

# Cognitive Load Theory

*“The single most important thing for teachers to know”  
(Dylan William)*

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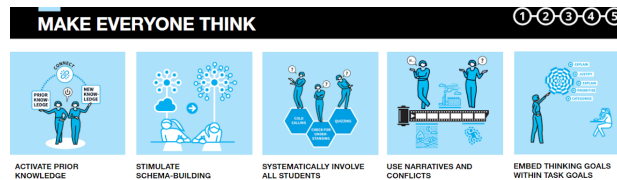
As educators, we need to design teaching strategies to maximise learning—this requires us to understand how the brain handles new information. Of great importance is the interaction between working memory and long term memory.

**Working Memory**—the site of conscious thought. Working memory can only hold a small amount of new information for a short amount of time because we ‘forget’ that information.

**Long Term Memory**—store of knowledge that is continually changing and growing as we learn new information. Knowledge remains in the long-term memory until it is needed and then it is drawn into working memory

## Key Principle – The Importance of Prior Knowledge

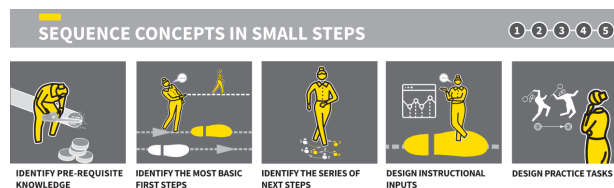
### Walkthru: Make Everybody Think



- “The most important single factor influencing learning is what the learner already knows. Ascertain this and teach them accordingly” – David Ausubel.
- **The Matthew Effect**—the more you know the more you can learn.
- **Schema Theory**—Schemas house our prior knowledge of a topic. Schema theory suggests that our mind is programmed to seek out connections. This leads to the construction of increasingly complex mental models, and as a result pupils have an increasing bank of information to draw upon. We can support this process by explicitly drawing attention to connections between new and existing knowledge.
- If we want pupils to think hard, then we need to tailor lessons according to students’ existing knowledge and skill so they can connect new ideas to what they already know

## Key Principle—Avoid Cognitive Overload

### Walkthru: Sequence Concepts in Small Steps



- **Cognitive Overload**—“the state of having one’s working memory completely filled’ (John Sweller, 1988)
- **Working memory = post-it note**—working memory is widely believed to be limited in capacity. It is designed to store information temporarily, a matter of a few seconds. Similarly, we can only recommend a small amount of information on a post-it note and it is designed to be temporary. Either we transfer the information somewhere more permanent (long term memory) or we throw it away (forget the information).
- **Limit how much new material learners receive in one go**—we should teach new information or a new skill in small steps. If we were learning a new dance, we would learn and practice each step as we go, adding more and more.
- Explicitly link period knowledge and new learning—don’t assume pupils will make connections automatically.

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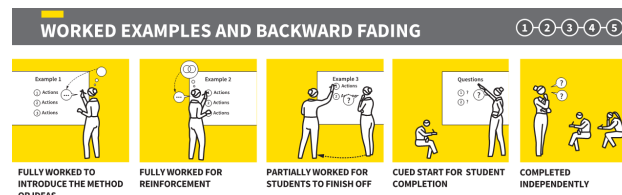
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## Key Principle – Use Worked Examples to Increase Independence

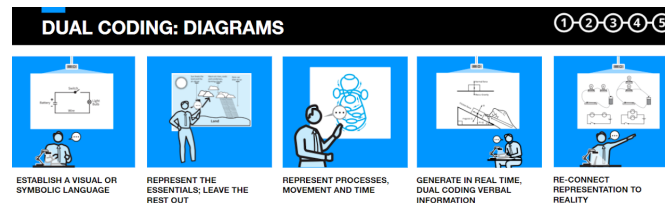
### Walkthru: Worked Examples and Backward Fading



- **Worked examples**—problems already solved for the learner, with every step fully explained and clearly demonstrated.
- **Minimise extraneous load**—cut out inessential information and only show what is absolutely necessary, to reduce the likelihood of cognitive overload.
- **Backward fading**—learners benefit from gradually being given more opportunities for independent problem-solving so that they can practise using the knowledge and skills they have learnt.
- **Expert retrieval effect**—eventually fully guided instruction, such as worked examples, becomes redundant or even counter-productive once pupils have mastered a concept.

## Key Principle—Use Visual Representations with Verbal Explanations

### Walkthru: Dual Coding



- We can process complex information more easily when it is presented in both oral and visual forms at the same time. This creates more space in working memory.
- By spreading the delivery of information across both forms, teachers can manage cognitive load and make it easier for students to learn the information.
- **Transient information effect**—using a visual representation also helps to overcome the transient information effect, which occurs when information disappears before it can be adequately processed and leads to inferior learning than more permanent sources of information. Visual representations provide a permanence.
- **Keep it simple**—another misconception is that the more information contained within the graphical representation, the better. This is not the case – the simpler the visual is the better and it should only include the information that is most important to what pupils are learning about.

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## Key Principle – Use Scaffolding

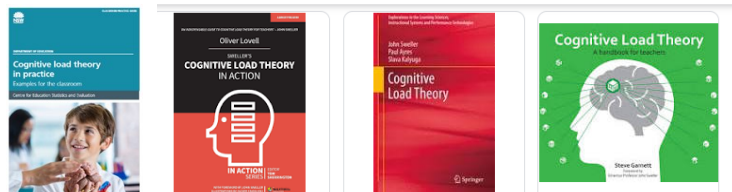
### Walkthru: Scaffolding



- **Scaffolds**—A temporary aid to support pupils' learning. It involves breaking up the learning into chunks and providing a tool, resource or structure with each chunk to help pupils experience success and achieve challenging end goals. Any scaffolds should allow pupils to concentrate their thinking on the right thing
- A key question—**does the scaffold remove the obstacle or does it replace the thinking?** They should make the work more accessible rather than easier.
- Modelling is one form of scaffolding. It may also be checklists, vocabulary banks or worked examples
- Scaffolds should be gradually removed as students experience a high rate of success

## Cognitive Load Theory – Reading and Resources

### Books



### Blogs and Articles

- [How CLT Changed My Teaching](#) (Zach Groshell)  
[Schemas Determine What we Learn](#) (Sarah Cottingham)  
[Is Everybody Thinking?](#) (Tom Sherrington)

### Podcasts and Videos

- [Podcast: What You Need to Know About Cognitive Load](#) (John Sweller)  
[Video: Cognitive Load Theory in Action](#) (Olly Lovell)  
[Video: Dual Coding to Organise Ideas](#) (Oliver Caviglioni)