

## TRAINING SESSION OUTLINES

### Block 2: How pupils learn – memory and cognition

#### Overview

- The ECF statements covered by the training sessions in this block are shown in the table.
- These sessions are complemented by and draw on the self-directed study materials and mentor sessions.

In these training sessions, ECTs will:

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 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
2.9 Worked examples that take pupils through each step of a new process are also likely to support pupils to learn

Learn how to
<b>Avoid overloading working memory, by:</b>
2a Taking into account pupils' prior knowledge when planning how much new information to introduce.
2b Breaking complex material into smaller steps (e.g. using partially completed examples to focus pupils on the specific steps).
2c Reducing distractions that take attention away from what is being taught (e.g. keeping the complexity of a task to a minimum, so that attention is focused on the content)

<b>Build on pupils' prior knowledge, by:</b>
2d Identifying possible misconceptions and planning how to prevent these forming
2e Linking what pupils already know to what is being taught (e.g. explaining how new content builds on what is already known)
2f Sequencing lessons so that pupils secure foundational knowledge before encountering more complex content
2g Encouraging pupils to share emerging understanding and points of confusion so that misconceptions can be addressed

## Session summary

The training sessions for this block are:

Session	Content	Duration	ECF statements covered
2.1	Cognitive load and implications for your practice	90 minutes	2.1, 2.3, 2.4, 2.5, 2a, 2b, 2c
2.2	Prior knowledge, misconceptions and worked examples	90 minutes	2.2, 2.6, 2.9, 2d, 2e, 2f, 2g

## Training Session 2.1: Cognitive load and implications for your practice

The intended outcomes of this session are for Early Career Teachers to:

**Learn that:**

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

**Learn how to:**

**Avoid overloading working memory, by:**

- 2a Taking into account pupils' prior knowledge when planning how much new information to introduce
- 2b Breaking complex material into smaller steps (e.g. using partially completed examples to focus pupils on the specific steps)
- 2c Reducing distractions that take attention away from what is being taught (e.g. keeping the complexity of a task to a minimum, so that attention is focused on the content)

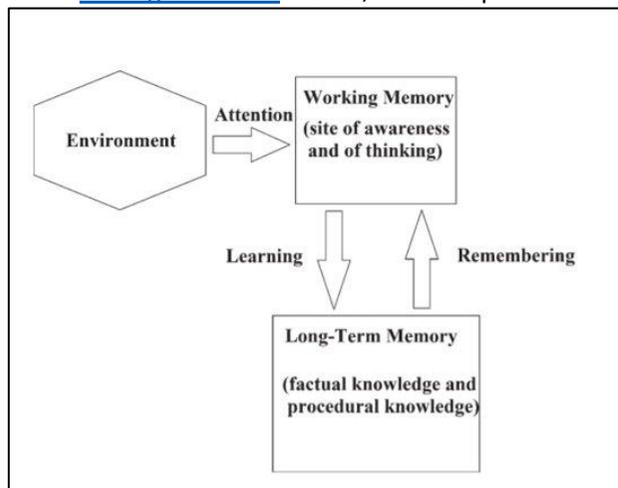
<b>Duration</b>	90 minutes
<b>Suggested pre-session activity for ECTs</b>	None
<b>To prepare for this session, trainers should:</b>	<ul style="list-style-type: none"> <li>• Read the self-directed study materials for Block 2, paying particular attention to the section on cognitive load.</li> <li>• If delivering this session remotely, trainers will want to check that they can set up breakout rooms on the webinar platform so that ECTs can take part in small group activities.</li> <li>• For further information, trainers may want to familiarise themselves with the key findings from the following:             <ul style="list-style-type: none"> <li>○ Rosenshine, B. (2012) Principles of Instruction: Research-based strategies that all teachers should know. <i>American Educator</i>, 12–20. <a href="https://doi.org/10.1111/j.1467-8535.2005.00507.x">https://doi.org/10.1111/j.1467-8535.2005.00507.x</a></li> <li>○ Sweller, J. (2016). Working Memory, Long-term Memory, and Instructional Design. <i>Journal of Applied Research in Memory and Cognition</i>, 5(4), 360–367. <a href="http://doi.org/10.1016/j.jarmac.2015.12.002">http://doi.org/10.1016/j.jarmac.2015.12.002</a></li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ Willingham, D. T. (2009) <i>Why don't students like school?</i> San Francisco, CA: JosseyBass</li> </ul> <p>Trainers should model effective practices throughout. This includes not overloading ECTs working memory by presenting too much new information in a short space of time and taking into consideration prior knowledge of participants.</p>	
Activities	ECF statements	Suggested materials
<p><b>What is cognitive load theory (5–10 minutes)</b></p> <p>Welcome ECTs to the session. Tell ECTs that the purpose of the session is to gain a greater understanding of cognitive load theory, its relationship to classroom practice and practically how you can design lessons and tasks that apply cognitive load theory to help pupils learn.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><b>Think-pair-share</b> (If this is remote, set up breakout rooms for ECTs to have discussion in)</p> <ul style="list-style-type: none"> <li>• Ask ECTs to think about what they already know about cognitive load theory (they may have already read the self-directed study materials).</li> <li>• Ask for them to tell their partner what they know.</li> <li>• Ask for a few volunteers to share. Encourage people to share if they have very little prior knowledge as this will help tailor the rest of the session.</li> </ul> </div> <p>Share with ECTs: <i>This session is an introduction to John Sweller's 'Cognitive Load Theory'. It is a theory of instructional design based upon aspects of human cognitive architecture. In particular, it draws upon Baddeley and Hitch's Working Memory Model developed in the 70s and is a widely accepted model for how the mind works.</i></p>		

### Cognitive architecture – how does the mind work? (25–30 minutes)

Tell the ECTs that in understanding how the mind works we need to consider the relationship between the working memory and the long-term memory.

Share [Willingham 2017](#) model, which explains this:



#### Explain the model

Let's focus on the environment and how the mind interacts with it.

- The environment is full of stimuli, which we can hear or see. Smells that trigger memories and problems to solve.
- We pay attention (another limited resource) to some stimuli and not others (how do we select?).
- Often we pay attention to things we have experienced before or are familiar with, sometimes it is something new or that we are curious about).

**Key learning point:** This is why assessing prior knowledge is so important in the classroom. New learning builds on prior knowledge.

2.3, 2.4, 2.5,

If you have ever had a bee or wasp in your classroom you know that attention is elsewhere and not much learning is taking place!

**Working memory (WM)** – the site of awareness/consciousness where we try and process new information. It is thought to be able to process sounds and images simultaneously. It can also access information from the long-term memory (LTM), which is seen as an infinite storehouse of factual knowledge (the what) and procedural knowledge (the how).

**Ask the question:** “Which country has won the Eurovision song contest more times than any other?” – answer Ireland.

Once the answer has been given, ask if anyone was thinking about the Eurovision song contest before the question was asked. They were probably not. But when the question was asked the information was held in the WM and the LTM was accessed. If the person knew the answer then that info is stored in the LTM (you could hazard a guess because you know some of the past winners and it is likely to be a country in Europe). This shows the interaction between the WM and LTM.

**Bring it back to learning.** Learning takes place when a change occurs in the LTM – this will mean there is a lasting change in pupils’ capabilities and understanding but new material will be processed in the WM. This is where material from the LTM and the environment combine to make new connections and deepen understanding.

The trainer might ask ECTs to share some examples of things that they have learnt and are now in their long-term memory:

- How did they know it was in their long-term memory?
- How often did they have to practise or see the knowledge before they learnt it?
- Do they remember learning and the levels of concentration that were needed?

Examples might include:

- Learning to play an instrument
- Learning to drive

- Learning a new language

They will have known it was in their long-term memory when they can easily recall the skill or knowledge. It is now just something they can do! When they were still learning they needed to process a lot more in the WM, which made them slower, or meant they made mistakes and forgot things.

### Characteristics of the WM

Share the characteristics of WM (trainers may want to present these on a slide):

- Limited capacity
- Temporary store of information
- Distraction can empty it
- Retrieves relevant information from the long-term memory (LTM)
- Able to process visual and auditory information simultaneously
- Small variations in capacity between individuals
- Younger children and older adults may have less WM.

### Activity (take the slide above off the screen)

Ask the ECTs to write down the different characteristics of WM

- Firstly on their own
- Secondly in pairs/as a group (use breakout rooms if remote).

If anyone copied them down – ask them to cover up their list! No peeking!

Return to the list of characteristics on the slide. See if they remembered them all and draw out two key things:

1. By asking them to bring to mind (recall) the information, they are more likely to remember it than if you just asked them to listen and read.
2. It is very likely that they did not remember all the characteristics. This is because the information was still in their WM and not LTM. They didn't have to use the information yet, so it hasn't started the journey to LTM.

**Discussion**

Discuss in groups of two or three: **How can you use these characteristics of WM to help plan your lessons?**

*Prompt: focus on specific features of WM... if we know that X, then what could that mean for your pupils? What might you need to do differently?*

Share some ideas as a group.

The trainer might add some such as:

- If you know pupils have limited WM capacity, don't present large chunks of information all at once.
- If you know WM is a temporary store for information, encourage pupils to write down their working out so they don't forget steps they have done.
- If you know distraction can empty it, reduce distractions like no music and a calm classroom

**A practical example of cognitive overload**

Ask the ECTs what  $13 \times 7$  is (answer 91). Ask for hands when they have the answer. Then ask how they did it. Some ECTs might say they did  $12 \times 7$  and then added 7. Some might not be able to do it under pressure.

If you were a maths teacher or primary teacher asking pupils to solve these questions, there may be too many things for some of the pupils to think about at one time. If someone finds that the task is too hard it is likely that the WM was overloaded. This just demonstrates that without prior knowledge to rely on (knowing multiplication facts by heart in this case) problem solving becomes harder and might lead to cognitive overload.

**Characteristics of LTM**

Share a slide (see below) and explain the characteristics of LTM

- LTM is seen as limitless and learning is seen as being caused by a change in the long term memory. How do we do this? By teaching!
- Knowledge and skills are thought to be stored in the LTM in memory in schemas.
- When we think about something, a schema is retrieved and brought to mind in the WM. Once it has been brought to mind the rest of the schema follows. What is interesting is that experts have a more fully formed schema than novices and this means that less of the WM is used to solve new problems because they are referencing ones they have experienced before.  
A novice has an incomplete schema and this means that learning is more effortful and they are more likely to experience cognitive overload. Learning is harder in the early stages of a topic and requires more teacher input. But as expertise increases teacher input can be reduced.

The trainer may want to present a slide with these points to describe LTM on it:

- Infinite capacity
- **Remember:** learning is a change in LTM
- Organisation of knowledge & skills into **schema**
- **Experts** have a more complex schema than a **novice**
- **Experts** – make links to prior knowledge, utilise information quickly; good at problem-solving
- **Novices** – learning is effortful, cognitive overload is more likely; implications for teaching
- **e.g.** At the beginning of a topic, learning will be more effortful, and will require more teacher input.

#### Activity

Discuss in groups of two or three: **How can you use the characteristics of LTM to help plan your lessons?**

*Prompt: focus on specific features of LTM... if we know that X, then what could that mean for your pupils? What might you need to do differently?*

Share some ideas as a group.

<p>The trainer might want to add some suggestions such as:</p> <ul style="list-style-type: none"> <li>Using strategies like retrieval practice, such as low stakes quizzing can support the formation of memories. (Forgetting is an important part of the learning process. Partially forgetting and then remembering (via something like low stakes quizzing) also strengthens the learning process).</li> </ul>		
<p><b>What is cognitive load theory? (5 minutes)</b></p> <p>Share the following two definitions:</p> <p><i>“The <b>cognitive load</b> involved in a task is the <b>cognitive effort</b> (or amount of information processing) required by a person to <b>perform</b> this task.”</i> Reif, 2010</p> <p><i>“Cognitive load theory aims to explain how the information processing load induced by learning tasks can affect students’ ability to <b>process new information</b> and to <b>construct knowledge in long-term memory</b>.”</i> Sweller, 2017</p> <p>Ask ECTs: <b>What do you understand from these quotes about what cognitive load theory is?</b></p> <p>Prompts to support their answers:</p> <ul style="list-style-type: none"> <li>Sweller’s cognitive load theory took into consideration the characteristics of WM and LTM to suggest methods of instructional design that take advantage of the cognitive architecture of the mind and can optimise learning.</li> <li>Reif talks about the cognitive effort involved in a task. WM has a limited capacity and it is all too easy for a learner to become overwhelmed.</li> </ul>		
<p><b>Introducing germane, intrinsic and extrinsic load (10 min)</b></p> <p>Sweller identified three types of cognitive load and understood that these can support the planning of lessons. These are intrinsic, extraneous and germane loads.</p> <p><b>Intrinsic load</b> – This relates to the complexity of the material itself.</p>	2.4	

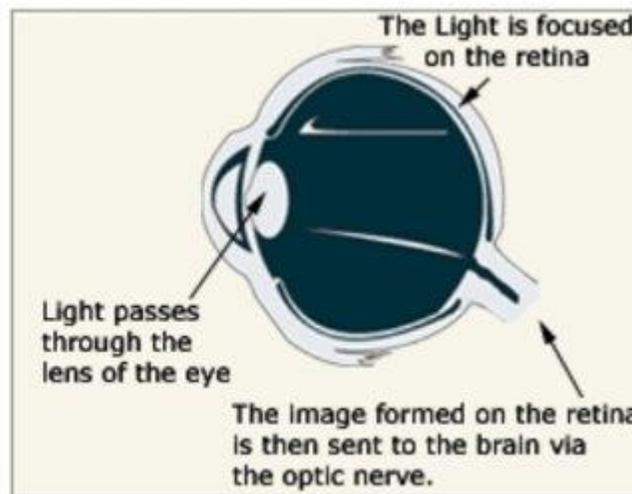
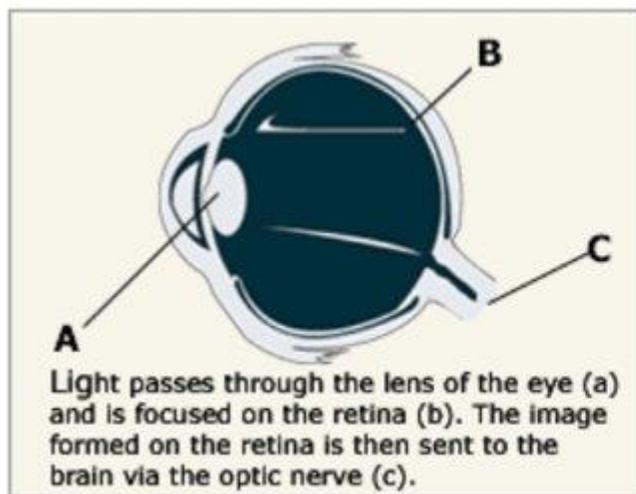
**Extraneous load** – This is the undesirable load that can hinder learning. It relates to how subject material is presented.

**Germane load** – This is the desirable load where mental resources are processing information and building new schemas.

**Example of reducing extraneous load**

**The split attention effect** (literally: learners have to split their attention between two types of material).

The trainer could use these diagrams to show this:



The first diagram presents information in a way that creates extraneous cognitive load.

The second diagram conveys the information better, making sure that information in a diagram is placed where it is needed and not elsewhere in the diagram. The second diagram reduces cognitive load because the learner doesn't have to process two pieces of information simultaneously. The labels in B mean that the information is where it is needed.

**Interesting point:** Could the second example be improved further? Suggest by adding numbers/letters to show order.

**Actually, what we have in the second diagram is an example of germane cognitive load...**

This is a difficult concept to grasp because as with all theories they develop over time and the definition of germane load has recently been tweaked because the original definition was unfalsifiable. As this is an introduction to CLT it is best to think of it as the load placed on the WM that leads to learning. The new definition of it can be accessed by clicking [here](#).

The following table might be useful:

Type of cognitive load	Source	Effect on learning
Intrinsic load	The inherent complexity of the material and the prior knowledge of the learner.	Necessary to learning (but potentially harmful if too high, because it can cause cognitive overload)
Extraneous load	Poorly designed instruction that does not facilitate schema construction and automation	Harmful because it does not contribute to learning
Germane load	Well-designed instruction that directly facilitates schema construction and automation	Helpful because it directly contributes to learning

What this all means is that the teacher needs to **manage** the intrinsic load by breaking a subject down into manageable chunks (but not too small as to make learning boring – Reif 2010) and recognise that the prior knowledge of the learners must be taken into account.

The teacher must **minimise** the extraneous load such as lengthy explanations, distracting content or multiple un-related examples.

By doing these two things the teacher is more likely to **maximise** the germane load, whereby the process of learning leads to the formation of long-term memories.

### What does this look like in the classroom (15 minutes)

Share the following which shows a set of notes from a Year 6 Religious Education lesson. In pairs, read through and consider how the teacher has made effective choices taking into account cognitive load theory:

- The sequence of learning that most enables learning
- The pedagogy that reduces the load on working memory
- How to help pupils to transfer the learning to long term memory
- How does the teacher manage intrinsic load, minimise extraneous load and maximise germane load?

#### Peer observation notes: 10th February 2020

##### Y6 Religious Education

##### Focus: The Ten Commandments

##### Big question: why do the Ten Commandments appear in both Bible and the Jewish Torah?

As I arrive, pupils are reading through what looks like a difficult text on the early Christians with the teacher. As they read, pupils put up their hands to ask you some thoughtful questions about how early Christians used sacred writings. I notice you are using terms such as “faith”, “scripture”, “sacred text”, and “worship”. I also notice that pupils are using these in their questions. You have thought about some new terms: “Early Christians” and “Sabbath” and you give examples of these in sentences.

The class then watches a two-minute film clip on the 10 Commandments and why they are in both the Bible and the Jewish Torah – again some of the terms explored in the previous activity are used in the film clip. You then remind pupils of the big question (which was also at the end of film clip) and set an activity where pupils are asked to get into pairs and together create a perfect paragraph that answers the question, using ideas from the reading and the film. Pupils settle quickly to the task – I notice they are using the film and text to help them frame their answers – but they are also looking back at relevant work from previous lessons in their exercise books as they write their answers. They are also drawing on their memory.

When I look round at their writing, I can see that they are all answering the question and their writing is using terms from the clip, for example “scriptures” and “worship”.

2a, 2b, 2c,

<p>Pupils put up their hands to ask you more about how early Christians used their sacred writings: you give some key information which they listen to carefully and then use meaningfully in their writing.</p> <p>When I ask pupils about their work, pupils answer confidently, explaining the story of Moses and linking this to stories from other faiths, looking in their books for the information. I can see they are drawing on previous learning. The pupils say that some sections are hard, but you have explained it and it's giving them lots of interesting details to include in their writing.</p> <p>When we spoke after this lesson, I asked you some questions about their planning. You explained you had analysed the film clip and then planned the sequence of lessons to make sure the pupils could answer well. You wanted to ensure that the pupils had a really firm grasp of the knowledge needed to understand the clip. You said you also make sure pupils repeatedly encounter and use their religious terms so that these are really familiar. You explained that the pupils were revisiting and referencing previous learning on the faiths they had covered in previous lessons. You also explained that this is part of a planned sequence of lessons for RE which make sure that teachers have identified the key learning which leads up to the writing activity and that pupils can identify the knowledge from earlier topics so that they can answer the question. In the medium-term plan the department identifies the most crucial things that they want people to know and that they have planned recall activities into their lessons so that these key things are not forgotten.</p> <p>Discuss:</p> <ul style="list-style-type: none"> <li>• What strategies did this teacher use?</li> <li>• How successful were they?</li> </ul>		
<p><b>Minimising extraneous load (20 minutes)</b></p> <p>Explain that the next part of the session will be looking at some high impact, low time cost strategies that can be employed in the classroom to reduce the burden on the WM to allow more processing of information.</p> <p>“Extraneous cognitive load should be minimised so that learners can allocate working memory resources (i.e. germane resources) to dealing with intrinsic cognitive load and engage in learning” <a href="#">Leppink, van Gog, Paas &amp; Sweller 2015</a></p>	2a, 2b, 2c, 2.4	

<p>When planning, the ECTs need to consider minimising extraneous load by thinking about teaching instruction to minimise the processing of unnecessary information that doesn't contribute to learning e.g. overly complex instructions or PowerPoints with too much information on them or images, words and the teacher talking at the same time. Attention is a limited resource and as stated earlier the WM is good at processing visual and auditory information but becomes overloaded if a slide is also text heavy.</p> <p><b>Share the following strategies for reducing cognitive load with ECTs:</b></p> <ol style="list-style-type: none"> <li>1. Cut out inessential information.</li> <li>2. Present essential information together.</li> <li>3. Simplify complex information by presenting it both orally and visually.</li> </ol> <p>ECTs should work in their small groups to design a slide or an activity that takes into account at least one of the strategies. If they need a topic, offer some of the following examples:</p> <ul style="list-style-type: none"> <li>• How photosynthesis works</li> <li>• The water cycle</li> <li>• Henry VIII's wives.</li> </ul>		
<p><b>Feedback and next steps (5 minutes)</b></p> <p>Ask ECTs to share their slide or activity that they designed to take into account one of the strategies.</p> <p>Ask the delegates to feedback from their reflections and share what they are going to do as a result of today's session.</p>		

## Training Session 2.2: Prior knowledge, misconceptions and worked examples

The intended outcomes of this session are for Early Career Teachers to:

**Learn that:**

- 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
- 2.6 Where prior knowledge is weak, pupils are more likely to develop misconceptions, particularly if new ideas are introduced too quickly
- 2.9 Worked examples that take pupils through each step of a new process are also likely to support pupils to learn

**Build on pupils' prior knowledge, by:**

- 2d Identifying possible misconceptions and planning how to prevent these forming
- 2e Linking what pupils already know to what is being taught (e.g. explaining how new content builds on what is already known)
- 2f Sequencing lessons so that pupils secure foundational knowledge before encountering more complex content
- 2g Encouraging pupils to share emerging understanding and points of confusion so that misconceptions can be addressed

<b>Duration</b>	90 minutes
<b>Suggested pre-session activity for ECTs</b>	None
<b>To prepare for this session, trainers should:</b>	<ul style="list-style-type: none"> <li>• Read the ECT self-directed study materials, particularly focusing on the section on worked examples and encouraging pupils to share emerging understanding and points of confusion</li> <li>• Read Mentor Handout 2.6 for this block as they may choose to model some of the activities using those activities as indicated below.</li> <li>• Read:             <ul style="list-style-type: none"> <li>○ *Rosenshine, B. (2012) Principles of Instruction: Research-based strategies that all teachers should know. <i>American Educator</i>, 12–20. <a href="https://doi.org/10.1111/j.1467-8535.2005.00507.x">https://doi.org/10.1111/j.1467-8535.2005.00507.x</a>.</li> <li>○ Wittwer, J., &amp; Renkl, A. (2010) How Effective are Instructional Explanations in Example-Based Learning? A Meta-Analytic Review. <i>Educational Psychology Review</i>, 22(4), 393–409. <a href="https://doi.org/10.1007/s10648-010-9136-5">https://doi.org/10.1007/s10648-010-9136-5</a>.</li> </ul> </li> <li>• Prepare a worked example in advance for the last activity to demonstrate what they want ECTs to do.</li> </ul>

Activities	ECF statements	Suggested materials
<p><b>Introduction to the session (15 minutes)</b></p> <p>Welcome the ECTs to this session and explain to them the main aims of the session are:</p> <ul style="list-style-type: none"> <li>• To understand the important role that prior knowledge plays in learning</li> <li>• To develop practical tools to uncover weak prior learning, and subsequent misconceptions or points of confusion that are emerging</li> <li>• To practise creating worked examples that will be useful in the classroom.</li> </ul> <p><b>Activity – Agree, Disagree or Don’t know.</b> This activity can be done in person, perhaps using the four corners structure on Handout 2.6 and below. Alternatively, the trainer could use a voting tool so ECTs can express their opinion virtually.</p> <p><b>Four corners example</b></p> <p>Tell ECTs that you will read out a set of statements and they need to choose the corner which best represents their understanding. Assign each corner as <i>Agree, Disagree, It Depends, No Idea</i>. Encourage them to form an opinion and maybe include the rule that they can only go to It Depends once – even if they don’t agree or disagree they have to argue that corner!</p> <p>The statements represent possible misconceptions teachers may have about pupils’ learning. The trainer can add their own statements but here are some to get started:</p> <ul style="list-style-type: none"> <li>• Pupils are all blank slates when they come to school.</li> <li>• There is only so much our memory can hold. When we learn new things, we will forget something else!</li> <li>• There’s nothing I can do if they always give up when the work gets hard.</li> <li>• Our brains get bigger as we get older so we can remember more things.</li> <li>• Memorising facts isn’t a good use of time when they can just look up information.</li> <li>• Pupils learn best by doing.</li> </ul> <p>After each statement, facilitate a short discussion. Ask ECTs to share why they have chosen that answer, draw out their experiences but try to steer them with some expert guidance e.g. pupils definitely do not come to school as blank slates,</p>	<p>2d, 2e, 2g, 2.6</p>	

<p>they come with a lot of prior experiences and potentially lots of misconceptions too. Make direct links to the self-directed study material that ECTs have read.</p> <p>Trainers may want to be explicit through this activity that they have drawn out any misconceptions or points of confusion that ECTs have about prior knowledge and how pupils learn.</p>		
<p><b>Committing some key facts to memory is likely to help pupils learn (15 minutes)</b></p> <p>Share the following quote from the character Thomas Gradgrind in Charles Dickens’s novel <i>Hard Times</i>:  <i>“Now, what I want is, Facts. Teach these boys and girls nothing but Facts. Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the minds of reasoning animals upon Facts: nothing else will ever be of any service to them. This is the principle on which I bring up my own children, and this is the principle on which I bring up these children. Stick to Facts, sir!”</i></p> <div style="border: 1px solid black; padding: 5px;"> <p><b>Discussion</b>            ECTs could discuss in small groups or in pairs.</p> <ul style="list-style-type: none"> <li>• What is your initial reaction to this quote?</li> <li>• To what extent do you agree with Thomas Gradgrind?</li> <li>• Are there any instances where you do want to plant facts in your pupils’ minds?</li> <li>• Why?</li> </ul> <p>Trainers may want to make the point that this is an extreme view of what a good education entails! However, there is often confusion about what is meant by <i>knowledge</i> in education and the type of rote memorisation portrayed here. As we have seen throughout this module, knowledge accumulates and builds upon itself. Subjects have foundational concepts (often ‘facts’), which act as the gateway to lots of other learning. The more we know, the more we <i>can</i> know.</p> </div> <p>Hopefully the ECTs will recognise that there are occasions where pupils having a particular set of facts stored in their long-term memory is useful. The trainer may want to expand on this to make some of the following points:</p> <ul style="list-style-type: none"> <li>• Remember that working memory is limited and can become overloaded.</li> </ul>	2.2	

- When we have information in our long-term memory (organised into schemas), it frees up working memory so having some facts in their long-term memory, which are high utilisation or form the basis of future learning is helpful.
- Having some key facts memorised in the long-term memory is also useful when introducing new content so pupils can connect the new material to existing knowledge or schema, this means they will build understanding of more complex concepts over time.

#### Activity

The trainer may want to organise ECTs into groups by phase or subject for this activity. If it is a remote session, organise breakout rooms on the webinar.

Note: ECTs may bring a list that they wrote during the self-directed study materials as the starting point for this activity.

Ask ECTs to make a list of some of the key facts or knowledge that they think would be useful for pupils in their subject or phase to have committed to long-term memory.

- Why did they choose these facts or knowledge?
- How would pupils having these in their long term memory help pupils learn more effectively?

The trainer may want to give an example e.g. times tables in long-term memory means that pupils can more easily do long multiplication or work with ratio and proportion.

### Where prior knowledge is weak, pupils are likely to develop misconceptions (15 minutes)

First check that ECTs are comfortable with the definition of misconception. Misconceptions are ‘a belief or an idea that is not based on correct information, or that is not understood by people’ (Oxford Dictionary).

They differ from mistakes in that they are conceptual misunderstandings, not just errors caused by inattention. For example, a pupil might spell a word incorrectly but they may know how to correct it when it is pointed out to them. This is a mistake. If a pupil has a false belief or assumption, such as all underwater animals must be fish, they have a misconception and would not be able to correct themselves to tell you that a whale is a mammal.

Why does this matter?

- Remind ECTs that information in our long-term memory is organised into groups called schemas.
- If our schema is weak or insecure, when we encounter new content we will forge faulty connections (or misconceptions).
- For example, if you kind of know the plot to Jane Austen’s Emma, and you watch the 1995 Hollywood movie, Clueless, which somebody tells you is based on the book Emma, you might make an assumption that Jane Austen was writing about teenage love triangles and miss the main points of the plot.

#### Activity

Paired discussion. If the trainer is doing this as a group, they could use the inside-outside circles model to facilitate as outlined below. Otherwise, just ask ECTs to partner up. If it is a remote session, the trainer can organise small breakout rooms in the webinar and move ECTs into the rooms for the paired discussion.

#### Inside-outside circle

Get ECTs to stand in two circles facing each other. They should be opposite a partner.

- Ask the inside partner to go first and share one strategy that they have used to successfully uncover pupils prior knowledge. They should explain the approach, what they did and how it worked.
- Give them around a minute to speak. Then ask their partner to share one strategy they have used.
- After a minute, ask the outside circle to step one place to the right.
- Everyone should have a new partner.
- Ask them to repeat the task but this time they should share either a second strategy of their own or if they don’t

2.6, 2d

<ul style="list-style-type: none"> <li>• have one, they should share their previous partner's strategy.</li> <li>• Repeat this a couple of times.</li> </ul> <p>After each ECT has spoken to a few different people, ask ECTs to share with the whole group a strategy they heard about that sounded like it would be successful in their classroom and that they are going to try.</p>		
<p><b>Planning a lesson (30 minutes)</b></p> <p>Tell ECTs that they are now going to work in small groups to plan a start of a lesson to introduce some new content, which must meet the criteria below. The trainer may want to keep them in subject or phase groups from earlier in the session. If working remotely, the trainer can set up breakout rooms.</p> <p>The lesson must:</p> <ul style="list-style-type: none"> <li>• Establish what prior knowledge pupils have about the topic</li> <li>• Link what pupils already know to what is being taught</li> <li>• Include a worked example</li> <li>• Begin with foundational knowledge and build up to more complex content.</li> </ul> <p>The trainer could either get ECTs to design the start of a lesson based on a topic of their choice or they could put the following topics into a hat and let them pick one out:</p> <ul style="list-style-type: none"> <li>• How to do a cartwheel</li> <li>• How to add two digit numbers together</li> <li>• How to count to 10 in Spanish/or other language</li> <li>• How to make an omelette.</li> </ul> <p>Before ECTs start the task, the trainer may want to model a worked example that meets all of the criteria below. The trainer could design their own or use the example below:</p> <p><b>Lesson aim: teach how to do a forward tumble</b></p>	2.9, 2d, 2e, 2f	Prepare a worked example in advance

<p>Starter activity:</p> <ul style="list-style-type: none"> <li>• Put the word tumble on the board</li> <li>• Think-Pair-Share: “What do you know about tumbling already? Have you seen it before?”</li> <li>• Ask: “How confident are you with doing a forward tumble?” (Take note)</li> <li>• Explain the aims of today’s session.</li> </ul> <p>Show a worked example:</p> <ul style="list-style-type: none"> <li>• Show a video I made earlier of me doing a tumble</li> <li>• As pupils watch the video, explain what I am doing</li> <li>• Write down the steps on the board.</li> </ul> <p>Put pupils in pairs (with one confident pupil in each pair who will take the role of the coach)</p> <ul style="list-style-type: none"> <li>• Pupils practise step 1 – getting into the ball shape.</li> </ul> <p>Whole class:</p> <ul style="list-style-type: none"> <li>• Watch the clip again, and discuss moving to step 2</li> <li>• Pupils now practise step 2</li> <li>• etc.</li> </ul>		
<p><b>Reviewing learning and next steps (15 minutes)</b></p> <p>If there is time, get the ECTs to demonstrate their lesson to the group.</p> <p>Ask ECTs what they will do next as a result of today’s session?</p>		