Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2003 Proceedings

Americas Conference on Information Systems (AMCIS)

December 2003

Multimedia Diversification of the Asynchronous Learning Network Learning Environment

Eunhee Kim
New Jersey Institute of Technology

Starr Roxanne Hiltz
New Jersey Institute of Technology

Julian Scher
New Jersey Institute of Technology

Murray Turoff
New Jersey Institute of Technology

MULTIMEDIA DIVERSIFICATION OF THE ASYNCHRONOUS LEARNING NETWORK LEARNING ENVIRONMENT

Eunhee Kim
New Jersey Institute of Technology
eunhee.kim@njit.edu

Starr Roxanne Hiltz
New Jersey Institute of Technology
hiltz@adm.njit.edu

Julian M. Scher
New Jersey Institute of Technology
julian.m.scher@njit.edu

Murray Turoff
New Jersey Institute of Technology
turoff@njit.edu

Abstract

Text-based discussions in Asynchronous Learning Networks (ALN) may not be an optimal learning environment for all learners. This paper discusses the reasons why and explores the possibility of applying multimedia to ALN. The contribution of this paper is to provide ways of diversifying the ALN learning environment to accommodate the needs of diverse learners having different learning styles.

Keywords: Asynchronous learning networks, multimedia learning, learning style

Introduction

According to the definition at the ALN web site (**http://www.aln.org**), Asynchronous Learning Networks are "people networks for anytime - anywhere learning. ALN combines self-study with substantial, rapid, asynchronous interactivity with others. In ALN, learners use computer and communications technologies to work with remote learning resources, including coaches and other learners, but without the requirement to be online at the same time." ALN is a learning mode which has no constraints of time and place. On the surface, it sounds like ALN simply enhances the convenience of teaching and learning by providing education at anytime and anyplace. However, the real strength of ALN lies in that learning can take place at the pace of learners.

ALN Learning

Above all, ALN is a learner-centered educational mode (Hiltz, 1998) which shifts the focus of education to learners. This characteristic clearly distinguishes ALN from traditional learning, which is implemented mostly from the perspective of "the sage on the stage." ALN, by contrast, is led by learners with teachers mostly taking the role of facilitators (Harasim et al., 1995).

Based on the conventional wisdom that there is no optimal learning environment for all learners, we can conjecture that ALN may not be a good learning environment for all learners. ALN is based on text-based communication where information is organized sequentially, which may not be a good communication mode for some learners. For example, sequential learners, who like to organize information sequentially, may experience higher interaction in ALN and are more motivated to learn, while random learners experience less benefit from ALN (Leuthold, 1999). Text-based communication may not create an optimal learning environment for some, given that learners have different preferences in terms of type or medium of information. For example, non-verbal learners are likely to learn better with non-verbal materials, such as images (Monaghan and Stenning, 1988). Thus, the text-based communication of ALN may place this type of learners at a disadvantage. At this juncture, there emerges a need for diversifying ALN, and we suggest application of multimedia to ALN.

Multimedia Learning

Before we examine the administration of multimedia in ALN, we may need to take a look at how multimedia can help the learning process of humans. It is known that our brain processes information using a special mechanism called memory. New information is input through our sensory organs, such as eyes and ears, and is processed into knowledge while going through working and long-term memory (Quealy and Langan-Fox, 1998).

Working memory, or short-term memory is actually a three-part system: central executive system, visuospatial sketch pad and phonological loop (Baddley, 1992). The central executive system controls attention while visuospatial sketch pad and phonological loop manipulate visual images (non-verbal) and speech-based (verbal) information, respectively. Thus, it seems to be a good strategy to provide learning material in the format of both image and audio simultaneously. In other words, learning is likely to be more effective when information is processed referentially through the two channels than when information is processed through only one channel. Referential processing helps learners create more cognitive paths that can be followed to retrieve the information (Mayer and Anderson, 1991).

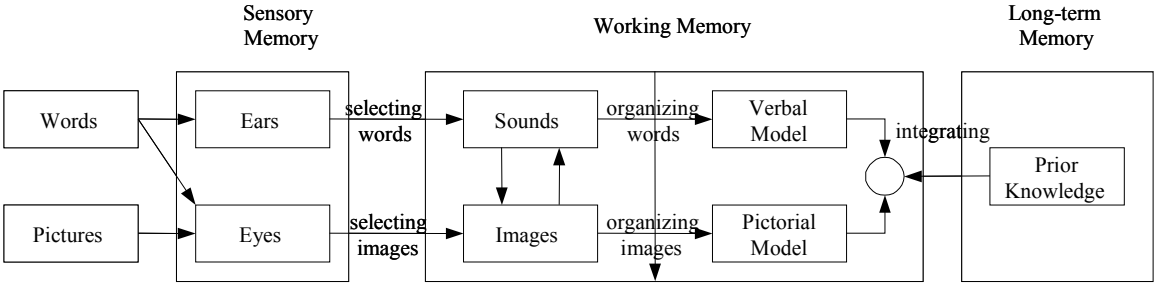

Figure 1. Cognitive Theory of Multimedia Learning (Mayer, 2001)

Several studies have shown that two media improve learning (Tabers et al., 2000; Moreno and Mayer, 1999; Mayer and Anderson, 1992). However, the notion of "the more, the better" does not seem to apropos to learning. In fact, redundant media could hamper effective learning (Mayer et al., 2001). This could be attributed to the fact that working memory is limited in terms of its capacity. If the incoming information exceeds the processing capability of working memory, the excessive information is not processed. It is very crucial to present learning material in such a way that working memory is not saturated with multiple elements of information provided simultaneously. Learning could be interfered with if the limited capacity of working memory is used to process extraneous cognitive load which is not directly related to the learning material itself (Chandler and Sweller, 1991). In a nutshell, the dual mode of information representation (verbal and nonverbal) can facilitate learning if the dual mode is presented contiguously without splitting attention of learners (Tabbers et al., 2000).

Multimedia can also enhance learning effectiveness of ALN learners by helping them get accustomed to their learning environment easily and increasing their motivation for learning. For example, Walther et al. (2001) found that photographic images could improve intimacy of short-term groups. Given that most of the participants in ALN classrooms have never met before or during the course activities, photographic images may help them overcome a sense of isolation and increase intimacy among themselves. Moreno et al. (2000) found that students feel higher motivation and interest in their learning when they are placed in a learning environment where personal agents realized by multimedia are provided. Reeves and Nass (1996) argue that voices can enhance social presence and help information processing. Based on these findings, it seems that multimedia can help improve motivation of students for learning which is one of the very important factors for successful learning.

Application of Multimedia to the ALN Learning Environment

Most of the current ALN environments appear to use mostly one channel of working memory: the phonological loop which deals with the processing of verbal information. Thus, a need emerges to provide more choices of information formats and communication modes to help improve learning effectiveness as well as satisfaction of learners.

In administering multimedia in ALN, there should be some principles and guidelines to use them more effectively as well as efficiently. Some say that the system should be flexible enough to accommodate their different needs so that so-called "tool

burnout" does not happen (Scigliano and Levin, 2000). Multimedia should also be able to stimulate curiosity and motivate learning of the learner (Diaz, 1999). Others may say that the multimedia environment should be designed to minimize cognitive load of learners (Iding et al., 2002).

However, the top priority needs to be put on the learner (Mellon, 1999). No matter how well multimedia are designed and how seamlessly they are integrated into instructional design, they are nothing more than a waste of resources unless learners use them and get help from them. In a nutshell, multimedia, instructional design and the learner need to be amalgamated into the learning context to achieve the highest possible learning effectiveness.

In order to utilize multimedia most effectively, we need to examine what kind of multimedia can be used in what kind of situations. Multimedia may be more effective for some purposes than others, and some types of multimedia may be more effective for particular purposes. For example, it is known that multimedia can be an effective learning tool for procedural information rather than declarative information (Pane et al., 1996; Lawrence et al., 1994). If we need to learn how to use software, or a system, it may be much easier for users to learn from animation, rather than from plain text explanations. Animations can help users learn the use of the software or the system more effectively and efficiently by showing them how to use it. Here, the saying that "to see is to believe" could be applied.

Although there are many kinds of multimedia, it seems that it may not be feasible to use all of them in the ALN environment. For instance, image or sound could be used easily by students. They may be able to use image or sound to present themselves without much effort. However, animations may not be easily created by students, given that it takes a considerable amount of time and energy to make them. Animations could be used by instructors to explain procedural information more efficiently. For instructors, the considerable amount of time and energy required to make an animation will be worthwhile because animations can be reused.

Research Questions

Based on several studies about cognitive and emotional multimedia learning discussed above, we may be able to safely say that multimedia can facilitate the learning process of humans. What this paper focuses on is how multimedia learning will work in the actual ALN learning environment. There seem to be few empirical studies about how multimedia and ALN learning interact each other. Thus, a key research question is how ALN learners will perceive multimedia leaning in their actual learning environment. Multimedia could complement the ALN learning environment by diversifying the mode of communication. Although multimedia can facilitate the learning process of humans and accommodate more needs of diverse learners, they are not a silver bullet. In order to reap their expected benefits, they should be used prudently. Thus, the most important thing is how we should use multimedia to facilitate learning in ALN courses.

In introducing multimedia into the ALN learning environment, one of the most important factors will be "feasibility", that is, how practical it is for learners and instructors to use multimedia for their learning and teaching. It may not be reasonable to use all kinds of multimedia. Thus, this project aims to find the most feasible and practical possible ways of applying multimedia to the ALN learning environment. Students and instructors may show different reactions to the application of multimedia to the ALN learning environment. Also, the same students and instructors may behave differently regarding multimedia learning when they create multimedia objects vs. when they see or listen to others' use of multimedia. Also, there are many different types of multimedia and each type has different advantages and disadvantages, and each ALN course has different learning environments and objectives. In addition, the different types of multimedia may affect the learning process in different ways. A picture may reap different results from sound in terms of perceived learning and satisfaction. Thus, how to match multimedia with learning objectives in ALN courses in order to reap maximized benefits is another research question. In this vein, the following questions are raised:

- Will students in an environment with high multimedia use report higher perceived learning?
- What will be the best possible administration of multimedia in ALN courses in terms of the frequency of use of multimedia?
- What will be the best possible match between multimedia and ALN courses in terms of multimedia type and characteristics of ALN courses?
- What reactions will ALN learners show to each type of multimedia, e.g., image, sound, and animation, in terms of the relationship between intended purposes of multimedia and perceived learning and satisfaction?
- How will multimedia affect the cognitive process of learning? Will there be differences among different types of multimedia?

- Will there be differences in terms of attitude toward multimedia learning/teaching between learners and instructors? Will there be difference in terms of attitude toward multimedia learning/teaching between when learners/instructors use multimedia and when they see or listen to multimedia used by others?

In order to explore these issues, a field study that incorporates direct observation, questionnaires and interviews will be carried out. We believe that the answers to these questions will be able to provide a clue for instructors to become good matchmakers for a possible marriage between ALN and multimedia.

References

Baddeley, A. Working Memory. Science. 225, 1992, pp.556-559

Chandler, P and Sweller, J. Cognitive Load Theory and the Format of Instruction. Cognition and Instruction, 8(4), 1991, pp.293-332

Diaz, D.P. CD/Web Hybrids: Delivering Multimedia to the Online Learner. Journal of Educational Multimedia and Hypermedia, 8(1), 1999, pp. 89-98

Harasim, L., Hiltz, S.R., Teles, L., and Turoff, M. Learning Networks: A feled guide to teaching and learning online, The MIT Press, 1995

Hiltz, S.R. Collaborative learning in asynchronous learning networks: building learning communities, Invited address at "WEB98" Orlando Florida November, 1998

Iding, M.K., Crosby, M.E., Auernheimer, B. and Klemm, E.B. Guidelines for Designing Evaluations of Web-Based Instructional Materials. Proceedings of the 35th Hawaii International Conference on System Sciences, 2002

Lawrence, A.W., Badre, A.N., and Stasko, J.T. Empirically Evaluating the Use of Animation to Teach Algorithms. Technical Report GIT-GVU-04-07, Georgia Institute of Technology, Atlanta, 1994

Leuthold, J.H. Is Computer-Based Learning Right for Everyone? Proceedings of 32nd Hawaii International Conference on Systems Sciences

Mayer, R.E. *Multimedia Learning*. Cambridge University Press. 2001

Mayer, R.E. and Anderson, R.B. Animations need narrations: An experimental test of a dual-coding hypothesis. Journal of Educational Psychology, 83, 1991, pp. 484-490

Mayer, R.E. and Anderson, R.B. The Instructive Animation: Helping Students Build Connections Between Words and Pictures in Multimedia Learning. Journal of Educational Psychology. 84(4), 1992, pp. 444-452

Mayer, R.E., Heiser, J. and Lonn, S. Cognitive Constraints on Multimedia Learning: When Presenting More Material Results in Less Understanding. Journal of Educational Psychology. 93(1). 2001. pp.187-198

Mellon, C.A. Technology and the Great Pendulum of Education. Journal of Research on Computing in Education, 32(1), Fall 1999, pp.28-35

Monaghan, P. and Stenning, K. Effects of representation modality and thinking style on learning to solve reasoning problems, Paper presented at the 20th Annual Meeting of the Cognitive Science Society, August 1-4, 1998, Madison, Wisconsin, USA

ing style on learning to solve reasoning problems, Paper presented at the 20th Annual Meeting of the Cognitive Science Society, August 1-4, 1998, Madison, Wisconsin, USA

Moreno, R. and Mayer, R.E. Cognitive principles of multimedia learning: The role of modality and contiguity. Journal of Educational Psychology, 91(2), 1999, pp.358-368

Moreno, R., Mayer, R. and Lester, J. Life-Like Pedagogical Agents in Constructivist Multimedia Environments: Cognitive Consequences of their Interaction. World Conference on Educational Multimedia, Hypermedia and Telecommunications, 2000 (1), 2000, pp. 776-781

Pane, J.F., Corbett, A.T., and John, B.E. Assessing Dynamics in Computer-Based Instruction. In Tauber, M.J.(Ed.) Proceedings of the 1996 ACM SIGCHI Conference on Human Factors in Computing Systems, New York: ACM Press, 1996, pp.197-204

Quealy, J and Langan-Fox, J. Attributes of delivery media in computer-assisted instruction. Erogonomics, 41(3), 1998, pp. 257-279

Reeves, B. and Nass, C. The media equation. New York: Cambridge University Press. 1996

Scigliano, J.A. and Levin, J. One-Stop Shopping in an Online Education Mall: an multimedia Weenvironment. T.H.E. Journal, 27(11), 2000, pp. 72-80

Tabbers, H., Martens, R. and van Merriënboer. Multimedia instructions and Cognitive Load Theory: split-attention and modality effects. Presented at the AECT 2000 in Long Beach, California

Walther, J.B., Slovacek, C.L., and Tidwell, L.C. Is a picture worth a thousand words? Photographic images in long-term and short-term computer-mediated communication. Communication Research, 28(1), February 2001, 105-134