

Cognitive load theory: Research that teachers really need to understand

Centre for Education Statistics and Evaluation

Background

This literature review provides an overview of cognitive load theory, which is a theory of how human brains learn and store knowledge. Dylan Wiliam has described cognitive load theory as ‘the single most important thing for teachers to know’. Grounded in a robust evidence base, cognitive load theory provides support for explicit models of instruction.

Main findings

The human brain can only process a small amount of new information at once, but it can process very large amounts of stored information.

Information is processed in the working memory, where small amounts of information are stored for a very short time. The average person can only hold about four ‘chunks’ of information in their working memory at one time.

Long-term memory is where large amounts of information are stored semi-permanently. Information is stored in the long-term memory in ‘schemas’, which provide a system for organising and storing knowledge.

If a student’s working memory is overloaded, there is a risk that they will not understand the content being taught and that their learning will be slow and/or ineffective.

With extensive practice, information can be automatically recalled from long-term memory with minimal conscious effort. This ‘automation’ reduces the burden on working memory, because when information can be accessed automatically, the working memory is freed up to learn new information.

Cognitive load theory provides support for explicit models of instruction.

Cognitive load theory is supported by a significant number of randomised controlled trials (RCTs). This large body of evidence indicates that instruction is most effective when it is designed according to the limitations of working memory.

Cognitive load theory indicates that when teaching students new content and skills, teachers are more effective when they provide explicit guidance accompanied by practice and feedback, not when they require students to discover for themselves many aspects of what they must learn.

Research from cognitive load theory has produced a number of instructional techniques that are directly transferable to the classroom.

These include the ‘worked example effect’, which is the widely replicated finding that novice learners who are given worked examples to study perform better on subsequent tests than learners who are required to solve the equivalent problems themselves.

Another finding is the ‘expertise reversal effect’, which shows that as students become more proficient at solving a particular type of problem, they should gradually be given more opportunities for independent problem solving.

More information

Read or listen to the literature review: education.nsw.gov.au/about-us/education-data-and-research/cese/publications/literature-reviews/cognitive-load-theory

CESE has recently released a professional learning course based on this literature review, which will contribute 1.5 hours of registered professional learning for teachers. Visit: education.nsw.gov.au/about-us/education-data-and-research/cese/publications/professional-learning