Switched on Science Curriculum: Intent, Implementation and Impact

Intent

The second edition of Rising Stars *Switched on Science* provides full coverage of the primary science programmes of study. *Switched on Science* provides access to all subject knowledge and working scientifically objectives in a range of contexts to support the embedding of these concepts and skills.

Teacher background information

At the start of each unit there is a section outlining the intentions for teaching and learning, including learning objectives (all of which are taken from the Programme of Study for Science (England)), cross-curricular links, and background subject knowledge for those teachers looking for additional support. This includes identification of misconceptions that pupils might hold in different areas of learning. There are also sections on key scientific vocabulary (with definitions) and STEAM, alongside health and safety.

Get started and let's think like scientists

Each Unit has a 'Get started' opener which provides ideas for eliciting prior learning from previous activities as well as personal experiences at home and in the locality. 'Let's think like scientists' provides questions to the teacher or supporting adult to ask to encourage critical thinking and research, thus extending and challenging the pupils.

Learning outcomes

The intention for each activity is clearly identified in the learning objective. This ensures that teachers know which skills and concepts are the focus for the activities. Subject leaders can be confident of curriculum coverage in each year group, ensuring progression through a coherent and carefully sequenced programme across the primary years.

The accompanying notes indicate what resources are required and provide suggestions such as additional activities, ideas for challenging pupils, suggestions for identifying misconceptions, and how to record and communicate their science.

Switched on Science assumes that teachers have high and equal expectations for all pupils and the programme is ambitious for all pupils. It also recognises that some pupils require additional support and offers suggestions where appropriate.

Relevant and meaningful

Switched on Science ensures that the science contexts are meaningful by setting content in a range of interesting contexts that are relevant to the pupils. It ensures that pupils relate the science they are learning to their own lives as well as working with contexts in the wider world.

First-hand and practical

Practical activity is at the core of *Switched on Science*. The scheme aims to support teachers in developing pupils as independent learners who are curious and willing to ask and answer their own questions. Throughout the various units, teachers are supported in developing approaches which scaffold pupils in asking a range of questions and making their own decisions about how to answer them using the five scientific enquiry activities.

Linked to developing pupil's independence, *Switched on Science* suggests opportunities where pupils are challenged to reflect on their learning through discussing ideas with adults and their peers, thereby articulating their learning. Progressing pupil's ability to communicate their understanding and explain their reasoning is central to primary science and so is a feature of *Switched on Science*. Throughout the scheme there is an expectation that pupils should not only be able to talk about what they have been doing, but also why and what they have learned.

STEAM (Science, Technology, Engineering, Arts and Science)

In the background information at the beginning of each unit is a section which provides teachers with links related to STEAM (Science Technology Engineering, Arts and Maths). To ensure that STEAM is integrated into science learning, *Switched on Science* provides suggestions of people to invite into the classroom and visits out, to support teachers in making these links to widen pupil's experience and understanding of STEAM. Links to the Arts have been included to assist teachers in providing pupils with opportunities to explore how art and science work well together, from observational drawing to scripting a play, creating a sculpture or learning how musicians work.

Implementation

Implementation is how a scheme translates the objectives (intent) into activity. Everything a pupil does and thinks in science is important, so it is crucial that activities provide regular opportunities for pupils to engage in hands on practical activity as well as think about or research scientific ideas and skills.

Practical hands-on activities

Throughout the scheme pupils are engaged in asking questions and using one of the five science enquiry activities:
- observation over time
- fair or comparative tests
- identification and classification
- research
- pattern seeking.

All activities have been planned so that they are relevant to the learning outcomes and pupil's experiences, ensuring that they are timely and meaningful. Where appropriate they are hands-on, ensuring that pupils engage in regular first-hand experience using a range of equipment, including ICT where suitable, to enhance and deepen learning.

Communicating science and scientific vocabulary

Throughout *Switch on Science*, pupils are asked to communicate their science using different approaches, e.g. writing, drama, poetry, discussion, modelling and using ICT (to create video clips, etc.).

Engaging pupils in a range of approaches to communicating science ensures that all pupils can share ideas and by listening to themselves articulate ideas, pupils engage in self-assessment, either reinforcing their learning or changing ideas and therefore moving learning on. By using different approaches to recording and communicating, all pupils can share their science, which means that teachers can access learning through assessment and use outcomes to plan next steps.

Key scientific vocabulary for each unit is listed (with definitions) so that teachers can share with pupils the expectation that these words should be learned. A pupil's ability to use scientific words appropriately is an indicator of understanding of knowledge and skills. Teachers can use a pupil's ability to use key words as part of assessment for learning, listening for how the words are used and, if necessary, asking follow-up questions to check depth of understanding. However, this requires teachers to use a range of approaches to support learning and applying scientific vocabulary in different contexts. Linking literacy approaches for teaching vocabulary in science lessons will help to embed scientific vocabulary alongside teacher expectations that pupils should use correct words when speaking and writing.

Application of literacy and numeracy skills in science

Switched on Science activities are designed to ensure that the expectations of literacy and mathematics are appropriate to each year group in science and therefore application of literacy and numeracy skills are embedded throughout.

Where appropriate, links with other curriculum subjects are included in the introductory section to topics and individual activities. This includes STEAM suggestions for arts related visitors, such as engineers, photographers, artists, poets to work with pupils and visits to places where science and other subjects naturally link.

Impact

Pupils develop their knowledge and skills through a series of planned activities linked to the curriculum which build on previous and personal knowledge. To assess the impact, teachers evaluate the knowledge and skills that pupils have gained against the original expectations of activities (the intent). This is indicated by the outcomes assigned to each activity. What and how well pupils have achieved will be accessed through using a range of approaches to assessment for learning.

It is important that assessment supports a pupil's journey through the science curriculum to ensure appropriate outcomes for each individual. The focus of *Switched on Science* is to support this journey so that teachers know how well pupils are doing at each point in a topic. The material is written in such a way that assessment is an integral part of activities. The learning objectives at the beginning of each activity show the intention for learning and these are then used as the basis for assessment, the criteria for which are outlined in the assessment section, split into subject knowledge and working scientifically.

Assessment statements are differentiated so that teachers can assess the progress of different groups in their classroom, suggesting how the teacher could assess pupils to find out whether they are at Emerging (Em.), Expected (Exp.) or Exceeded (Exc.); some schools might use different terms. These are suggestions for what to look for when carrying out a formative assessment and it will also help teachers when considering next steps for pupils, moving them from Emerging to Expected to Exceeding. For those schools who want to use end-of-topic tests, these can be found online.

It is expected that teachers will use a range of evidence to assess pupil's progress. This includes observing them working, listening to their discussions and using questions to probe understanding and reasoning, alongside their writing and other products such as video clips, models and role play activities.

As pupils progress through the primary years, self and peer assessment is another approach to complement teacher assessment. Not only does this develop a pupil's ability to reflect on their own learning, it also provides teachers access to how well pupils perceive their learning to be progressing and why.

A feature of *Switched on Science* is the application of 'Working Scientifically Skills' and 'Knowledge and Understanding' through regular problem solving activities. Challenging pupils to apply their learning in new contexts provides opportunities for them to further embed ideas and skills. Assessing how pupils respond to applying their knowledge and skills is an indicator of how successful their leaning has been.

Additional materials

To support and supplement the principles outlined above, also thread through the additional online materials, including:

- activity resources
- teaching PowerPoints
- pupil videos
- CPD (Continuing Professional Development) videos
- editable medium-term planning
- end-of-topic tests.