

Primary science aide-memoire

Substantive Disciplinary Ø knowledge knowledae

Contents

- This document has been creat-ed to support inspectors undertaking a deep dive in science.
- It provides a summary of stage two training and the subject quidance.
- The six focus areas provide a structure to explain subject level outcomes as identified by inspection activities.
- School leaders should not be expected to articulate their intent as it is outlined in this aide-memoire, or supply documents which neatly provide the evidence for the focus areas.

Dr Jasper Green, HMI

Science Subject Lead

jasper.green@ofsted.gov.uk



www.twitter.com/ofstednews

www.youtube.com/ofstednews

Curriculum

Science as a discipline and school subject

Science explains the material world.

By learning about the **prod**ucts of science, pupils are able to explain the world around them.

By learning how scientific enquiry establishes scientific knowledge, pupils learn about its nature and status i.e. it is revised in the light of new evidence.

Progress in school science:

Pupils know and remember more about the products and practices of science.

Substantive knowledge

(referred to as scientific knowledge and conceptual understanding in the NC)

Do plans identify the most important substantive concepts?

Do plans anticipate and address common misconceptions?

Substantive: components & sequencing

Do plans break down end goals into their component parts?

Are these component parts seguenced so that pupils build schemata for important concepts over time?

الم

888

Disciplinary knowledge

Scope: The curriculum should meet the minimum expectations set out in the EYFS and National Curriculum. It

should be increasingly demanding and broaden and deepen pupils' scientific knowledge. See over page.

(outlined in the working scientifically sections of the NC)

Does the curriculum identify what disciplinary knowledge underpins working scientificallv?

Do plans break down these concepts and procedures into their components?

Do plans outline how disciplinary knowledge **advances** over time? See over page.

Are pupils **taught** disciplinary knowledge or simply expected to acquire it by carrying out practicals?

Are pupils equipped with the necessary mathematical knowledge?

Interplay between substantive and disciplinary knowledge

Is disciplinary knowledge paired with the most appropriate scientific concepts?

Do pupils learn about the **different** types of scientific enquiry i.e. not just fair tests?

Is **scientific enquiry** more than just practical work or data collection?

Once the necessary prior knowledge has been secured can pupils:

- ask and answer their own scientific questions?

Pedagogy

Instruction:

Do lesson activities match curriculum intent?

Are instructional approaches systematic, with new content introduced in a logical order, building on what pupils know?

Are teacher **explanations** clear, supported by deep subject knowledge? Are misconceptions addressed?

Practical work (demo or whole class):

Do pupils encounter objects/phenomena of studv?

Have pupils secured the necessary **prior** knowledge to conduct and learn from the activity?

Are pupils able to **connect** concepts to what they are doing?

Is sufficient **time** allocated before and after the practical so pupils learn what was intended?



Component parts - formative

Is the most fundamental knowledge pupils need to learn identified?

Does assessment check for specific misconceptions or missing components?

Do pupils get sufficient and purposeful feedback? Is this feedback focused on science content not generic features?

Composite parts — summative

What processes are in place to help teachers make valid judgements when assessing composite tasks?

Implications for curriculum

⊡→☑

Are results from assessments used to **develop** curriculum? ᠿ→⊡

Systems

Does the curriculum and its implementation engineer success?

Is the subject **led** effectively?

Do staff have strong subject knowledge?

How are staff supported to develop their subject and subjectspecific pedagogical knowledge?

How are curriculum materials used to support teachers and ensure curriculum coherence?

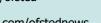
What actions are being taken to address weaknesses in science?

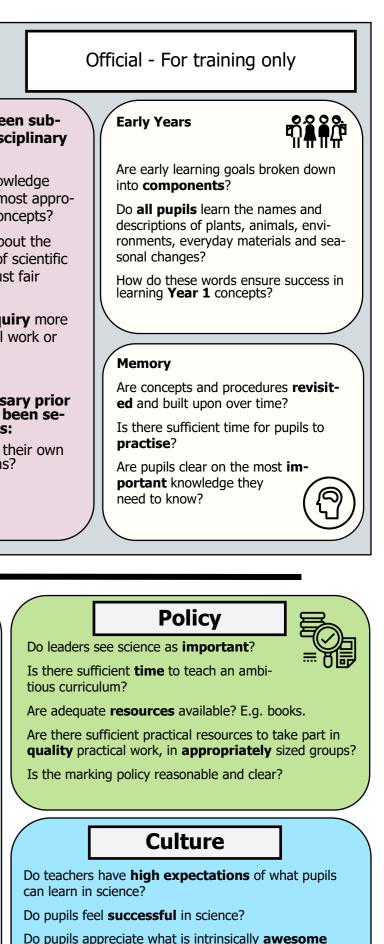
What mechanisms are there for curriculum construction, sequencing and improvement?

How are **parents** kept informed of their child's progress and attainment in science?



www.gov.uk/ofsted





and wonderful about scientific concepts?

Do pupils see a value in science, both personally and in relation to wider society and employment?

What enrichment activities are offered?



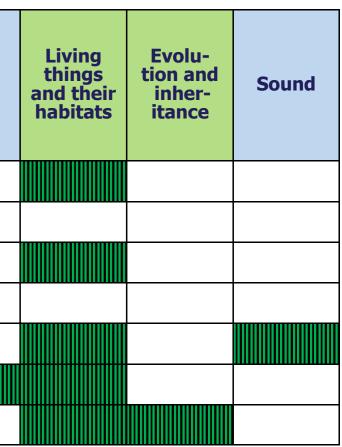
Two tools to help inspectors consider the scope of a primary science curriculum.

Note: the tables are not a curriculum because they do not identify and sequence component knowledge.

Table 1: Substantive knowledge

	Plants	Rocks	Animals includ- ing humans	Forces and magnets	Materi- als and their proper- ties	States of matter	Seasonal changes	Electrici- ty	Light	Earth and space
EYs										
1										
2										
3										
4										
5										
6										

Table 2:	Disciplinary knowledg Methods to answer scientific questions	Apparatus and techniques, including measurement	Analysis, presentation and evaluation of sci- entific data to draw valid conclusions	Development of scientific knowledge over time and its implications	Table 1 s the Nation how a curr inspectors lum. Table 2 s	
KS1	Asking simple questions. Identifying and classifying.	Gathering and recording da- ta. Observing closely using simple equipment e.g. hand lens.	Using their observations and ideas to suggest answers to questions.		ments tal tions. Ins science cu for progree	
Lower KS2	Using different types of scientific enquiries to an- swer questions. Setting up fair tests, make predic- tions.	Taking accurate measure- ments using standard units, use a range of equipment incl. thermometers.	Recording findings using bar charts, keys, tables, labelled diagrams. Draw conclusions. Make predictions for new val- ues, suggest improvements.	Using scientific evidence to support findings.	example, ` ment adva to use the lum.	
Upper KS2	Planning different types of scientific enquiries. Recog- nising and controlling vari- ables.	Taking measurements with increasing accuracy and pre- cision. Taking repeat read- ings.	Scatter graphs, line graphs, causal relationships. Degree of trust in results.	Identifying scientific evidence used to support or refute ideas or arguments.		



ows substantive content areas from al Curriculum and ELGs. This is **not** culum would be organised but should help onsider scope against the National Curricu-

ows <u>a selection</u> of composite stateen from working scientifically sec-

ectors can use the table to explore how a iculum breaks down these goals and plans ion in working scientifically over time. For now me how pupils' knowledge of measureces over time'. Schools are **not** expected e four categories to organise their curricu-

Official - For training only