Professional Development Leave Report: Summer, 2009
Submitted by Shawn P. Calhoun on September 17, 2009

My goals on this leave were to develop the first two chapters of my Ed. D. dissertation. I completed my coursework during the Spring 2009 semester. The chair of my committee is Dr. Mathew Mitchell, Ph.D., USF School of Education.

The tentative title for my dissertation is: **AN ASSESSMENT OF INFORMATION LITERACY INSTRUCTION USING COGNITIVE LOAD THEORY, THE PRINCIPLES OF MULTIMEDIA AND AUDIO BOOK LEARNING PODCASTS.**

The overall goal of my study is to develop and test an audio book learning package (podcast) that will deliver information literacy instruction to college students. My theoretical perspective is based on the work of Richard Mayer who developed cognitive load theory (CLT). CLT suggests that instruction that uses multimedia (voice, narration, slides, movies etc) can be more effective when designed using the principals of multimedia instruction. These principles were developed from Mayer’s CLT and research into the limited capacity of the human brain to processes new information. Research suggests that instruction using multimedia can be more effective when instructional design decisions are made giving affordances to the limited cognitive capacity of the human brain to process new information. However, to date I have found no literature explicitly linking information literacy instruction and CLT. Hence, my dissertation topic – applying CLT, the principles of multimedia design to information literacy instruction.

My work during my research leave was divided into two components. During the first half of the leave, I focused on refinement of Chapter 1, which includes a statement of the problem, background and need, and theoretical rationale for my study. Excerpts from these sections (DRAFT) are outlined below.

**Background and Need (excerpt):**

The acquisition of information literacy skills is an important component of an effective educational process. At the college level, proficiency in these skills translates into students’ ability to engage in rigorous curricula as well as produce academically sound work. Information literacy skills include the ability to determine the extent of information needed, access the needed information effectively and efficiently, evaluate information and its sources critically, incorporate selected information into one’s knowledge base and use information effectively to accomplish a specific purpose (ALA, 2000; 2008). The importance of information literacy skills include teaching students to manage the complexity of research, collecting and integrating information from different sources and using technology to assist in the research process (Cox & Lindsay, 2008; Eisenberg, Lowe, & Spitzer, 2004; Farmer & Henri, 2008).

The teaching and development of these skills, however, is not optimal at many U.S. colleges and universities. A 2003 survey of academic libraries revealed that only 47% of over 1400 surveyed masters and baccalaureate colleges and institutions had integrated information literacy into the curriculum of one or more programs and less than 15% had
gathered evidence that students are information literate when they graduate (Association of College and Research Libraries., 2004b). Data from the same survey indicated that doctorate granting institutions had a slightly higher integration rate (49%) but a lower post-graduate literacy rate (13%) (Association of College and Research Libraries., 2004a). While academic libraries often have instruction programs designed to teach information literacy skills (Eisenberg, et al., 2004; Neely, 2006), the integration of this expertise into the college curriculum occurs at only small number of universities and colleges (Association of College and Research Libraries., 2004a, 2004b). Library instruction is typically a one-time course taught by a library staff member will be discussed in more detail in the literature review section of this paper. A practical gap in higher education is that information literacy is an important skill set for students, information literacy expertise often resides in academic libraries, however, information literacy skills instruction is not consistently or effectively integrated into the undergraduate curricula for many students.

One way to address the information literacy skills gap is through the use of multimedia learning. Mayer defines multimedia as, “presenting both words (such as spoken text or printed text) and pictures (such as illustrations, photos, animation or video)” (Mayer, 2005a, p. 2). Building upon the brief definition of multimedia above, we can further describe multimedia as a computer-based presentation of content that blends text in written or verbal forms, sound and graphics into a discrete learning package. In the context of this study, learning refers to the construction of knowledge. Therefore, using multimedia learning to construct knowledge about information literacy involves the use of computer-based text, voice and images. Moreover, students can use computer-based multimedia instruction whenever and wherever the necessary technology is present, meaning that it can be delivered outside the constraints of the library and can be integrated into courses undergraduate courses without adding additional required courses.

**Purpose of the study and theoretical rationale (excerpt):**

*Purpose of the Study:* This study will employ the principles of multimedia learning, which are derived from cognitive load theory, in the design of an audio learning package podcast that will deliver information literacy skills instruction. This instruction will be tailored to college-level students and the framework that will bind these elements together will be based on instructional design theory.

*Theoretical Rationale:* Cognitive load theory suggests that there are three characteristics of the human mind works that when combined, dictate the effectiveness of learning: 1) humans beings have an audio and a visual channel for processing information, 2) the human mind is limited in its capacity to effectively process new information via working memory, and 3) learners must be actively engaged in processing new information if it is to be used to create new knowledge or augment existing schemas (Baddeley, 1986; Chandler & Sweller, 1991; Paivio, 1986). Cognitive load theory provides the theoretical rational upon which the principles of multimedia learning were developed.
The multimedia learning principal states that people learn better from words and pictures than from words alone, and that learning is deeper when appropriate pictures are added to text (Mayer, 2001). Under this umbrella principal, there are a number of other empirically supported principles under the umbrella of multimedia. For example the modality principal suggests that people learn better from graphics and narration than graphics and printed text. Additionally, the redundancy principal suggests that people learn better when the same information is not presented in more than one format (Mayer, 2001, 2005b). These principles and others are addressed in detail after this summary of the research problem.

In this study multimedia-learning principles will be used to discuss what instructional designers can use to build effective multimedia for student learning. Multimedia for instructional purposes is contextualized for this study within cognitive load theory. Cognitive load theory, the principles of multimedia and related research agendas have been studied extensively and the evidence pointing to beneficial learning have been well documented (Mayer, 2005b; Sweller, van Merrienboer, & Paas, 1998). However, there is a paucity of research that extends cognitive load theory and the principles of multimedia design to the delivery of information literacy instruction using podcasting. This study will contribute to the literature though its investigation of a novel information literacy instruction method using the principles of multimedia learning and cognitive load theory.

The second half of my research leave focused on creating a draft of my literature review. This section of my dissertation is divided into roughly three sections. Section one of my literature review focused on information literacy from the perspective of academic librarianship, and the tools used to assess information literacy. As I plan to use different parts of already existing assessments, I focused much of this section on the research supporting following tests and their development:

1. The Standardized Assessment of Information Literacy Skills (SAILS)
2. The B-TILED – An extension of the SAILS instrument
3. The Educational Testing Service (ETS) Information and Communication Technology Assessment (iSkills)
4. The implementation of the iSkills assessment by the UCLA library
5. A sample of localized assessments.

From the list above, 1-4 shared many common themes (e.g. developed using ACRL’s (2000) information literacy standards and intended for use across many different types of academic libraries). The 5th set of assessments is an attempt to sample from the largest pool of research. While most libraries develop their own information literacy assessments, many appear to lack the rigor of SAILS, iSkills and the B-TTILED.

The second section of my literature review developed and written during my research leave focused on working memory and Mayer’s model of cognitive load theory. One of my hypotheses is that instruction developed without tacit acknowledgement of, and affordances for how the human brain processes new information, might be less than optimal. An excerpt from my writing this summer follows:
Working memory has a unique role when discussing educational goals as well as significant limitations. “Working memory is the center of cognition since all active thinking takes place there” (Clark & Mayer, 2003, p. 36). For learning to be successful, an individual must actively engage in the tasks related to learning and the active processing takes place in working memory. According to Mayer in *Across the Century: The centennial volume* (Corono, 2001, p. 42), “knowledge is not a commodity that can be placed neatly in a learner’s head, but rather it is the result of a learner’s active sense-making,” [where sense-making is] “processing new information using schemata in working memory.” The integration of new knowledge into long-term memory occurs when a learner actively processes it in working memory using the process of encoding. The capacity for the brain to encode is limited by it’s ability to processes a limited amount of information in working memory (Moreno & Mayer).

Cognitive overload in multimedia learning occurs when one or both of the auditory/verbal or the visual/pictorial channels are overloaded beyond the limited capacity of working memory (Mayer & Moreno, 2003; Paivio, 1986). While long-term memory storage of new knowledge is practically unlimited, optimal learning takes place when the dual-channels of working memory are carefully accounted for in the instructional design and teaching of new subjects. The central problems of limited working memory are discussed in the literature as cognitive load. The three areas that can combine to create cognitive load are essential processing, extraneous processing and its sub-category representational holding. The third area of cognitive load to be discussed will be generative processing.

This section of my literature review continued by further outlining the following sub-parts of Mayer’s model.

- Essential processing
- Extraneous overload and extraneous processing
- The Multimedia Principle of Redundancy
- Generative processing

My next step is to develop the third and final component of my literature review. Section three will focus on podcasting and audio book learning packages. When brought together, I will have developed a review of the literature which supports my general hypothesis that information literacy instruction, when developed using Mayer’s model of cognitive load theory, is a compelling line of research and might lead to more effective information literacy instruction. So far, my review of the literature suggests that this is a line of inquiry (blending CLT, information literacy instruction and postcasting) has yet to be explored in the professional literature. My goal for the coming weeks is to complete my review of the literature and defend the first three chapters of my dissertation during the fall of 2009.
References


