COGNITIVE LOAD THEORY

Written by John SWELLER, Paul AYRES, and Slava KALYUGA,
(Springer, New York, 2011, 274 pp., ISBN: 978-1-4419-8125-7)

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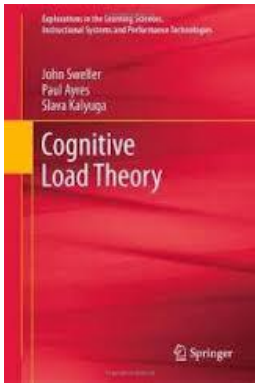

Cognitive load theory **(2011) by John Sweller, Paul Ayres, and Slava Kalyuga presents the state-of-the art form of cognitive load theory (CLT) including instructional guidelines produced by the theory so far. The book achieves this in a precise, detailed and well-organized manner thereby being very informative from the very beginning to the very end. For instance, even the preface provides an ample amount of information about CLT after stating the main premise of this theory: "Without knowledge of human cognitive processes, instructional design is blind." (p. v). As stated in the book, CLT is that sort of a theory that informs instructional design from a cognitive perspective or on the basis of how human cognition works.**

Consequently and unsurprisingly, first part of the book, "Preliminaries to Cognitive Load Theory" (p. 1), consists of chapter 1 that focuses on the concept of knowledge from an evolutionary perspective. Specifically, it discusses biologically primary and biologically secondary knowledge as well as instructional implications of this distinction. Starting with chapter 2, the second part presents how human cognitive architecture and biological evolution work from three perspectives:

- **"Amassing information" (p. 17);**
- **"Acquiring information" (p. 27); and**
- **"Interacting with the external environment" (p. 39).**

This part also establishes possible analogies between human cognition and biological evolution both of which are stated to be natural information processing systems in the book.

Types of cognitive load and how to measure it are provided in part 3. In line with what Sweller (2010) and Kalyuga (2011) suggested, chapter 5 identifies two additive cognitive load categories:

- **Intrinsic; and**
- **Extraneous.**

It seems that this way, the theory can explain the ups and downs observable in the total amount of cognitive load. Moreover, the authors argued that germane load can be a misguiding expression since it already refers to working memory resources allocated to deal with intrinsic load. They further stated that it is better to use germane load in the sense that it refers to cognitive resources used for "information that is relevant or germane to learning." (p. 57). These interestingly raise the question of whether germane load might also relate to extraneous load since self-management of extraneous load or the ways in which learners try to overcome it can foster learning. Alternatively, does any possible amount of load created by any mental or physical attempts (please see Roodenrys, Agostinho, Roodenrys, & Chandler, 2012, for self-management of split attention) to deal with extraneous cognitive load belong to extraneous load category already? Finally, given the possible strategies to use (e.g., underlining, highlighting), it seems to be equally noteworthy to question whether or to what extent dealing with extraneous load can be independent of dealing with intrinsic load.

As for chapter 6, it provides insights into different ways of measuring cognitive load. Specifically, it should be noted that even though the authors seemed to agree with van Gog and Paas (2008) in that instructional efficiency informed by the mental effort invested in the learning phase differs from the efficiency calculated based on the mental effort spent on the test, they voted for both.

In other words, according to the authors, determining instructional efficiency based on both the learning process and learning outcomes may produce valuable instructional design insights. Very recently, Van Gog, Kirschner, Kester, and Paas (2012) suggested that both timing and frequency of cognitive load ratings matter, and that it seems to be better to measure cognitive load repeatedly in a series of tasks or tasks of longer durations.

Part 4 of the book is devoted to instructional guidelines or effects that emanate from CLT along with specific references to empirical evidence put forward so far. This seems to be the basic strength of the book: Providing an evidence-based presentation of the content. However, in terms of encouraging future research, it would have been more effective to refer more to some key limitations and/or delimitations as well as common points of previous research.

Additionally, this part covers how to manipulate element interactivity and intrinsic load of learning materials, and presents two emerging effects: the transient information effect and the collective working memory effect. According to the authors, both of these effects warrant further research and can shed more light on our understanding of learning.

The book concludes with a closing part 5 that includes a final chapter entitled "Cognitive Load Theory in Perspective" (p. 237). Even though this is a relatively shorter chapter, it is not that much different from others in terms of intensity or richness of information provided.

It summarizes the topics covered in the book earlier by mainly focusing on how CLT differs from other instructional theories. It also highlights the basic strength of CLT: previously conducted randomized controlled experiments and encouragement for such research in the future.

Moreover, the authors strongly argued for scientific experiments that manipulates one variable at a time. Even though the merits of such an approach are clear, altering more than one independent variable in a well-controlled experiment that has an enough number of participants may provide valuable insights into possible interaction effects.

Overall, Sweller, Ayres, and Kalyuga (2011) present CLT thoroughly. The book has a persuasive and strong voice behind its arguments basically due to empirical evidence provided and reasonableness of the theoretical assumptions. The logical structure or order of the parts and chapters of the book also contributes to this. As a result, this book is very good at providing deep insights into CLT and into further research that would be informed by CLT itself, by other theories, or by possible combinations of these in a variety of fields including distance education.

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