INSPECTOR CURRICULUM

Primary science aide-memoire

Substantive knowledge | Disciplinary knowledge

Contents

- This document has been created to support inspectors undertaking a deep dive in science.
- It provides a summary of stage two training and the subject guidance.
- 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.

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Curriculum

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.**

Official - For training only

Science as a discipline and school subject

Science **explains** the material world.

By learning about the **products** 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 sequenced so that pupils build **schemata** for important concepts over time?

Disciplinary knowledge

(outlined in the working scientifically sections of the NC)

Does the curriculum identify **what** disciplinary knowledge underpins working scientifically?

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?

Early Years

Are early learning goals broken down into **components**?

Do **all pupils** learn the names and descriptions of plants, animals, environments, everyday materials and seasonal changes?

How do these words ensure success in learning **Year 1** concepts?

Memory

Are concepts and procedures **revisited** and built upon over time?

Is there sufficient time for pupils to **practise**?

Are pupils clear on the most **important** knowledge they need to know?

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 study?

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?

Assessment

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?

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 subject-specific 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?

Policy

Do leaders see science as **important**?

Is there sufficient **time** to teach an ambitious curriculum?

Are adequate **resources** available? E.g. books.

Are there sufficient practical resources to take part in **quality** practical work, in **appropriately** sized groups?

Is the marking policy reasonable and clear?

Culture

Do teachers have **high expectations** of what pupils can learn in science?

Do pupils feel **successful** in science?

Do pupils appreciate what is intrinsically **awesome 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 including humans	Forces and magnets	Materials and their properties	States of matter	Seasonal changes	Electricity	Light	Earth and space	Living things and their habitats	Evolution and inheritance	Sound
EYs	■		■		■	■	■				■		
1	■		■		■		■						
2	■		■		■						■		
3	■	■	■	■					■				
4			■			■		■			■		■
5			■	■	■	■				■	■		
6			■					■	■		■	■	

Table 2: Disciplinary knowledge

	Methods to answer scientific questions	Apparatus and techniques, including measurement	Analysis, presentation and evaluation of scientific data to draw valid conclusions	Development of scientific knowledge over time and its implications
KS1	Asking simple questions. Identifying and classifying.	Gathering and recording data. Observing closely using simple equipment e.g. hand lens.	Using their observations and ideas to suggest answers to questions.	
Lower KS2	Using different types of scientific enquiries to answer questions. Setting up fair tests, make predictions.	Taking accurate measurements 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 values, suggest improvements.	Using scientific evidence to support findings.
Upper KS2	Planning different types of scientific enquiries. Recognising and controlling variables.	Taking measurements with increasing accuracy and precision. Taking repeat readings.	Scatter graphs, line graphs, causal relationships. Degree of trust in results.	Identifying scientific evidence used to support or refute ideas or arguments.

Table 1 shows substantive content areas from the National Curriculum and ELGs. This is **not** how a curriculum would be organised but should help inspectors consider scope against the National Curriculum.

Table 2 shows a selection of composite statements taken from working scientifically sections. Inspectors can use the table to explore how a science curriculum breaks down these goals and plans for progression in working scientifically over time. For example, 'show me how pupils' knowledge of measurement advances over time'. Schools are **not** expected to use these four categories to organise their curriculum.