Knowledge-rich Learning – Are we there yet?

Bryony Turford and Jane Turner
EEF blog: What do we mean by ‘knowledge rich’ anyway?

Alex Quigley EEF Senior associate – January 2019

‘A successful knowledge-rich curriculum should be designed to help pupils remember what they have been taught.’

‘Such a curriculum must be well-sequenced and underpinned by an understanding of how children learn. But, in addition, it must be based on a rich conception of knowledge that includes skills and attitudes that contribute to success.’

Read the EEF blog
Active learning – the motivation

Ofsted blog: Curriculum research – our findings

Chris Jones, Ofsted’s Deputy Director Research and Evaluation – September 2018

‘Schools need to have a strong relationship with knowledge, particularly around what they want pupils to know and know how to do.’

Ofsted: Commentary on 2nd phase of curriculum research

Amanda Spielman, Ofsted Chief Inspector – September 2018

‘Too many teachers and leaders have not been trained to think deeply about what they want pupils to learn and how to teach it.’

What knowledge, skills and attitudes do I want them to learn?

What do I need to do to help them learn it/get better at it?

How will I and they know if they have learnt it/can do it/got better at it?
Where are we getting it wrong in science?

**OFSTED: Intention and substance**
Further findings on primary school science from Ofsted’s curriculum research – February 2019

Little consideration was given to understanding scientific concepts and skills nor how they could be sequenced to aid pupils’ understanding.

Surface-level compliance with the national curriculum, which in practice meant carrying out one-off activities or lessons covering the statements in the programmes of study.

Focus on make learning more engaging and motivating for pupils.

But too frequently, the activities carried out were not deepening pupils’ understanding of the scientific concept, because teachers had not covered the baseline substantive knowledge required sufficiently beforehand.

When inspectors questioned pupils during the research visits, pupils could easily recall the task carried out, but struggled to explain how the processes they were investigating actually worked.
OFSTED blog: Curriculum research – our findings

Chris Jones, OfSTED’s Deputy Director Research and Evaluation – September 2018

‘This should not take the form of isolated ‘chunks of knowledge’.

‘A rich web of knowledge is what provides the capacity for pupils to learn even more and develop their understanding.’

What knowledge do teachers need?
Year 5 Chemistry

• Demonstrate that dissolving, mixing and changes of state are reversible changes.
• Explain that some changes result in the formation of new materials and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

What substantive subject knowledge do teachers need to teach this?
Where can they find it?
Year 5 Chemistry

• Demonstrate that dissolving, mixing and changes of state are reversible changes.
• Explain that some changes result in the formation of new materials and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Where does this fit into children’s learning journey?
CHEMISTRY: progression of ideas through KS1 and 2

MATERIALS

DESCRIBING AND USING MATERIALS

Different materials, including rocks, have different properties
Y1 Everyday materials
Y3 Rocks

Materials can be sorted into groups according to their observable properties
Y1 Everyday materials

Different materials are suitable for different uses (properties that can be observed)
Y2 Uses of everyday materials

Different properties make materials suitable for different uses (properties that can be measured)
Y5 Properties and changes of materials

Materials can be sorted into groups according to properties including hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets
Y5 Properties and changes of materials

Materials can be solids, liquids or gases
Y4 States of Matter

All materials have mass
CHANGING MATERIALS

Materials can be changed

- The shape of some solid materials can be changed by a contact force acting on them.
- Y2 Uses of everyday materials
- Some materials change state when heated or cooled.
  - Heating causes melting and evaporation.
  - Removing heat causes condensing and solidifying (freezing).
  - Y4 States of Matter
  - Y5 Properties and changes of materials

MIXING AND SEPARATING MATERIALS

Materials can be mixed together

- Mixtures occur when materials are mixed together but don’t react to each other.
- Y3 Rocks
- Soils are a mixture of rocks and organic matter.
- Fossils are formed when trapped within rock.
  - Y3 Rocks
- Mixtures can be separated by filtering, sieving, and evaporating.
  - Y8 Properties and changes of materials

Dissolving, mixing, and changes of state are reversible changes.
- Y5 Properties and changes of materials
Planning for learning: How much gas can be produced by a non-reversible change?

In this lesson, as an example of a non-reversible change, children explore a variety of solids and liquids that react chemically when they are mixed.

By the end of this lesson they will have identified the best combination of materials to use to inflate different containers such as plastic disposable gloves, balloons and plastic bags of varying capacities.

What is the intent?
What knowledge will be learnt?
What skills will be developed?
What attitudes will be encouraged?
Planning for learning: How much gas can be produced by a non-reversible change?

In this lesson, as an example of a non-reversible change, children explore a variety of solids and liquids that react chemically when they are mixed.

By the end of this lesson they will have identified the best combination of materials to use to inflate different containers such as plastic disposable gloves, balloons and plastic bags of varying capacities.

How do you know where you are starting from?
Planning for learning: How much gas can be produced by a non-reversible change?

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By the end of this lesson they will have identified the best combination of materials to use to inflate different containers such as plastic disposable gloves, balloons and plastic bags of varying capacities.

How is the intent implemented?

Interactive – physical or chemical change?
Planning for learning: How much gas can be produced by a non-reversible change?

What has been learned?
What knowledge has been gained?
What skills were developed?
What attitudes were encouraged?
What opportunities have they had to represent or express their understanding?
What new knowledge will children use in their explanations?
How will you know if their understanding is secure?
How will the children know?
Knowledge-rich learning – Are we there yet?

How has this workshop helped you to think about what ‘knowledge rich’ means in terms of science teaching and learning?

What will you use from this session?