Cognitive Load Theory

General

Cognitive load theory was firstly introduced in 1980s by John Sweller, an Australian educational psychologist. The key aspects of this theory are the characteristics and **relations between long-term memory and working memory**, and **how load on cognitive system affects learning**. It is clear that learning will be best under conditions that are set according to human cognitive architecture which is why the principles and properties of this architecture are object of specific interest in this theory.

What is cognitive load theory?

In Sweller's theory, **learning is defined as an alternation in long-term memory**, which in humans has very large capacity. That capacity is used to store **knowledge in schematic** form, where schemas, according to Sweller represent “cognitive constructs that incorporate multiple elements of information into a single element with a specific function”. After acquiring a new schema (verbal, pictorial, spoken or written), it can be further developed by practice and finally automated (in example operation of reading).

Sweller recognizes Information processing theory by George Miller and his conclusions that **human working memory has a very limited duration and capacity of 7±2 elements** or even less if some manipulations with those elements have to be performed. He still suggests that there are evolutionary reasons for that and that smaller working memory could be even more efficient than a bigger one. The mentioned **restrictions** however **apply only to the sensory memory**. Information from long-term memory can be loaded into working memory with practically no limit.

According to the cognitive load theory, there are **three types of cognitive load**:

- **Extraneous cognitive load**, caused by **inappropriate instructional designs** that do not take into considerations mentioned limitations and architecture of human memory.
- **Intrinsic cognitive load**, caused by **complexity of the information** that needs to be processed. In example, when translating a single words cognitive load is quite small, but when translating same number of words forming part of a sentence cognitive load is higher since not only word meanings, but also their relations must be analyzed.
- **Germane cognitive load**,caused by the **learners effort to construct new schemas**.

Cognitive load types are additive. That means that reduction of extraneous cognitive load might allow increase in germane cognitive load. Also, if intrinsic cognitive load is rather low (information to learn is not complicated), it can be learned even though extraneous cognitive load is rather high (learning material is badly designed).

What is the practical meaning of cognitive load theory?

In Sweller's words, “Instructional designs that ignore working memory are likely to be random in their effectiveness.” Key concepts of Sweller's theory are human working and **long-term memory characteristics which have to be considered during instructional design** in order to **reduce extraneous cognitive load**. That will reduce cognitive load overall or enable increase in learners intrinsic cognitive load. Both ways it should enable more successful learning.

Various ways of reducing extraneous cognitive load suggested so far are split-attention, modality, redundancy and expertise-reversal effects principles explained in the cognitive theory of multimedia learning section.

Keywords and most important names

- **Cognitive load theory**, **long-term memory**, **working theory**, **information processing theory**, **schema**, **extraneous cognitive load**, **intrinsic cognitive load**, **germane cognitive load**
- John Sweller, George Miller

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Theory into practise: Cognitive Load Theory (J. Sweller)

Read more

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