Chapter 63
Leveraging the Design and Development of Multimedia Presentations for Learners

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ABSTRACT

The chapter addresses how multimedia presentations can be designed effectively for learners. Based on the literature, it defines the related terms and discusses the role of human factors during the design and development process of multimedia. Then, it discusses strategies, such as providing learner control and using visual cueing, to design effective multimedia presentations. In addition, various technologies in creating multimedia-based instruction are described. Finally, the chapter discusses evaluation frameworks, as well as the implications for integrating multimedia into educational practices.

INTRODUCTION

We know the old saying that "A picture is worth a thousand words". And many times we assume that learning from the combination of words and pictures should be better than learning from words alone. That may be the major reason that we have illustrations in the printed textbooks, we have a job aid with static screenshots and text labels to show you how to install a piece of software, or we have a narrated video to get you started for a brand new laptop with a new operating system. Sometimes however, as a teacher, an instructional designer or a developer, you may rely solely on your experience and intuition

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to design and develop a multimedia presentation without evidence-based guidance. Your target audience may still find the instruction difficult to understand even with the combination of words and pictures. In this chapter, we will define multimedia related concepts and discuss human factors and strategies for effective multimedia design and development in the hope of inspiring both research and practice. To guide educational practices, we will also identify technologies for multimedia design and development, provide evaluation frameworks for effective multimedia products, and discuss implications for integrating multimedia into practices.

Defining Multimedia Presentations as Levers for Learning

In computer-based learning environments such as online learning systems, intelligent tutoring systems, or virtual worlds, information may be presented to learners in a variety of forms, such as on-screen texts, music, narrations, illustrations, diagrams, animations, and videos. The combination of all or some of these media is considered as multimedia. Mayer (2005a) adopted a presentation mode view to define multimedia—"presenting material in verbal and pictorial form" (p. 2). From this broad perspective, multimedia are not limited to computer-based environments. Texts and visualizations in printing format can also be considered as media. Also, a learner is learning from multimedia if the printed texts and visualizations are presented with other technology-based media (e.g., computer-based animations and narrations). As technology advances, multiple forms of information presented on mobile devices may also be categorized as multimedia. For instance, by tapping on the screen of your mobile phone, you learn about how to conduct a knee surgery from the application *Virtual Knee Surgery* that includes audios, visuals and on-screen texts (see: http://www.edheads.org/activities/knee). This type of mobile learning is also in the form of multimedia. In sum, the term *multimedia* in this chapter refers to multiple forms of information presented on a wide range of platforms and these platforms are mostly technology-based.

Multimedia learning, particularly in research, is to describe learning in multimedia environments. It occurs when a learner constructs mental representations via multimedia in his/her working memory by integrating his/her prior knowledge and stores these representations in his/her long-term memory. The rationale for using multimedia presentations to foster learning is that presenting information in multiple formats is aligned with our humans' cognitive architecture (Mayer, 2005b).

Based on our current understanding of human's cognitive architecture, we process incoming information via two channels, one channel dealing with verbal information and the other channel dealing with visual information (Baddeley, 1986; Mayer, 2005b; Paivio, 1986). These two channels do not necessarily process information separately. Information processed in one channel can be converted to the other channel for further processing. For example, when the word "dog" is presented to a learner textually, an individual may process the information via his/her verbal channel. However, he/she can also mentally form a visualization of a dog, therefore converting verbal information to visual information and allowing the visual channel to process. It is also possible that a learner may mentally construct textual descriptions when he/she views an animation that shows the blood flow in the human cardiovascular system. Due to the limited capacity of our working memory (Miller, 1956), each channel can only process a limited amount of information. A learner may experience cognitive overload if too much information is squeezed into one channel at the initial processing stage. For instance, when both animations and on-screen texts are used to explain human cardiovascular system, all of these visual instructional messages may be initially processed through a learner's verbal channel, and his/her limited processing capacity may become a bottle neck for information processing, thus preventing him/her from understanding the