Cognitive Load, as Defined by John Sweller

John Sweller's (1988) article, *Cognitive Load During Problem Solving: Effects on Learning*, introduces cognitive load theory and explores its implications for instructional design. Sweller argues that traditional problem-solving techniques, particularly means-ends analysis, place a high cognitive burden on learners, which can interfere with effective learning. The study presents evidence suggesting that alternative instructional approaches, such as worked examples, are more beneficial for knowledge acquisition because they reduce unnecessary cognitive demands.

The article highlights the limitations of conventional problem-solving methods, which require learners to continuously track differences between their current state and the goal state. This process consumes a significant amount of working memory, leaving little capacity for learners to develop long-term schemas that facilitate knowledge retention and transfer. Instead of promoting deep understanding, excessive problem-solving effort may hinder the ability to recognize patterns and apply knowledge efficiently.

Sweller supports this argument by presenting research comparing students who studied worked examples with those who engaged in unguided problem-solving. The findings show that students who learned through worked examples performed better on subsequent problem-solving tasks. By providing a structured approach to problem-solving, worked examples reduce extraneous cognitive load and allow learners to focus on fundamental principles rather than struggling with procedural complexities.

A key distinction introduced in the article is between intrinsic and extraneous cognitive load. Intrinsic cognitive load is tied to the inherent complexity of the material and cannot be easily altered. However, extraneous cognitive load is influenced by instructional design and can be minimized to improve learning efficiency. Sweller suggests that instructional materials should be structured to optimize cognitive load by emphasizing schema construction while reducing unnecessary problem-solving demands.

These findings have significant implications for educational practice. Sweller challenges the assumption that problem-solving is always beneficial for learning, particularly for novice learners who have limited prior knowledge. Instead of relying primarily on conventional problem-solving exercises, educators should incorporate worked examples and structured guidance to facilitate schema development. This shift in instructional design has influenced contemporary educational approaches, including problem-based learning strategies that carefully manage cognitive load.

In summary, Sweller's study underscores the importance of cognitive load considerations in instructional design. The research suggests that while problem-solving is an essential skill, excessive cognitive load can hinder learning. By demonstrating the

advantages of worked examples, Sweller provides a foundation for instructional strategies that enhance learning efficiency and promote deeper conceptual understanding.

Reference

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4