UNIVERSITY
OF WOLLONGONG
AUSTRALIA

KEYNOTE ABSTRACT

**Shaping the Future of CLT: A Retrospective and Prospective Look at Theory and Data**

John Sweller[a] and Fred Paas[b c]

[a]School of Education, University of New South Wales, Sydney, Australia

[b]Department of Psychology, Education, and Child Studies, Erasmus University Rotterdam, Rotterdam, The Netherlands

[c]Early Start Research Institute, University of Wollongong, Wollongong, Australia

Scientific theories are attempts to impose order and meaning on what would otherwise appear to be random data. As evidence accumulates, all theories must evolve to accommodate new findings or die if they cannot be altered. In that sense, there is no such thing as a valid theory. Instead, each theory is an approximation that must be altered to adapt to new findings and so provide a closer approximation to the data. Cognitive load theory provides an exemplar of the process. The theory has survived due to constant modification over the last several decades. We believe a major modification is in the process of occurring now. The theory was initially designed to explain why problem solving might interfere with learning by assuming that problem solving consumed working memory resources at a level that prevented learning from occurring. The theory then was modified to assume that problem solving skill depended entirely on the acquisition of knowledge held in long-term memory and that long-term memory altered the capacity of working memory. That modification was critical because it opened up the theory as a more general theory of learning rather than just a theory of problem solving. Implicitly, as a learning theory, it was further assumed that the contents of long-term memory constituted the most important factor that could modify working-memory. That assumption may be in the process of being overturned. While it is clear that long-term memory is by far the most important modifiable factor in determining the capacity of working memory, it may not be the only factor. There now is evidence for working memory resource depletion caused by cognitive effort. It appears possible that working memory capacity may decrease during cognitive effort with that depletion reversed by rest. If so, those processes may have implications for instruction, opening up the possibility of discovering new cognitive load effects and providing cognitive load theory explanations for old effects that previously have appeared not to be amenable to incorporation within the theory. In this talk we will provide very preliminary theory and data in support of adding to cognitive load theory the assumptions of working memory depletion after cognitive effort and recovery after rest.

**John Sweller Biography**

BA (Hons Psychology), 1969, University of Adelaide
PhD (Psychology) 1972, University of Adelaide

Lecturer in Education, Tasmanian College of Advanced Education, 1973
Lecturer in Education, University of New South Wales, 1974-1978
Senior Lecturer in Education, University of New South Wales, 1979-1989
Associate Professor of Education, University of New South Wales, 1990-1991
Professor of Education, University of New South Wales, 1992-2005
Emeritus Professor of Education, University of New South Wales, 2006-

My research is associated with cognitive load theory, an instructional theory based on our knowledge of human cognitive architecture. I initiated work on the theory in the early 1980's. Subsequently, "ownership" of the theory shifted to my research group at UNSW and then to a large group of international researchers. The theory is now a contributor to both research and debate on issues associated with human cognitive architecture, its links to evolution by natural selection, and the instructional design consequences that follow. It is one of the few theories to have generated a large range of novel instructional designs from our knowledge of human cognitive architecture.

**Fred Paas Biography**

Fred Paas is professor of educational psychology at Erasmus University Rotterdam in the Netherlands, and professorial fellow at the University of Wollongong. He holds a MSc (1988) in human movement science and a PhD (1993) in instructional technology. Since 1990 he has been using the theoretical framework of cognitive load theory to investigate the instructional control of cognitive load in the training of complex cognitive tasks. In 2016 he was recognized as the world's most productive author in the five best journals in the field of educational psychology for the period 2009-2014. His publications have generated more than 26.000 citations. He is editor-in-chief of the journal *Educational Psychology Review*, and on the editorial board of several other renowned journals, such as the *Journal of Educational Psychology*. He is a fellow of the American Educational Research Association.