Taxonomies for Technology

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INTRODUCTION

For over 3000 years from Homer, Moses and Socrates onwards, the teacher in direct, personal contact with the learner, has been the primary means of communicating knowledge…until the fourteenth century, when the invention of the printing press allowed for the first time the large-scale dissemination of knowledge though books. (Bates, 1995)

Today there is a range of technologies available to those who design learning events, from the old and simple to the new and complex. Key attempts have been made to develop theoretical frameworks of learning technologies and have been reported in the literature of higher education, human resource development, and instructional design. These three fields are not discrete and some overlap occurs. For example, commentators in the field of instructional design state that their designs are provided for learning in many contexts including schools, higher education, organizations, and government (Gagné, Briggs, & Wager, 1992; Reigeluth, 1983). In many cases the theoretical frameworks are intended to guide the selection of learning technologies but often the conceptualizations have not kept pace with technological change.

There are many definitions of taxonomy and most of them refer to systems for the classification and organization of things. Carl Linnaeus developed the most well known taxonomy during the expansion of natural history knowledge in the 18th century. It is the scientific system for the classification of living things and has the basic structure of organism, domain, kingdom, phylum, class, order, family, genus, and species.

It has been argued (Wikipedia, 2005) that the human mind uses organizational structures to naturally and systematically order information received and hence makes sense of the world. A taxonomy is clearly an organizational structure and it follows that as the Linnaean taxonomy assists those investigating the life sciences; a taxonomy of learning technologies can help users and investigators of learning technologies. Further it is suggested that taxonomies of learning technologies are appropriate tools to assist in the design of learning events that include technologies.

BACKGROUND

The Linnaean taxonomy has a deep hierarchical structure which reflects the number and diversity of living things. It is reasonable to expect that a taxonomy for learning technologies will be smaller due the smaller number of learning technologies. Just as new species are added to the Linnaean taxonomy as they are discovered, a taxonomy of learning technologies must be adaptable to cater for leaning technologies of the future. A taxonomy of learning technologies is therefore a framework that classifies or organizes learning technologies.

There have been a number attempts to classify or organize learning technologies and while their classification frameworks are logically sound they have not always been developed to assist in the design of learning events that use technology in the most effective and efficient manner. Also, there is a considerable range in the depth of approach or rigor. However, all of the approaches either divide technologies into categories, either by intention or as a result of categorization by other criteria.

Leshin, Pollock, and Reigeluth (1992) present a classification scheme for "media" that is based on attributes in which learning technologies are grouped into five "systems."

- Human-based system (teacher instructor, tutor, role-plays, group activities, field trips, etc.)
- Print-based system (books, manuals, workbooks, job aids, handouts, ect.)
- Visual-based system (books, job aids, charts, graphs, maps, figures, transparencies, slides, etc.)
- Audiovisual-based system (video, film, slide-tape programs, live television, etc.)

- Computer-based system (computer-based instruction, computer-based interactive video, hypertext, etc.)

They state that the "systems" share the characteristic of carrying "a message (information) to a receiver (learner)" and that some "systems" can "process messages from the receiver" (Leshin et al., 1992, p. 256). Writing in the field of instructional design, Leshin, Pollock, and Reigeluth use their classification as a starting point from which technology-based learning events can be designed: "Now through the process of message design you will tailor your instruction to a particular medium or set of media." (Leshin et al., 1992)

The approach taken to the classification of learning technologies by Leshin, Pollock, and Reigeluth provides little or no insight into the application of the technology, and is not much more than a labeling system. As they were writing prior to the development of the World Wide Web, the classification system did not include learning management systems or online technologies. They could easily be added to the last category of computer-based systems, but this adds little to the understanding of them or to their application to learning in an appropriate way.

Also writing in the literature of instructional design, Romiszowski (1988) classifies "media" by the sensory channels they support and provides examples such as telephone for the auditory channel, video for the "audio/visual" channel, chalkboards for the visual channel, and devices or models for the "tactile or kinesthetic" channel. Romiszowski's approach is slightly more informative than that of Leshin, Pollock, and Reigeluth as he makes the conceptual connection between technologies and "sensory channels." However his system of classification provides little insight into the characteristics of the technologies which lead to the matching of them to learning activities in an appropriate manner.

Others in the field of instructional design take an even less rigorous approach to the categorization or classification of learning technologies. Reiser and Gagné (1983) argue that a "number of kinds of categories can be devised for the classification of media" and that "frequently employed categories include audio, print, still visual and motion visual, and real objects." They elaborate that the reasons for categorizing "media" are generally associated with their selection and that their application can be optimized through matching their characteristics to the task:

A particular type of medium can best present a task having a similar classification. For example the learning of a task that requires differentiation of visual features can best be done with a visual medium (Reiser & Gagné, 1983, p. 13).

While Reiser and Gagné's categorization of "media" is appropriate for the selection of technologies as adjuncts to classroom teaching from the technologies available in the early 1980s, it does not have much to offer the selection of learning technologies as central elements of learning events and does not easily expand to address technologies developed after their conceptualization was published.

Some other commentators have taken a more interpretive approach to the categorization of learning technologies. Contrary to the descriptive classification approaches, Laurillard (2002) categorizes learning technologies through the use of "pedagogical categories" and argues that "there are many attempts in the literature to categorise and classify the forms of media, none of which is very illuminating for our purpose here" (pp. 77-78).

Laurillard continues with the argument that "educational media" should be classified in terms of the categories and extent of learning processes they support and provides the four categories: "Discursive, Adaptive, Interactive and Reflective." Laurillard's categories provide limited insight to the nature and characteristics of learning technologies when used outside of the "teaching strategy."

In a similar fashion to Leshin et al., Romiszowski, and Reiser and Gagné, Bates classifies learning technologies in two ways. First, according to the "medium they carry" and he states:

"In education the five most important media are:

- Direct human contact (face-to-face)
- Text (including still graphics)
- Audio
- Television
- Computing" (Bates, 1995, p. 32)

Second, Bates distinguishes between technologies that are "primarily one-way and those that are primarily