

A Cognitive Approach to Instructional Design for Multimedia Learning

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Abstract

Aimed at both newcomers to online learning as well as experienced multimedia developers, this paper addresses the issue of how to avoid unproductive multimedia instructional practices and employ more effective cognitive strategies. Baddeley's model of working memory and Paivio's dual coding theory suggest that humans process information through dual channels, one auditory and the other visual. This, combined with Sweller's Theory of Cognitive Load and Anderson's ACT-R cognitive architecture, provides a convincing argument for how humans learn, which leads to the question of how multimedia instruction can be designed to maximize learning. Cognitive theory and frameworks like Mayer's Cognitive Theory of Multimedia Learning provide empirical guidelines that may help us to design multimedia instruction more effectively. Mayer argues that the best way to present multimedia instruction is through visual graphics and informal voice narration, which takes advantage of both verbal and visual working memories without overloading one or the other.

Keywords: working memory, multimedia, cognitive load, act-r, production system, dual coding.

Introduction

Cognitive theory is borne from the relatively new interdisciplinary field of cognitive science. Cognitive science studies the nature of the mind by drawing from research in a number of areas including psychology, neuroscience, artificial intelligence, computer science, linguistics, philosophy, and biology. The term **cognitive** refers to perceiving and knowing, and cognitive scientists seek to understand mental processes such as perceiving, thinking, remembering, understanding language, and learning (Stillings, Weisler, Chase, Feinstein, Garfield, & Risland, 1995). As such, cognitive science can provide powerful insight into human nature, and, more importantly, the potential of humans to develop increasingly powerful information technologies.

This paper addresses the problem that much of what we are currently seeing in multimedia in-

struction may actually hinder the learning that it claims to promote and then discusses possible ways to improve it. I introduce several well-known assumptions of cognitive science, which provide a framework for applying empirical theories of cognition and learning that improve multimedia instruction and assist humans in learning more effectively. The cognitive theories discussed in the paper

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