How Does Technology Facilitate Constructivist Learning?  
(Approaches)

Technology is increasingly viewed as an “optimal medium for the application of constructivist principles to learning” (Murphy 1997b). Although the advent of the personal computer has streamlined and economized the processing of information, new technologies such as e-mail, listservs, synchronized chat, and the World Wide Web have facilitated the exchange of information and expanded access to a global environment. The constructivist approach to learning is facilitated by the World Wide Web because “the theory focuses on making connections and making meaning in the learning process. Web-based courses that are designed with a constructivist approach encourage the learners to navigate, create, and construct their unique knowledge base” (Conceição-Runlee and Daley 1998, p. 39). They afford the opportunity to engage learning in creative and collaborative activities that promote knowledge construction. They encourage self-directed learning, collaborative learning, and critical analysis by expanding the environments from which knowledge is constructed.

Self-Directed Learning

The Internet offers multiple pathways to learning, using hypertext/hypermedia as a constructivist learning tool. Carefully designed materials presented online can assist individuals’ construction of knowledge by providing alternative pathways to information and making that information easily accessible from any location that has system facilities.

Farquhar et al. (1996) note that, in the past, computer-based instruction reflected a stimulus-response approach. Material was organized in a linear manner to reflect the author’s knowledge structure, thus limiting learners’ ability to form their own structures (O’Carroll 1997). In fact, “highly structured and repetitive interactions delivering immediate feedback are still standard features” (Farquhar et al. 1996, p. 212). However, today, the use of hypertext, which organizes information according to discrete elements,
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allows learners to control the search for knowledge. It offers learners access to information in ways that are consistent with their individual learning styles and enables them to forge their own linkages between bodies of knowledge. It facilitates a self-directed approach to learning and actively engages learners in higher-order thinking and problem solving (O’Carroll 1997).

**Engagement**

Hypertext/hypermedia is its own motivator in that it accommodates the diverse learning styles of learners and allows the integration of aural, visual, and textual elements. Kerka (1998) describes two different approaches to using hypermedia: the approach of field independent (FI) individuals (those who perceive details and rely on internal cues) and that of field dependent (FD) individuals (those who use their entire surroundings, including other people, to process information). “FIs perform more efficient searches in shorter times and are more comfortable jumping around (‘surfing’) in hyperspace. FDs more often report feeling disoriented or lost, navigate more linearly (frequently using Back or Home keys), and tend to follow sequences instead of jumping around, accepting the environment as presented” (ibid., p. 1). FIs tend to be left-brained, analytical thinkers; FDs tend to be right-brained, global thinkers (Brown 1998c, p. 1). However, research shows that in spite of the fact that their approaches are different, both FIs and FDs perform well using hypermedia (Kerka 1998).

**Inquiry**

As a tool for teaching and learning, the Internet affords the benefits of libraries and publishing infrastructures without the drawbacks of limited hours of operation, fixed location, extensive user time, and high publishing costs. It offers access to vast amounts of information that continue to expand daily. It facilitates inquiry by affording users access to various databases from which they can make their own selection of hits and documents to retrieve. From a learner-centered perspective, hypertext indexes enable learners to take charge of their own learning and self-select the text passages that are uniquely interesting to them and relevant to their purposes (Ryder and Wilson 1996). World Wide Web environments provide opportunities for learner interactions that enable learners to “create new relationships with knowledge and new representations of knowledge” (Conceição-Runlee and Daley 1998, p. 41). In comparison to traditional paper/pencil types of information exchanges, learner interaction with information technology is “more dynamic and the knowledge structures formed are more likely to reflect
each reader’s unique approach to learning and to the subject matter” (O’Carroll 1997, p. 121).

Collaborative Learning

Collaborative learning is a constructivist strategy in that it actively engages learners in the process of learning and requires interaction with others. “Collaborative work that is learning centered often involves small groups or teams of two or more students within or across classrooms. Although each student’s role and tasks may be different, all members of the group collaborate to accomplish a joint goal or project. . . Groups that include males and females and a mix of cultures, learning styles, abilities, socioeconomic status, and age bring a wealth of knowledge and perspective to authentic, challenging tasks” (Jones et al. 1996, p. 10). Technology can facilitate the collaboration process by linking together individuals who share a common interest and goal.

Effective communication is a key to knowledge construction. It must be mutually satisfying to learners to be engaging. Kaye (1996) notes that “communication competence represents the degree to which individuals perceive they have satisfied their goals in a given social situation without jeopardizing their ability or opportunity to pursue their other subjectively more important goals” (p. 61). “Hence, people’s interpretations of their relationships and interactions with others form the basis of their future communication and behavior toward those others” (p. 67).

Knowledge Construction

As an instructional tool, the Internet (and World Wide Web) enables distance learning by connecting people separated by time and space. It promotes peer learning by bringing learners together in the same space so that they can share their knowledge and insights, communicating with each other to help each other learn (Kerka 1996a). Chat rooms where synchronous communication occurs, message boards and e-mail where message exchanges are asynchronous, and listservs that enable designated groups to talk collectively with each other are some examples of strategies for connecting learners through online technology. Online conferences, distance learning, and collaborative projects conducted on the Internet are examples of instructional practices that support cognitive skill development from a constructivist perspective. Not only do they expand learners’ perspectives of information, but they
also allow learners to adjust and readjust their thinking based on new information.

Concept maps offer a visual way for learners in a group to share meanings. They are a “metacognitive tool that demonstrates explicit, overt representations of concepts and propositions a person holds; they allow teachers and learners to exchange views on why a particular propositional linkage is good or valid, or to recognize missing linkages between concepts that suggest a need for new learning’ (Novak and Gowin 1984, p. 19)” (Conceição-Runlee and Daley 1998, p. 42). In one online course, students were asked to develop a concept map to represent the similarities and differences between the concepts presented in two books they have read. The students then used this map as a format for online discussion of their understandings (ibid.).

**Reflection**

Articulating ideas in group discussion, debate, and activities offers learners opportunities to reflect about their past knowledge and experiences, and their interest in and purposes for learning. The relative anonymity of online users is one factor that encourages communication from some individuals, especially those who are reluctant to speak in face-to-face situations, and it allows individual contributions to be judged on their own merit, without bias (Kerka 1996a). Peer appraisals of contributions offer additional insight for self-assessment. However, learner participation in reflective practices is not an automatic outcome of technology-related collaboration. It must be fostered through instructional design, delivery, and practices that provide support and encouragement to learners (Imel 1998).

In a project described by Conceição-Runlee and Daley (1998), online discussion groups were established to foster discussions about course concepts, case studies, and course readings. “It was interesting that the online discussion seemed to promote a more in-depth level of analysis and synthesis. The learners’ discussion points and comments were a thoughtful analysis and critique, of not only their course work, but their life experiences as well. Learners reported that they used a constructivist process in preparing for and participating in the online discussions. The learner would read the discussion questions, review some of the material in the text, read and think about the contributions of other students, and then frame their responses. Responses were thoughtfully created and showed many connections to other course work and learning materials” (p. 43).
Critical Analysis

"In this half-century, for the first time in history, the capacity for producing information is far greater than the human capacity to process it" (Kerka 1997b, p. 1). Some believe this condition has resulted in "information overload" but others contend that the problem is too many channels of communication (ibid.). It appears, however, that whatever the source of the problem, the real issue is how to help users cope with the vast amount of information available to them. From the constructivist perspective, inquiry must be grounded in facts and concepts and culminate in an in-depth understanding of a problem or issue. Therefore, issues of quality control and veracity and reliability of technologically transmitted information must be resolved.

Quality Control

Ryder and Wilson (1996) reflect on the quality control of vast amounts of online information—a reflection that is especially suitable to the examination of a constructivism and the Internet as it addresses the issue of helping learners to develop critical thinking skills:

For the reader (of online information), a fundamental constraint has to do with the accuracy, veracity, and reliability of online information. This is not to say that accurate information can’t be found on the Net. The implication has more to do with the shifting role of the reader in assessing the accuracy, validity, and applicability of materials that were heretofore left to editors, experts, and peer professionals.

In more modern times, educators could easily control what their students read and direct how those tender minds might be shaped. The educator’s role was largely in the selection of good and proper literature, selecting resources that combined intellectual development with moral edification. The learner’s moral edification was directed externally by a teacher, by an editorial committee, or by a school board.

Today, the classics of literature, fine essays, and poetry still abound. They are rapidly finding their way online. There will be a time in the next 10 or 15 years when every essay or poem that was ever published by McGuffey or any other reputable source will be available in digital format for readers who wish to
partake of these edifying materials. But alongside such uplifting literature will be objectional material, countless resources of questionable value, and some resources of objectionable content. The supreme difficulty in the Information Age will be the ability to restrict a learner’s education to a “sanctioned” body of literature. The discipline required of learners in the postmodern age goes beyond that of all previous generations. The role of education in the age of information will be the development of disciplined readers, skilled in the art of abductive logic. Since we can no longer filter and select proper materials for our students, our highest calling as educators will be to support students in developing such discipline for themselves. (pp. 650-651)

**Veracity and Reliability**

Kerka (1997b) offers insights on the need to verify information obtained online:

One myth rapidly taking hold is that the World Wide Web is a one-stop source for all information needs and the secret to information management is in knowing how to navigate it. The capacity for speed, quantity, and ease of access make the Web a highly attractive information source, and there is also what Wurman (1989) calls “aesthetic seduction,” the graphical display that makes information look good. However, “a piece of information performs when it successfully communicates an idea, not when it is delivered in a pleasing manner” (ibid., p. 125).

The Internet gives the impression that the pace of change has accelerated, but Dvorak (1996) attributes that to the fact that the Web has simply removed natural barriers between people and information they would otherwise never see. It may all have been out there before, but it was not easily accessible. What is often forgotten is that availability does not lend importance, accuracy, utility, or value to the content (Berghel 1997). Because everyone can (and seemingly does) publish on the Web, the responsibility for quality control is now on the receiver. However, “research has shown that many people feel that information gained through a computer screen is more reliable than that from any other source” (Breivik and Jones 1993, p. 29). Kinnaman (1994) tells of companies that published reports on computer printout paper because people were more accepting of their authority.
On the other hand, the attraction of the Internet for some people is independence from authority (McKenzie 1996). The lack of centralized quality control and the expansion of access may be good for democracy. However, as in any democratic institution the risks of demagoguery are present if people are not able to judge the quality and accuracy of sources (Kinna-man 1994). Sven Birkerts suggests that deep reading and thought are necessary to discover the truth in information (McKenzie 1996), but the Web encourages breadth over depth. As with any information source, critical information literacy is vital, and users must be wary of overreliance on any single information source. (pp. 1-2)

**Terms**

**Collaborative learning.** learning that occurs through communication and negotiation with others and involving engagement, inquiry, knowledge development, and reflection

**Field dependent learners.** learners who use their entire surroundings, including other people, to process information; right-brained, global thinkers

**Field independent learners.** learners who perceive details and rely on internal cues; left-brained, analytical learners

**Self-directed learning.** learning that involves the learner in determining what will be learned and how learning will occur
Questions for Reflection and Discussion

1. In what ways does Internet access facilitate construction of knowledge?
2. How does the World Wide Web support learner engagement and inquiry?
3. In what ways does online access to information place greater demands on the learner?
4. How does the World Wide Web enable classroom equity?
5. How does collaborative learning promote knowledge development and reflection?
6. Why does new information technology require learners to become disciplined readers?