can do better.

Summary

Good practice for pupils with SEND is good practice for all, however this does not translate to good practice for all is good enough practice for pupils with SEND. Along with the advice above, it is important that personalised adaptations are made so that all pupils are be taught essential aspects of the knowledge, methods, processes and uses of science