'How Pupils Learn' exemplar materials

This document includes 3 examples of curriculum materials, taken from different early career framework (ECF) core induction programmes, which focus on the CCF statement 'How Pupils Learn'. The Department for Education (DfE) is making these exemplars available to support initial teacher training (ITT) providers that have been accredited to deliver ITT leading to qualified teacher status from 2024/25 as they develop their own materials.

The department recognises that the ECF core induction programmes are not ITT programmes and that the materials in this document may differ in some ways from materials designed for use in ITT courses, given the different stages the intended audiences are at in their development as a teacher. Therefore, ITT providers should not simply copy these exemplars, but should use their content and design as prompts for reflection when developing their own materials.

The 3 examples included in this document are:

1. **Ambition Institute self-study materials** – demonstrates how to summarise relevant research and exemplify through a specific teaching challenge

2. **Teach First mentor-facing materials** – demonstrates how to provide clear and specific advice to mentors, drawing on participant self-study materials

3. **UCL mentor-facing materials** – demonstrates integration of the content of participant self-study materials into specific advice for mentors

The materials have been annotated by the department (comments in the blue boxes) to identify specific features representing good practice. In addition to the department's comments, ITT providers may find it useful to note the following when reviewing the exemplars:

- the direct and explicit link between a curricular unit and the CCF

- succinct explanations of the evidence points and clear statements of what they mean for teacher practice

- suggestions regarding what kind of classroom or teaching problem/challenge the application of this point of evidence-based practice might address

- examples (or 'non-examples') of the teaching approach informed by the evidence being applied

- how the selected evidence-based point logically builds on trainees' recent learning, and logically also prepares for proximate following points

- how the evidence-based point looks when translated into teaching practice in a range of subjects, ages or contexts

- how trainees will themselves practice delivering a specified teaching sequence applying the relevant point, ideally with as few distractors as possible in the first instance, receive informed feedback from mentors, and repeat until confident

- how trainees will integrate the newly understood point, and its practice, into previously learnt evidence-based approaches

ITT providers should note that the inclusion of self-study materials in the exemplars is not an indication that this is a preferred method of delivery for ITT. Similarly, the mentor-facing materials should not be taken as an expectation that any specific model of mentoring is preferred. To this end, 2 different examples of school-based mentor-facing materials have been included to illustrate the variation in approaches.

Example 1 – Self-study materials from Ambition Institute

Week 3: instruction for memory

Duration: 40 minutes

> **DfE commentary:** As can be seen in the contents section below, this self-study activity has been carefully sequenced within the curriculum. Prior to completing this activity, participants have had key ideas explained and exemplified from practice (via a video) across a range of age groups and subjects. After completing this activity, participants will have opportunities to reflect on what they have learnt and how it might apply to their practice.

Contents

- Video
- Teaching challenge
- Reflect

Teaching challenge

Mr Alexander has a clear idea of the content that he wants his pupils to learn. However, despite 'covering' the content in lessons, he still finds that many of his pupils struggle to remember it in future lessons. What can Mr Alexander do to help his pupils remember what they have been taught?

Key idea

> **DfE commentary:** In this section, the key idea to be learnt has been explicitly identified. It relates directly to the CCF statement 2.3. *An important factor in learning is memory…*

Memory plays an important role pupil learning. Teachers need to understand this and design instruction that is sensitive to the properties and limitations of memory to support remembering.

Evidence summary

Pupils remember what they think about

Memory plays an important role in pupil learning. Pupils use the store of knowledge in their long-term memory to make sense of new ideas and to help with higher order tasks like creativity and critical thinking (Willingham, 2009). Therefore, if pupils can't remember what has been taught previously, we might say that they haven't learnt it properly and, as a result, they are also unlikely to learn related new material or succeed at tasks that require higher order thinking. Mr Alexander needs to understand the link between memory and learning and adapt his instruction to make remembering more likely.

Mr Alexander's pupils may be struggling to remember material he has 'covered' if too many new ideas have been taught too quickly, exceeding the capacity of pupil working memory (Willingham, 2009). When this happens pupils might experience 'cognitive overload'.

Attempt the tasks below:

- First try to work out in your head the sum 4 x 7.

- Now try to work out in your head the sum 14 x 273.

Both sums require the same process, but the second sum is more complicated and requires more items to be held in working memory, causing cognitive overload for most people. We learn what we have thought hard about (Coe, 2013). However, when working memory is overloaded like this, pupils are unable to think sufficiently about any of the material and are therefore unlikely to be able to remember it. Some pupils with special educational needs or disabilities may experience particular challenges linked to working memory capacity (Gathercole et al., 2006) and are therefore likely to require additional or adapted support to successfully access material (Willingham, 2009). Conversations with colleagues, families and pupils may support teachers to identify effective strategies.

Supporting pupil thinking

Mr. Alexander can support pupils to remember taught material by ensuring his instruction supports effective thinking. The capacity of pupil working memory is limited to a few items; the exact number depends on pupil prior knowledge and the items' complexity (Cowan, 2008). Mr Alexander can support pupil thinking by explicitly linking new material to what has previously been learned and ensuring small steps are used (Rosenshine, 2012). If these steps are the right size, pupils can properly process new information and integrate it into their existing mental models.

Here are two approaches to introducing new material in ways that minimise overloading pupil working memory:

- Worked examples: Showing all the steps of a process (for example long multiplication in sum two above) enables pupils to attend to one step at a time.

- Partially worked examples: For example, completing the first step of the problem for pupils helps them focus on, and think more deeply about, fewer parts of the problem (Sweller et al., 1998).

However, as pupil knowledge develops, the support which initially helped pupils can get in the way of them using their growing knowledge (Sweller et al., 1998). For example, an explanation of a diagram might help a novice but may distract a pupil who already has the knowledge to interpret the same diagram. So, Mr Alexander gradually needs to remove support as pupil expertise increases.

The I-We-You model can be a useful approach to gradually removing support (Lemov, 2015):

- 'I do': Pupils need direct input to have enough knowledge to avoid their working memory becoming overloaded.

- 'We do': Pupils complete a worked or partially worked example using this knowledge, with teacher support.

- 'You do': Only when he has checked pupils can complete examples successfully with minimal support should Mr Alexander move to independent pupil practice.

Retrieval for memory over time

> **DfE commentary:** Throughout this section, there is consideration of how the research evidence relates to and informs teachers' classroom practice. In particular, the final sentence helpfully exemplifies the research evidence by drawing out the implications for how a teacher might put it into practice.

Having supported pupils to think successfully about new material, Mr Alexander needs to help pupils remember material over time. We have known for 100 years that without revisiting learning, people forget most material covered within a few days (Ebbinghaus, 1885 in Cowan, 2008).

A powerful way Mr Alexander can support pupils to remember learning is to get them to regularly 'retrieve' material covered. Retrieval is the act of recalling information from memory and is beneficial in itself because it helps to 'cement the information to memory' and makes forgetting less likely (Pashler et al., 2007).

Retrieval is most powerful when pupils have begun to forget material, as this makes pupils think harder when retrieving, strengthening their memories. So, to be most effective, retrieval practice should be spaced out over time (Pashler et al., 2007). For example, Mr Alexander could return to material in a few days and then a few weeks to support his pupils to remember it most successfully.

Nuances and caveats

> **DfE commentary:** In this section, possible limitations of the approach are considered, along with the specific circumstances under which it may be more or less effective.

One challenge some pupils with special educational needs or disabilities may experience is limited working memory capacity (Gathercole et al., 2006). So, supporting pupil thinking may in itself support these pupils to be successful. However, pupils may have other barriers so teachers should always take care to find out about specific barriers (for example, visual impairment) and support strategies (for example, large font copy of class materials).

Individual differences may mean retrieval practice is not equally powerful for all pupils. Factors that affect the impact of retrieval practice on pupil memory include the intervals between teaching and recall, and whether feedback on pupil responses is provided (Agarwal et al., 2017).

Key takeaways

> **DfE commentary:** The key takeaways provide a summary of the main points of this resource. These relate to CCF statements 2.4, 2.6, 2.8 and 2.9.

Mr Alexander can ensure his instruction supports pupil memory by understanding that:

- pupils remember content they think hard about, and they can't think if their working memory is overloaded

- teachers can support thinking by introducing material which builds on prior knowledge, breaking it up into manageable steps and using worked and partially worked examples

- as pupil knowledge increases, support can get in the way of thinking and should be removed

- opportunities to retrieve at increasingly spaced intervals promotes remembering

Further reading

> **DfE commentary:** The reference list includes all of the sources cited above. These sources include references listed in the CCF as well as other sources that provide additional detail and exemplification.

Pashler, H., Bain, P. M., Bottge, B. A., Graesser, A., Koedinger, K., McDaniel, M., & Metcalfe, J. (2007). Organizing Instruction and Study to Improve Student Learning. US Department of Education.

References

Agarwal, P. K., Finley, J. R., Rose, N. S., & Roediger, H. L. (2017). Benefits from retrieval practice are greater for students with lower working memory capacity. Memory, 25(6), 764–771.

Coe, R. (2013). Improving Education: A triumph of hope over experience.

Cowan, N. (2008). What are the differences between long-term, short-term, and working memory? Progress in brain research, 169, 323-338.

Gathercole, S., Lamont, E., & Alloway, T. (2006). Working memory in the classroom. Working memory and education, 219-240.

Lemov, D. Teach Like a Champion 2.0. San Francisco, Jossey Bass. 2nd Edition.

Pashler, H., Bain, P. M., Bottge, B. A., Graesser, A., Koedinger, K., McDaniel, M., & Metcalfe, J. (2007). Organizing Instruction and Study to Improve Student Learning. US Department of Education.

Rosenshine, B. (2012). Principles of Instruction: Research-based strategies that all teachers should know. American Educator, 36(1), 12–20.

Sweller, J., van Merrienboer, J. J. G., & Paas, F. G. W. C. (1998). Cognitive Architecture and Instructional Design. Educational Psychology Review, 10(3), 251–296.

Willingham, D. T. (2009). Why don't students like school? San Francisco: Jossey Bass.

Example 2 – Mentor-facing materials from Teach First

Week 1: discussion – identifying key prior knowledge and vocabulary

Duration: 1 hour

Contents

- Teaching techniques to focus feedback on
- Key questions and talking points

Teaching techniques to focus feedback on

Interaction:

Discussion

Outcome:

> **DfE commentary:** This section explicitly identifies the key idea to be learnt, which relates directly to the CCF 'Learn how to' statement *Avoid overloading the working memory by receiving clear, consistent and effective mentoring in how to take into account pupils' prior knowledge when planning how much new information to introduce.*

To have practised identifying the prior knowledge and vocabulary pupils will need in order to access the lesson.

Stimulus

> **DfE commentary:** As shown in the following paragraph, this mentor-led activity has been carefully sequenced within the curriculum and mentors are given access to the content that mentees have previously studied. This supports the integration of all aspects of the training programme, and the application of learning to practice.

In the online study, your teacher was introduced to a model of the mind and taught the role the working memory and long-term memory play in the process of learning. They were also asked to consider a new idea or concept that they have taught that the pupils struggled to access. They were asked to think about what prior knowledge and/or vocabulary they assumed the pupils had and how this might have impacted pupils learning.

Praise, probe and set precise actions

DfE commentary: The material reminds mentors to take the mentee's individual development needs into account when setting and agreeing specific goals.

The following practice should be focused around the outcomes of the probe and precise actions, so that it is specific to your teacher's developmental needs. However, below are some practise ideas based on the online study content to support you if needed.

Plan and practice ideas

DfE commentary: In this section, an activity has been suggested that will give the mentee an opportunity to receive very clear and specific advice and mentoring. The activity provides an opportunity for the participant to practice applying the general principle to their specific context (for example, age range or subject).

With your teacher, look at a lesson that will soon be taught and practise identifying prior knowledge and vocabulary that pupils will need in order to access the lesson. You may want to link this to the points discussed by Lee Donaghy in the online study materials.

Key questions and talking points

DfE commentary: This section provides some key questions to focus the discussion. These allow the mentor to assess and develop the mentee's understanding of the principles and related effective practice.

1. What is the role of the working and long-term memory in the process of learning?

2. What existing knowledge and vocabulary do pupils need to have in order to be able to access and understand the new idea or concept?

3. What are the key ideas and concepts you want your pupils to learn?

4. How could you link these key ideas and concepts to their prior knowledge?

DfE commentary: Note that it is important to consider how the mentor will provide opportunities for the mentee to repeat, receive feedback and improve. It would also be useful for the material to set out how the participant will integrate the new point, and its practice, into previously learnt evidence-based approaches.

Example 3 – Mentor-facing materials from UCL

Week 2: prior knowledge, memory and misconceptions

Duration: 50 minutes

> **DfE commentary:** The contents section shows how this mentor-facing materials has been carefully sequenced. Learning intentions are identified, followed by information on the topic and then guidance on the weekly mentor meeting. The mentor can draw on this information to support the mentee to develop their understanding and apply it to their practice.

Contents

- Learning intentions
- Topic introduction
- Meeting activities

Learning intentions

> **DfE commentary:** Learning intentions are clearly identified and relate to a number of CCF 'Learn how to' statements on 'How Pupils Learn'.

Your ECT will learn how to:

Build on pupils' prior knowledge by:

- identifying possible misconceptions and planning how to prevent these forming.

- linking what pupils already know to what is being taught (for example, explaining how new content builds on what is already known).

- sequencing lessons so that pupils secure foundational knowledge before encountering more complex content.

- encouraging pupils to share emerging understanding and points of confusion so that misconceptions can be addressed.

Deliver a carefully sequenced and coherent curriculum by:

- being aware of common misconceptions and discussing with experienced colleagues how to help pupils master important concepts.

Avoid overloading working memory by:

- taking into account pupils' prior knowledge when planning how much new information to introduce.

- breaking complex material into smaller steps (for example, using partially completed examples to focus pupils on the specific steps).

- reducing distractions that take attention away from what is being taught (for example, keeping the complexity of a task to a minimum so that attention is focused on the content).

Topic introduction

DfE commentary: Mentors are given information about the content their mentees have already accessed (in this case self-study materials). This supports the integration of all aspects of the training programme and the application of learning to practice.

In their self-directed training session earlier this week, your mentee began to examine the ways in which learning rests on the interplay between new information and prior knowledge, with working memory acting as a sort of 'conscious mental workspace' within which this interplay occurs, and long-term memory providing stores for prior knowledge of ideas and how to do things. They considered the relationship between long-term and working memory, using an illustrative exercise to examine how activation of prior knowledge from long-term memory can reduce the load on working memory load, which has limited capacity. They also noted that where prior knowledge is weak, it can lead to errors in their immediate activity and the learning that results from this. They applied insights from this session to examples from their own past experience with pupils and to a lesson plan for use in their teaching in the forthcoming week.

DfE commentary: Below, the specific 'Learn that' statements that mentees have studied are shared with mentors. Mentors can then build on these to ensure that there is cohesion between provider-led training and on-placement experiences. This supports the integration of 'Learn that' and 'Learn how to' statements.

The learning outcomes from their self-directed study were to learn that:

2.1 Learning involves a lasting change in pupils' capabilities or understanding.

2.2 Prior knowledge plays an important role in how pupils learn; committing some key facts to their long-term memory is likely to help pupils learn more complex ideas.

2.3 An important factor in learning is memory, which can be thought of as comprising two elements: working memory and long-term memory.

2.4 Working memory is where information that is being actively processed is held, but its capacity is limited, and it can be overloaded.

2.5 Long-term memory can be considered as a store of knowledge that changes as pupils learn by integrating new ideas with existing knowledge.

2.6 Where prior knowledge is weak, pupils are more likely to develop misconceptions, particularly if new ideas are introduced too quickly.

3.4 Anticipating common misconceptions within particular subjects is also an important aspect of curricular knowledge; working closely with colleagues to develop an understanding of likely misconceptions is valuable.

3.5 Explicitly teaching pupils the knowledge and skills they need to succeed within particular subject areas is beneficial.

> **DfE commentary:** The remainder of this section provides the mentor with very specific information that identifies the exact focus of the interactions with the mentee. This includes the relevant CCF 'Learn how to' statements.

In this session, you will help your mentee build on this previous activity, focusing for the most part on its practical implications. It is crucial for your mentee to become alert to potential misconceptions (2d, 3e), take into account pupils' prior knowledge when planning how much new information to introduce (2a) and consider the best means of linking this new information to what they already know (2e). It is equally crucial that they appreciate how to sequence lessons and plan activities to build a firm foundation of effective understanding that will provide the basis for organised growth of increasingly complex stores of knowledge within long-term memory (2b, 2c, 2f). You will help them consider ways of identifying 'in conflict' misconceptions (2g) and discuss how to sequence lesson content to provide a more secure base for future learning. You will also assist them in developing activities and approaches to be tried in the classroom, starting with their planned activity for promoting working memory/long-term memory exchange to reduce working memory load.

Key goals include helping them to a) recognise the extent of their pupils' prior knowledge and how (and how much) new material should be introduced and b) plan for creating a foundation of facts in long-term memory to reduce load on working memory when introducing new concepts.

Meeting activities

> **DfE commentary:** As in example 2, this material reminds mentors to take their mentee's individual development needs into account when setting and agreeing specific goals.

Throughout the session, try to refer explicitly to the Learning Intentions and encourage your mentee to record key points in their Learning Log. Tailor your use of the Theory to Practice activities below in response to the Review and Plan section of this session.

Review and Plan 5 mins

Clarify the Learning Intentions for this session with your mentee.

At the start of this module, you looked at all of the 'learn how to' statements for Standards 2 and 3 and conducted a module audit with your mentee: in some areas, they will already be confident and skilled; in others, they will want more practise and support from you and others. Look back at this audit now and use it to help decide how you and your mentee will make the most productive use of the suggested Theory to Practice activities below.

Theory to Practice 40 mins

1. Collaborative planning

> **DfE commentary:** The material suggests a specific activity to provide an opportunity for mentees to practise, receive feedback and improve particular aspects of their practice. Questions are suggested to support the mentor in probing the mentee's understanding and application of key principles.

Jointly work through your mentee's lesson plan from their last self-directed session incorporating working memory/long-term memory exchange. They had Hasan's Year 9 English lesson to work from as a model. Work together to explore how this might be refined in order to avoid cognitive overload to working memory and maximise learning.

To support this exploration of their lesson you might like to ask:

- Do you think your pupils, or some of them, might find this too hard?

- If so, could it be because their working memory is overloaded – you are asking them to handle too many 'bits' of knowledge at once?

- Have you done enough to help your pupils to retrieve knowledge from their long-term memories?

2. Discuss with mentor

Briefly discuss with your mentee their ideas about:

- how to identify when prior knowledge is weak and pupils have misconceptions

- what strategies might be effective for their class(es) in anticipating and dealing with these misconceptions

Focusing specifically on an instance of misconception that your mentee has encountered, jointly work through their ideas and how these might be refined in order to minimise the occurrence of this.

To support this discussion, you could refer to the research and practice summary in this week's ECT materials, and use perhaps two of these prompts:

- consider how they might discover the likely extent of this misconception, both across their class as a whole and among different pupils (for example, do a quick quiz of their previous learning, get pupils to rehearse 'everything they remember', give a quick recap of what they ought to have learned and follow up with one or two multiple-choice questions, 'correct the teacher' – deliberately quote the likely misconception and challenge the class to point out the mistake)

- draw out implications of this discussion for what – and how – new material might be introduced

- building on their understanding of the role of memory in learning, map out a strategy for addressing misconceptions that could be used within their classroom, including providing appropriate external support and thinking about what form this should take

- draw up a list of specific ways in which lesson content might be sequenced to prevent misconceptions from occurring in the first place by sharing and reflecting on examples from your own or another teacher's planning and activity

Ask your mentee to identify three other specific opportunities in which they will apply the insights they have gained. How could they make this a routine part of their teaching?

Next Steps 5 mins

> **DfE commentary:** This final section considers how the mentor will provide opportunities for their mentee to practise the specific skill within their teaching, including practising it in isolation in order to achieve automaticity and secure it in the long-term memory. The mentor is also prompted to consider how the trainee will receive feedback and have the opportunity to improve.

Agree with your mentee how they will now put their learning from this week's session(s) into practise in their teaching. Help your mentee to clarify:

1. the action(s) they will take and how these action(s) are expected to contribute to improving their workload and wellbeing

2. what success will 'look like' in relation to these action(s)

3. how they will evaluate their success in taking these action(s)

Note the date of your next mentor meeting, when you will check on your mentee's progress.

> **DfE commentary:** As in the previous example, it would also be helpful for the material to set out how the participant will integrate the new point, and its practice, into previously learnt evidence-based approaches.