

TEACHER HANDBOOK

S3 | SUBJECT: TYPES OF KNOWLEDGE

WATCH



**CLICK TO WATCH
MODULE VIDEO**

Or visit ambition.org.uk/ecf

READ | EVIDENCE SUMMARY

TEACHING CHALLENGE

Mr Jones has reviewed the curriculum for his next topic: he is confident about the learning goals, has refreshed his knowledge of the key ideas and has talked to colleagues about how pupils can best learn them. However, the amount and range of content appears huge. He is unsure how he will find time to cover everything in depth. What should he prioritise teaching?

KEY IDEA

Teachers can develop pupils' mental models by identifying and ensuring they understand and retain critical subject content.

KEY TAKEAWAYS:

Mr Jones can help students to develop their mental models and think more effectively about his subject by:

- > Focusing on developing pupil knowledge in order to ultimately develop pupil capabilities and understanding.
- > Developing his mental model using available resources and reflecting on what this implies in terms of the important knowledge he wants to teach.
- > Prioritising types of knowledge and identifying which is critical subject content – concepts, knowledge, skills and principles – that he wants pupils to retain, while teaching enough supporting content to give pupils access to a broad and balanced curriculum.

MENTAL MODELS

Mr Jones is using guidance from the school curriculum, colleagues and curricular resources to build up an increasingly sophisticated mental model of the subject. A mental model is a structured body of knowledge. It is a collection of concepts, knowledge, skills and principles which fit together to provide an overall understanding of an idea (Sweller et al., 1998). For example, most adults have a mental model of a restaurant: this means they know what to do (more-or-less) in a new restaurant or an unfamiliar country (Sweller et al., 1998). Similarly, Mr Jones has a mental model of the topics he is teaching: both the content that he is going to teach about and how to teach it in a way that links to a subject – what makes this content historical or mathematical? He knows the key ideas, the underlying principles and how they fit together. For example, he knows the key events of the English Civil War, how they are linked and different ways in which they can be interpreted.

To achieve curricular goals, he must use his subject mental model to motivate pupils to develop increasingly complex mental models of the subject. The more complex a pupil's mental model, the better they can apply it to skills such as answering questions, solving problems or learning new ideas (Willingham, 2009). For example, a pupil whose mental model did not include the word "monarch", or the concept of "Parliament" would struggle to make sense of a text describing the causes of the Civil War. In contrast, a pupil with a complex mental model would move from attempting to understand the story of the Civil War to using historical reasoning as to which cause was most significant.

THE IMPORTANCE OF KNOWLEDGE

When pupils learn, they gain – and retain – deeper and more sophisticated knowledge in their mental models. Developing pupil knowledge is important as the more pupils know (and the better organised their knowledge), the better they can understand a new idea (by connecting it to their existing knowledge) and the better they can solve problems (by applying their knowledge). Their existing knowledge reduces the burden on pupils' working memory (Deans for Impact, 2015; Willingham, 2006).

Therefore, if Mr Jones is to help pupils achieve ambitious learning goals, his priority is teaching pupils knowledge in order to also develop their skills (Willingham 2009). He should focus on what he wants his pupils to know and be able to do. For example, a wide vocabulary will help pupils understand unfamiliar texts, while knowledge of long multiplication gives pupils the capability to solve previously unseen maths problems.

To develop pupils' mental models, Mr Jones must first identify their constituent parts: exactly what he wants pupils to know. This helps him to reduce his sophisticated knowledge into comprehensible building blocks for pupils: doing so reduces the risk of overestimating pupils' knowledge and underestimating how hard they will find new ideas (Wiliam, 2013). If he wants pupils to explain the causes of the Civil War, he can identify what he wants them to know about each cause, for example: "to know that King Charles I believed he ruled by Divine Right." If he wants pupils to complete long multiplication, he can identify that he wants them to know that a number can be partitioned into tens and hundreds.

PRIORITISING SUBJECT CONTENT

Having identified everything he wants pupils to know about a topic, Mr Jones is left with a problem: there is a huge amount of relevant and interesting knowledge. He can address this by identifying the essential concepts, knowledge, skills and principles – the 'critical' subject content that pupils need to remember in order to have a complete mental model (Counsell, 2018; Sweller et al., 1998). Critical content is what he hopes pupils will recall in one, three, or perhaps even ten years: Iago's jealousy, the causes of the English Civil War and how to design an experiment.

Mr Jones could also identify how he wants his pupils to organise what they remember. For example, concepts are organising ideas that allow us to categorise knowledge (Chi, 2009). Critical concepts, then, are important subject ideas Mr Jones will want to return to many times to help pupils develop organised mental models of his subject. Therefore, he can introduce the idea of the tragic form in English literature and teach Othello as an example of this. In science, he could teach the scientific method in biology, chemistry and physics and use experiments as examples of these. This content also will influence how he sequences what he teaches. He can plan how a new idea can be linked to previous and future learning (Wiliam, 2013) by asking: which content is foundational and why? Where relevant, he might also identify subject principles (Chi, 2009). Subject principles are rules or theorems that serve to apply across a whole field. They can be used to transcend specific examples. For example, in physics he might teach the Law of Conservation of Energy or Newton's Second Law ($F=MA$) and highlight when these principles are returned to, to help pupils organise their mental models. In an Early Years setting, teachers might return to the principle of synthetic phonics at different times as they teach reading.

The National Curriculum also calls for a 'broad and balanced curriculum'. So, in addition to 'critical' content, Mr Jones should select 'supporting' content: further examples, stories and illustrations that he won't necessarily expect his pupils to remember, but which will bring his teaching to life and support pupils to remember and understand the critical content. It is particularly effective if these examples explicitly link to pupils' knowledge and experiences. This supporting content helps pupils make sense of critical content: Othello wouldn't make sense without all its characters; getting the equipment wrong means an experiment will not work. So, while Mr Jones is teaching these topics, he wants pupils to know, understand and recall supporting content as well as the critical content. However, after teaching the topic, he will accept that he does not need to revisit supporting content (since not every item of information can be recalled and his time is limited); but he will want to ensure critical content is revisited to strengthen it.

NUANCES AND CAVEATS

Developing pupils' knowledge does not just mean teaching isolated facts: mental models are organised collections of concepts, knowledge, skills and principles.

While it is important that supporting content brings critical content to life and makes it meaningful, teachers need to be careful that it does not distract from pupils remembering critical content.

CHECK

Answer the questions below to check your understanding of the evidence summary. Answers are available at the bottom of the 'Reflect' section.

1. What impact does a teacher's mental model have on their ability to break down a topic for pupils?

a.) Teachers with developed mental models of the topic can easily overestimate pupils' knowledge unless they break it down.

b.) Teachers with limited mental models of the topic find it easy to break down a topic because they are coming at it from the same perspective as pupils.

c.) Teachers with developed mental models of the topic can motivate pupils by selecting and breaking down important knowledge that will help pupils to be successful.

2. Identifying exactly what pupils should learn is valuable because it...

a.) Helps the teacher to reduce their sophisticated understanding to comprehensible building blocks.

b.) Allows the teacher to focus teaching on repetition of basic facts.

c.) Helps the teacher to know what will be on their assessments.

3. What is 'critical' subject content?

a.) Content that the teacher hopes that pupils will recall in one, three, or perhaps even ten years.

b.) Knowledge which is unimportant.

c.) Knowledge which matters in understanding a topic, but less so once the topic is complete.

FURTHER READING

Deans for Impact (2015). The Science of Learning. bit.ly/ecf-dea

REFLECT

A REMINDER OF THE KEY TAKEAWAYS:

Mr Jones can help students to develop their mental models and think more effectively about his subject by:

- > Focusing on developing pupil knowledge in order to ultimately develop pupil capabilities and understanding.
- > Developing his mental model using available resources and reflecting on what this implies in terms of the important knowledge he wants to teach.
- > Prioritising types of knowledge and identifying which is critical subject content – concepts, knowledge, skills and principles – that he wants pupils to retain, while teaching enough supporting content to give pupils access to a broad and balanced curriculum.

1. What did you see in this module that you already do or have seen in other classrooms?

2. What do you feel is the gap between your current practice and what you have seen in this module?

3. Which of the 'key takeaways' do you need to focus on? Where and when might you try to apply them to your teaching?

REFERENCES

- Chi, M. T. (2009). Three types of conceptual change: Belief revision, mental model transformation, and categorical shift. *International handbook of research on conceptual change*, 89-110. Routledge.
- Counsell, C. (2018). The indirect manifestation of knowledge. The dignity of the thing [blog]. bit.ly/ecf-cou
- Deans for Impact (2015). *The Science of Learning*. bit.ly/ecf-dea
- Sweller, J., van Merriënboer, J. J., & Paas, F. G. (1998). Cognitive Architecture and Instructional Design. *Educational Psychology Review*, 10(3), 251–296.
- William, D. (2013). Principled curriculum design. *Redesigning Schooling 3*, SSAT. bit.ly/ecf-wil4
- Willingham, D.T. (2006). How knowledge helps. *American Educator*. bit.ly/ecf-wil2
- Willingham, D. T. (2009) *Why don't students like school?* San Francisco, CA: Jossey Bass.

QUIZ ANSWERS

1. a, c
2. a
3. a