

Core Principles of Educational Multimedia

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INTRODUCTION

The notion of using technology for educational purposes is not new. In fact, it can be traced back to the early 1900s during which school museums were used to distribute portable exhibits. This was the beginning of the visual education movement that persisted throughout the 1930s, as advances in technology such as radio and sound motion pictures continued. The training needs of World War II stimulated serious growth in the audiovisual instruction movement. Instructional television arrived in the 1950s but had little impact, due mainly to the expense of installing and maintaining systems. The advent of computers in the 1950s laid the foundation for CAI (computer assisted instruction) through the 1960s and 1970s. However, it wasn't until the 1980s that computers began to make a major impact on education (Reiser, 2001). Early applications of computer resources included the use of primitive simulation. These early simulations had little graphic capabilities and did little to enhance the learning experience (Munro, 2000).

Since the 1990s, there have been rapid advances in computer technologies in the area of multimedia production tools, delivery, and storage devices. Throughout the 1990s, numerous CD-ROM educational multimedia software was produced and was used in educational settings. More recently, the advent of the World Wide Web (WWW) and associated information and communications technologies (ICT) has opened a vast array of possibilities for the use of multimedia technologies to enrich the learning environment. Today, educational institutions are investing considerable effort and money into the use of multimedia. The use of multimedia technologies in educational institutions is seen as necessary for keeping education relevant to the 21st century (Selwyn & Gordard, 2003).

The term *multimedia* as used in this article refers to any technologies that make possible "the entirely

digital delivery of content presented by using an integrated combination of audio, video, images (two-dimensional, three-dimensional) and text," along with the capacity to support user interaction (Torrisi-Steele, 2004, p. 24). Multimedia encompasses related communications technologies such as e-mail, chat, video-conferencing, and so forth. "The concept of interaction may be conceptualised as occurring along two dimensions: the capacity of the system to allow individual to control the pace of presentation and to make choices about which pathways are followed to move through the content; and the ability of the system to accept input from the user and provide appropriate feedback to that input.... Multimedia may be delivered on computer via CD-ROM, DVD, via the internet or on other devices such as mobile phones and personal digital assistants or any digital device capable of supporting interactive and integrated delivery of digital audio, video, image and text data" (Torrisi-Steele, 2004, p. 24).

The fundamental belief underlying this article is that the goal of implementing multimedia into educational contexts is to exploit the attributes of multimedia technologies in order to support deeper, more meaningful learner-centered learning. Furthermore, if multimedia is integrated effectively into educational contexts, then teaching and learning practice must necessarily be transformed (Torrisi-Steele, 2004). It is intended that this article will serve as a useful starting point for educators beginning to use multimedia. This article attempts to provide an overview of concepts related to the effective application of multimedia technologies to educational contexts. First, constructivist perspective is discussed as the accepted framework for the design of multimedia learning environments. Following this, the characteristics of constructivist multimedia learning environments are noted, and then some important professional development issues are highlighted.

THEORETICAL FOUNDATIONS FOR THE ROLE OF MULTIMEDIA IN EDUCATIONAL CONTEXTS

Traditionally, teaching practices have focused on knowledge acquisition, direct instruction, and the recall of facts and procedures. This approach suited the needs of a society needing “assembly line workers” (Reigeluth, 1999, p. 18). However, in today’s knowledge-based society, there is a necessity to emphasize deeper learning that occurs through creative thinking, problem solving, analysis, and evaluation, rather than the simple recall of facts and procedures emphasized in more traditional approaches (Bates, 2000). The advent of multimedia technologies has been heralded by educators as having the capacity to facilitate the required shift away from traditional teaching practices in order to innovate and improve on traditional practices (LeFoe, 1998; Relan & Gillani, 1997). Theoretically, the shift away from traditional teaching practices is conceptualized as a shift from a teacher-centered instructivist perspective to a learner-centered constructivist perspective on teaching and learning.

The constructivist perspective is widely accepted as the framework for design of educational multimedia applications (Strommen, 1999). The constructivist perspective describes a “theory of development whereby learners build their own knowledge by constructing mental models, or schemas, based on their own experiences” (Tse-Kian, 2003, p. 295). The constructivist view embodies notions that are in direct opposition to the traditional instructivist teaching methods that have been used in educational institutions for decades (see Table 1).

Expanding on Table 1, learning environments designed on constructivist principles tend to result in open-ended learning environments in which:

- Learners have different preferences of learning styles, cognitive abilities, and prior knowledge; they construct knowledge in individual ways by choosing their own pathways. Learning is affected by its contexts as well as the beliefs and attitudes of the learner;
- Optimal learning occurs when learners are active learners (e.g., learn by doing and learn by discovery;

Table 1. Key principles of the constructivist view of teaching and learning vs. key principles of the instructivist view of teaching and learning

CONSTRUCTIVIST	INSTRUCTIVIST
• learner-centered perspective: the learner is the focus of the learning environment – learners as individuals	• teacher-centered perspective: the teacher is focus of the learning environment- group learning
• encourages student independence in learning	• encourages student dependence on teacher
• teacher as facilitator that acts as a guide	• teacher as instructor
• learner and facilitator engage in a collaborative learning experience	• teacher in control of learning and in position of power over learner
• learners actively constructing knowledge in their own individual manner	• learners passively acquiring knowledge from the instructor
• Process of knowledge acquisition is important - how are learners interacting with the learning environment?	• acquisition of content and factual knowledge is key objective of learning episode
• curriculum design as development of knowledge spaces which allow active exploration by the learner	• curriculum design as goal oriented, strictly structured and ordered knowledge transmission
• Higher order thinking skills emphasized, creative thinking, problem solving, evaluation, synthesis	• behavioral objectives focusing on recall of facts and procedures, surface learning
• Open-ended learning environments (OELE)	• directed instruction

- Learning is a process of construction whereby learners build knowledge through a process of scaffolding. Scaffolding is the process whereby learners link new knowledge with existing knowledge;
- Knowledge construction is facilitated through authentic problem-solving experiences;
- The process of learning is just as important as learning outcomes. Learners are encouraged to “articulate what they are doing in the environment and reasons for their actions” (Jonassen, 1999, p. 217).

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