Audio Enhancement in Multimedia eLearning

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ABSTRACT

The success of computer-based multimedia instruction in providing a compelling vehicle for the execution of self-directed learning is indisputable. Over the past decade, educators have given a significant impetus to harnessing the power of computer-based learning with traditional classroom teaching. Advancements in computer technology and the popularity of multimedia approaches to eLearning have generated many instructional applications comprising dynamic visual illustrations, synchronized with on-screen text.

In recent years, there has been empirical evidence suggesting that the effectiveness of multimedia presentation as an instructional medium is influenced largely by the presentation strategies and instructional design guided by the cognitive theory behind it. According to this theory, a balanced flow of information into the working memory through both the visual and auditory channels is likely to enhance the efficiency of information processing by building and forming connections between verbal and graphical mental models.

While it may be more efficient or cost effective to present graphics and written words in a multimedia presentation, there is evidence to suggest that using on-screen text to describe a graphical illustration is likely to create a cognitive conflict. Based on the cognitive learning theory, visual and auditory/verbal information are processed in separate channels, each with a limited capacity to acquire new information at any given time. When graphics are presented along with explanatory text, both compete for the same visual channel with limited capacity. Using a verbal explanation as speech instead of text is likely to reduce the demand on the visual channel.

With the recognition of the positive impact of audio narration in multimedia delivery, previously-developed learning aids for BICH121 and BICH122 have been supplemented with auditory instructions. Follow-up studies in identifying the comparative effectiveness of different presentation strategies offered by these multimedia applications are likely to present a more effective environment for self-directed learning.

Keywords

Multimedia instruction, self-directed learning, cognitive learning theory, visual channel, audio channel

INTRODUCTION

Multimedia, manifested by the emergence and convergence of technological advances, has provided an important stepping stone in the evolution of eLearning. The virtual world of seamless digital integration of text, images, animation and sound offers a fundamental transformation in educational panorama and commitment. Synergistic amalgamation of pedagogical elements and multimedia technologies promise a new era in education.

Exploitation of multimedia in education offers significant prospects for the modernization of curricula. Incorporation of instructional technology into conventional teaching methods is certainly effective in facilitating conceptual understanding and fostering active, independent learning. However, it is of paramount importance to decipher the key features that can be offered by multimedia technologies and strike a balance between didactic strategies and technological capabilities in the design of novel multimedia-based instructions.

COGNITIVE THEORY OF MULTIMEDIA LEARNING

Until recently, many multimedia instructional designs were based on anecdotal intuition rather than empirically grounded strategies. However, there is increasing evidence to indicate that success of multimedia-based instruction in enhancing teaching and learning effectiveness is achieved through engagement of cognitive mechanisms.

In 1997, Mayer proposed a cognitive theory of multimedia learning (Mayer, 1997) established on the basis of three assumptions:

1. Visual and verbal information are processed differently along distinct channels (Paivio, 1986).

2. Working memory includes independent auditory and visual working memories (Baddeley, 1986).

3. Each working memory has a limited capacity (Sweller & Chandler, 1994).

Within the theoretical framework of the cognitive theory of multimedia learning, active learning occurs when a learner selects, organizes and integrates corresponding verbal and non-verbal information.

PRINCIPLES OF INSTRUCTIONAL DESIGN

The recognition of the cognitive theory of multimedia learning has made a significant impact on the principles of instructional design. With the increasing exploitation of multimedia-based instructions as knowledge delivery systems, development of instructional specifications that support defined educational outcomes should be premeditated with the cognitive learning approach. According to the cognitive theory, five major principles of instructional design have been formulated (Moreno & Mayer 1999; Mayer 2007).

1. Multiple Representation Principle: Multimedia-based instruction is more effective if the intended explanation is illustrated by two different modes of representation such as texts

and diagrams.

2. Contiguity Principle: Multimedia-based instruction is more effective if the two modes of representation are given contiguously rather than separately.

3. Split-Attention Principle: Multimedia-based instruction is more effective if texts are presented auditorily rather than visually.

4. Individual Differences Principle: Magnitude of multimedia effects, contiguity effects and split-attention effects are dependent on individual differences within a learning group.

5. Coherence Principle: Multimedia-based instruction is more effective if the intended explanation is presented with fewer texts and diagrams.

The ultimate success of cognitive learning principles as a dominant strategy for instructional design awaits further evaluation and affirmation. Nonetheless, advances in cognitive psychology have offered a starting point for the construction of multimedia-based applications.

AUDIO-ENHANCED INSTRUCTION IN MULTIMEDIA-BASED LEARNING

In recent years, the integration of streaming audio into instructional design has become an essential consideration in the development of effective multimedia-based learning environments (Hill & Chidambaram, 2002). As supported by the cognitive theory of multimedia learning, synchronized presentation of visual and audio material permits a balanced, independent flow of information into the visual and auditory channels from which verbal and pictorial mental models are assembled and conceptual connections are built. Utilization of audio narration in the replacement of on-screen text to complement dynamic visual illustrations is likely to avoid overloading of the visual channel (Mousavi *et.al.* 1995), thereby making the process of active learning more effective.

AUDIO ENHANCEMENT IN BICH121 AND BICH122

With the growing confidence in the use of audio-enhanced instruction in multimedia-based learning, streaming audio has been incorporated into the previously developed student-directed learning aids for BICH121 and BICH122. The definitive efficacy and long term impact of the audio component in enhancing conceptual understanding of basic biochemistry and promoting active, independent learning requires implementation and evaluation. Nevertheless, the initiative is likely to generate a set of constructive guidelines for future development of learning aids in other areas of the discipline.

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