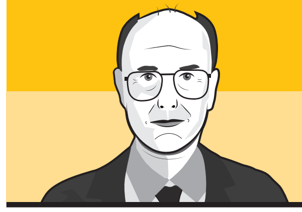
Reference: 'Cognitive Load Theory: Research That Teachers Really Need To Understand: Classroom Practice Guide'.
Centre For Education Statistics and Evaluation, 2017.



John Sweller et al.

Cognitive Load Theory

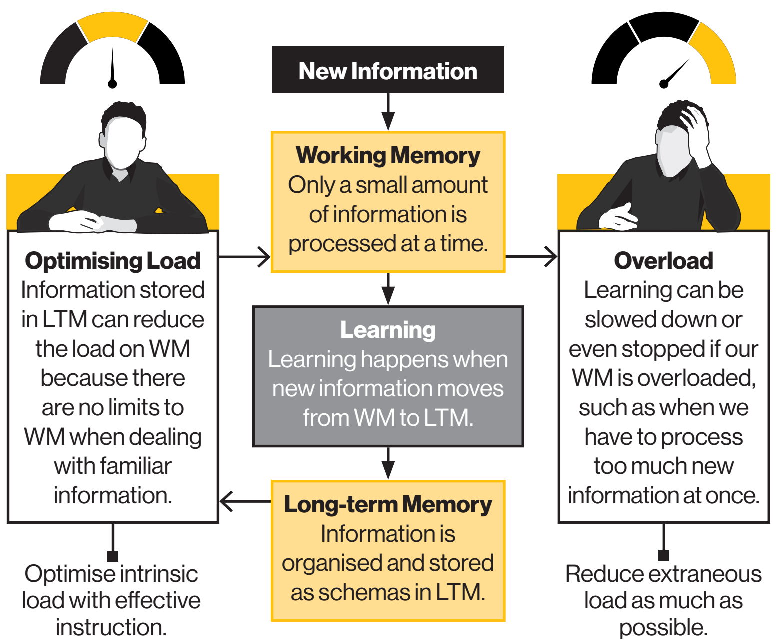
Six Strategies to Tailor Instruction for Maximum Learning

Sweller's Cognitive Load Theory

Tailoring Instruction for Maximum Learning

Cognitive Load Theory (CLT) explores how the cognitive load, or mental effort, required to process information impacts learning. To learn something new, information must first be processed in working memory (WM) before being transferred and stored in long- term memory (LTM) in the form of 'schemas'. If WM is overloaded, there is a greater risk that the content being taught will not be understood by the learner. This knowledge of the human brain is critical for teachers because it helps them to design instructional strategies that optimise the load on students' working memories to help maximise learning. CLT supports the use of explicit instruction (especially for novice learners). Research shows that direct, explicit guidance is more effective and efficient for teaching new content and skills to novices.

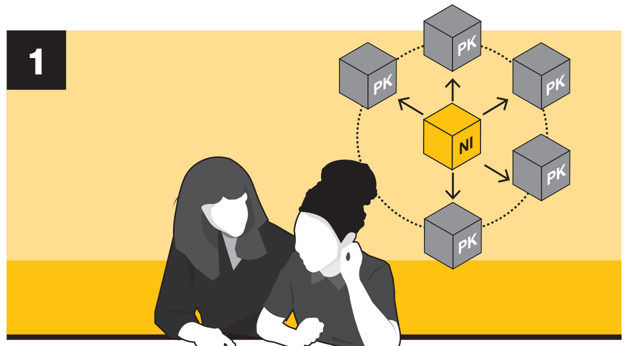
How the Human Brain Learns



The Two Types of Cognitive Load

Reduce Extraneous Load and Optimise Intrinsic Load

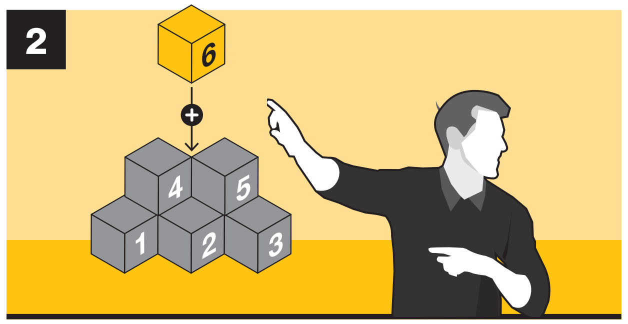
CLT identifies two main types of cognitive load: intrinsic and extraneous. Intrinsic cognitive load relates to the inherent difficulty of the subject matter being learnt. We must optimise intrinsic load by responding to and adjusting the difficulty of the learning content. Extraneous cognitive load relates to *how* the subject matter is taught. Extraneous load is the 'bad' type of cognitive load, because it does not directly contribute to learning and therefore must be reduced.



Prior Knowledge

Activate What Students Already Know

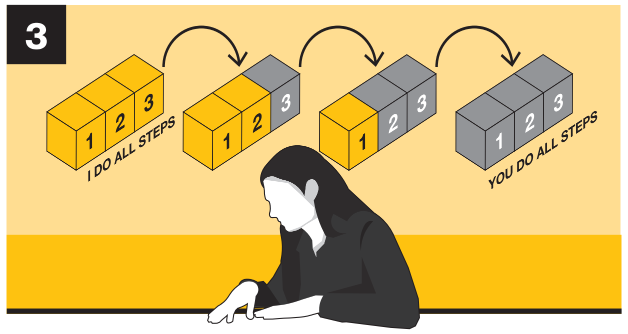
Tailoring lessons to students' existing knowledge and skills is crucial for optimal learning. This method of instruction encourages students to construct new knowledge based on their previous experiences, leading to more meaningful and lasting learning. By adjusting the complexity of tasks based on students' knowledge and abilities, you can minimise cognitive load. Strategies that help students to activate prior knowledge (PK) and relate new information (NI) to what they already know are: analogies, real-world examples, and comparing and contrasting with familiar ideas.



Worked Examples

Guide Students Step By Step With New Skills

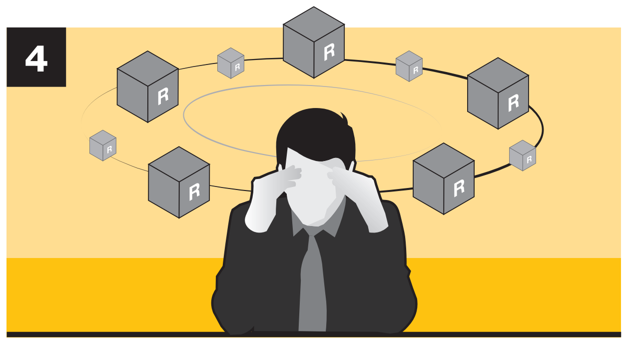
A 'worked example' is a problem that has already been solved for the student, with every step fully explained and clearly shown. Research consistently demonstrates that students who are given lots of worked examples learn new content more effectively than students who are required to solve the same problem themselves. Unguided problem-solving can overburden the WM and therefore impact the transfer of knowledge to the LTM. Worked examples are most effective when combined with the teacher thinking aloud because it enables them to externalise their thinking process when working through a problem.



Completion Tasks

Increase Independent Problem Solving

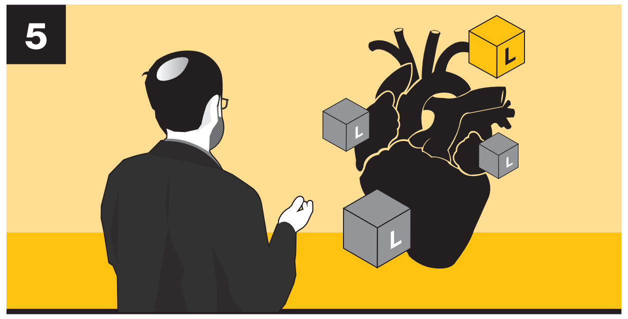
Fully guided instruction is effective for teaching new material, but as students become more skilled, it becomes counterproductive. Too much guidance can burden working memory. Independent problem-solving is more beneficial as students develop expertise. To do this effectively, monitor students' knowledge and skill levels, and adjust your teaching strategies accordingly as students gradually become more and more proficient. This might mean omitting some of the steps from a worked example (also known as completion tasks) or gradually giving the students fewer worked examples.



The 'Redundancy/Coherency Effect'

Cut out unnecessary or repeated information

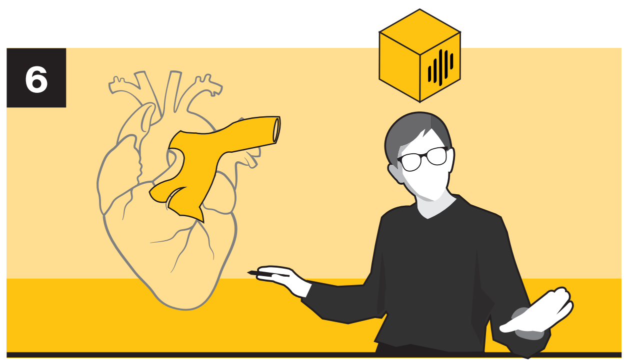
To enhance learning and reduce any unnecessary cognitive load on students' working memory, it's crucial to eliminate non-essential information. This means keeping learning materials as simple as possible and not repeating the same points in different ways. In multimedia presentations (such as PowerPoint), consider breaking down new information across slides, verbalising text instead of displaying it, and omitting non-pertinent images. Be mindful that what is critical for beginners may become superfluous for more advanced learners, and adapt content to match their growing expertise.



The 'Split Attention Effect'

Present All Essential Information Together

Cognitive overload can occur when students have to split their attention between two or more sources of information that have been presented separately, but can only be understood in reference to each other (for example a scientific diagram). Evidence suggests that this separation has negative consequences and should be eliminated wherever possible. With this in mind, teachers should design learning materials that integrate labels, incorporate written instructions next to tasks and utilise visual cues to stress key information on worksheets and other learning resources.



The 'Modality Effect'

Present Information Verbally And Visually

The 'modality effect' refers to the strategy of using both auditory and visual modes of communication to reduce cognitive load. According to dual coding theory, our WM has two channels. One for processing visual information and one for processing auditory information. The 'modality effect' leverages dual channels of working memory to increase its capacity. To do this, teachers can verbalise information instead of presenting it for students to both read *and* hear. For example, when presenting a diagram, use visual cues only (such as pointing) and then explain the labels using your voice.