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Interaction: what is it, and how can

I include it in online instruction?

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I include it in online instruction?

Interaction is viewed by many authors as an important element in instruction, both in traditional face to face instruction as well as in distance education (Hirumi, in press; Moore, 1989; Sutton, 2001). Kearsley (n.d.) describes interaction as “the key to a successful online course” (para. 13). While interaction commonly takes place without conscious effort in classroom instruction, conscious effort is required for instructional designers who are designing for a distance education setting such as an Internet-based class to incorporate interaction into instruction. This extra effort notwithstanding, Kearsley and Schneiderman (1999) believe that the quality of interaction which is possible through technology-based instruction can exceed that which takes place in the classroom. In addition, Galambos (2001) and Peters (2000a) both agree that online interaction can be more effective than the traditional classroom experience in helping students learn to use higher-order thinking skills.

The purpose of this paper is to facilitate the process of developing online instruction which provides opportunities for interaction. First we will discuss a classification scheme for categories of interaction, with the purpose of establishing a structure within which we can base the rest of the work. Then, based on a literature review including published articles as well as analysis of discussions among educators which have taken place on discussion forums, e-mail mailing lists, and so forth, a list of suggested instructional activities will be presented, which an instructional designer can incorporate into his or her instructional design in order to encourage interaction. This list

of activities will be organized according to how they fit into the classification scheme developed in the first part of the paper.

Background and explanations

Before delving into a discussion about the different types of interaction and how to encourage them, it will be useful to identify key elements of the framework within which this work is based, and specifically define how they will be used in this report. The items which will be discussed are constructivism, asynchronous versus synchronous communication, and interaction.

Constructivism

Constructivism includes the constructivist theories of learning and instruction, which attempt to define the nature of learning and cognition in the mind, and how instruction can be designed to best fit those processes. Several of the ideas which are used to explain the classification of types of interaction are based in the tenets of constructivist theories of learning. The most basic idea of constructivist learning theory is that knowledge does not exist apart from a learner, as something which an instructor can give out and a learner can receive, but rather knowledge is something which the learner constructs for him or herself. Consequently, instruction which is based on these approaches traditionally recommends activities which allow the learner to learn by exploration and discovery, if possible in the actual application context (Driscoll, 2000). Social constructivist theories also believe that learning is a process of shared dialog and social experience (Jonassen, Davidson, Collins, Campbell, & Haag, 1995). In this context, activities which facilitate a social negotiation of meaning are valued, and

consequently interaction plays an important role in the social constructivist (or sociocultural) approaches to instruction (Bonk & Cunningham, 1998).

Asynchronous versus Synchronous communication

Since the end product of this discussion is a series of activities which learners are to be involved in, questions may arise as to what communication methods or media should be used to conduct them, including the question of whether to conduct activities using synchronous or asynchronous communication tools. Many articles which discuss the use of synchronous and asynchronous communication in online instruction choose not to express a preference for one or the other mode of communication (e.g. Branon & Essex, 2001; Davidson-Shivers, Tanner, & Muilenburg, 2000). Others have presented viewpoints on the differences between synchronous and asynchronous communication; however, even those authors who choose to express a preference for one mode of communication or the other (e.g. Goldberg, n.d.; Shotsberger, 2000) acknowledge that neither mode of communication is the most appropriate for all instructional situations, and that learning can take place when instruction is delivered using either communication mode. Furthermore, other articles (e.g. Soo & Bonk, 1998) seem to indicate that as often as not, political, economic, or technological reasons rather than pedagogical ones are the driving force behind the choice of communication tools used in an online course.

For the purposes of the activities which are described in this paper, the instructional designer should choose whether a particular mode or medium of communication will be used, based on the circumstances for which he or she is designing instruction. In cases where there is some freedom as to these choices, it is recommended that the decision be made taking into consideration all the factors which have just been

mentioned. Unless the mode or medium of instruction is a critical attribute of a particular instructional activity, it will not be specified in the listing given here, and the designer should feel free to make that choice based on his or her own situation.

Interaction

Before we consider what types of interaction exist, it is important that we define the term “interaction” as it will be used here. There are a number of definitions of interaction in online distance education (Hirumi, in press; Sutton, 2001). To further confound the matter, the term “interactivity” is also used interchangeably with “interaction” in some cases. For instance, when a learner moves their mouse pointer over a button on a course web page, and the button changes color in response to the learner’s action, it can be said that the web page is interactive—it responds to the actions of the learner. This type of response to a user’s actions by a computer interface is defined both as interaction (breakthebarriers.com, as described in Hirumi, in press) and as interactivity. However, Wagner (1994) differentiates between the two terms, indicating that interactivity is “an attribute of contemporary instructional delivery systems” whereas interaction is “an attribute of effective instruction” (p. 7). Other definitions of interaction make distinctions according to the medium used, arranging the media according to various criteria (e.g. Bonk & King, 1998).

For the purposes of this paper, the definition of interaction will be limited to include interactions which have certain critical attributes. First, interaction must involve an event, something which actually happens (Wagner, 1994). It involves conscious cognitive activity on the part of the participants (Moore, 1989; Sutton, 2001). Wagner (1994) further refines the definition of interaction as “reciprocal events that require at

least two objects and two actions...when these objects mutually influence one another” (p. 8). Finally, in the present discussion the definition of interaction will be restricted to interaction which is linked to learning outcomes. There are other types of interactions which might otherwise be included, and which are important for the administration of an online distance education program. For instance, a learner may indeed interact with a technical support representative, notifying him or her of a problem, and receiving a suggested solution in return. While that situation could very well be considered a distance education interaction, the treatment of administrative matters such as this falls outside the scope of this discussion. In summary, “interaction” can be said to exist when these attributes are present:

- An event;
- Which is reciprocal, including two objects and two actions;
- Involving conscious cognitive activity on the part of the participants; and
- Which is linked to learning outcomes.

Major categories of interaction

Just as there are differing ideas on what interaction is, there are also many different systems which are used to categorize the types of interaction (Hirumi, in press). For the purposes of this discussion, we will limit the categories of interaction to those which are considered in the literature to fall within the working definition of interaction described earlier.

The most well known classification scheme for interaction is Moore’s (1989) framework. This framework includes learner-instructor, learner-learner, and learner-content interaction.

Learner-instructor

Interaction between the instructor and a learner or learners includes those two groups as participants. The instructor plays the role of expert, mentor, or tutor, providing information, guidance, or encouragement to the learner. This type of interaction includes lecture-mode communication where an instructor presents material, then seeks for (and receives) feedback from the learners who are the recipients of that presentation. In addition, learner-instructor interaction can also be one-on-one, as in a private e-mail conversation or an office consultation between the two (Sutton, 2001).

Learner-learner

This type of interaction is the one which is most typically associated with online distance education. Sociocultural learning theories in particular espouse the virtues of this type of interaction, in which two or more learners engage in communication about a subject, sharing information, ideas, viewpoints, or experiences (Bonk & Cunningham, 1998). As with learner-instructor interaction, two participants is only the minimum number necessary for this type of interaction to take place.

Learner-content

Scheel and Branch (1993) explain that content can “be said to influence and likewise be influenced through people’s creation, action upon, and cognitive interpretation of that phenomenon” (p. 9). Moore (1989) defines learner-content interaction as the process of the learner “intellectually interacting with content,” resulting in a change in understanding or perspective on the part of the learner (p. 2). He includes in this definition learners’ interactions with radio and television broadcasts, audio and video recordings, and computer software.

In addition to the three categories identified by Moore, several other categories of interaction have been suggested.

Learner-interface

To Moore's three categories, Hillman, Willis & Gunawardena (1994) added a fourth, learner-interface interaction, which has also become somewhat of a mainstay in the literature on interaction in distance education. This category of interaction is based in the notion that, in an online instruction situation, all communication and interaction is in fact mediated by the interface which the learner must "interact" with each time he or she wishes to perform some task in the computer-mediated environment. Thus in using the communication medium, the learner must make interpretations about the meanings of the various elements which make up the interface, and choices as to how he or she will perform actions on the system and receive responses or feedback from it.

Learner-self

Soo & Bonk (1998) describe learner-self interaction as "learner's reflections on the content, learning process, and new understanding" (p. 3). In learner-self interaction, the learner steps outside his or her viewpoint and attempts to examine it from another perspective as in reflecting on one's own experience, choices, skills, or behaviors, or conducting a debate in one's own head, weighing or balancing different sides of an issue, attempting to form connections between material or develop an opinion on an issue. Synthesis activities such as preparing a personal study sheet for an exam, where a learner reviews his or her own notes or knowledge of a topic, are also included in this type of interaction.

Vicarious interaction

Sutton (1999, 2001) discusses the fact that some learners do not feel comfortable acting as participants in a discussion or conversation, either with the instructor or other learners. However, such learners can in many cases still achieve learning by actively observing and processing both sides of an interaction between two other people. While observing this interaction, the learner vicariously participates in the interaction, and by doing so achieves many of the benefits as though he or she had actually been a participant in a learner-learner or learner-instructor interaction. At the same time, the learner achieves the added benefit of not having to openly express him or herself in a situation in which he or she might not feel comfortable.

In summary, the following major categories of interaction are the principle ones which have been identified in the literature: learner-instructor, learner-learner, learner-content, learner-interface, learner-self, and vicarious interaction.

New categories of interaction

In looking at these and other types of interaction that are discussed in the literature, it seems that it has become the trend to consider all the activities in which a student or instructor may be involved in the process of participating in distance education, and to attempt to classify them into the current set of types of interaction. And if it turns out that an activity doesn't seem to fit into the current set, well, why not come up with a new category of interaction which includes it! As a result of this approach, the categories of interaction continue to grow.

However, there are some limitations with this approach to classification. First of all, this approach assumes that all activities involved in distance education are in fact

interactions. Second of all, the approach often confuses interaction with learning or instruction—all of which are different things. Not all activities which promote or lead to learning involve interaction, and likewise interaction does not necessarily presume learning as an outcome. From the standpoint of this discussion, which deals with pedagogical approaches for Internet-based distance education, and as identified in the critical attributes of interaction formulated earlier, we are interested in those types of interaction which lead to learning outcomes. It is the continuation of these assumptions which has led to the identification of categories of interaction such as learner-interface interaction or learner-technical support interaction. Finally and perhaps most critically, some of the types of interaction which have been identified under the traditional classification system do not meet the critical attributes of interaction which were described previously. In response to these limitations, I present a classification system including these types of interaction:

- Learner-instructor;
- Learner-learner; and
- Learner-self.

Learner-instructor

For this type of interaction, the previous description will be maintained; that is, interaction between an instructor and one or more learners.

Learner-learner

Likewise for this type of interaction, the new system will continue as described previously. In other words, this type of interaction includes interaction between two or more learners.

Learner-self

Following a principal constructivist viewpoint, all interaction which resulted in learning would in some sense involve learner-self interaction. This is because the fundamental act of learning involves the learner constructing knowledge for him or herself, often by examining previously held ideas and beliefs in light of new information and experiences, then adapting (or completely replacing) the old to accommodate the new (Driscoll, 2000). This process of examining ideas and incorporating new experience, if done as a conscious “self-debate” or analysis, is equivalent to the definition of learner-self interaction.

In that sense, some activities which have previously been considered to be categories of interaction, including learner-content and vicarious interaction, are in fact not types of interaction at all, but rather are types of activities which can serve as catalysts for learner-self interaction. Both learner-content interaction and vicarious interaction involve only one person, and one direction of information flow, and hence do not meet the critical attribute of interaction that it must be reciprocal. For this reason, in this new classification system these two types of activities are incorporated under the heading of learner-self interaction as suggested ways of encouraging learner-self interaction.

Naturally it is difficult for an instructional designer to plan for a learner to create meaning or to have learner-self interaction; rather, constructivist instructional activities are designed to provide learners with experiences which will encourage them to create meaning (Driscoll, 2000). Activities which require a learner to explore content, be it in the form of a textbook, a multimedia segment, or the record of a conversation between

learners in an Internet discussion forum, will encourage learners to examine their own ideas and develop new connections with them. In fact, the content which Sutton's (2001) "vicarious interactors" are exposed to can be useful to train learners to make conscious evaluation of their own ideas. When they are considering content such as an online discussion, whether watching it unfold live or reading the results of an asynchronous discussion, this content serves as a model for learners to use in developing their own mental arguments. In being presented with multiple viewpoints on an idea or issue, the learner has multiple opportunities to evaluate his or her own ideas, and "critically think about the possibilities beyond their initial perspective" (Peters, 2000a). In contrast, if a learner were reading an article from a book or journal, chances are only the viewpoint of the author would be presented in detail, and opposing viewpoints would be presented only inasmuch as the author felt that they could be refuted.

As a final thought on this topic, it is interesting to note that the authors who originally suggested both learner-content interaction and vicarious interaction recognize that for learners who are involved in those types of activities, the interaction is in fact taking place within the learner. For instance, Moore (1989) describes learner-content interaction as "the process...that results in changes in the learner's understanding, the learner's perspective, or the cognitive structures of the learner's mind...what Holmberg (1986) calls the 'internal didactic conversation' when learners 'talk to themselves' about the information and ideas they encounter in [content]" (p. 2). Sutton (2001) explains that the "vicarious interactor," a learner who is observing the interactions between teacher and/or students, "cognitively processes content while absorbing the interactions of others," making the learner "better able to structure and absorb course content" (p. 14).

Additionally, in relating interaction to learning, she cites Brandon and Hollingshead that “interaction with others leads to active processing of information by the individual, which in turn modifies the individual’s cognitive structures” (p. 10).

Instructional activities to promote interaction

Different types of interaction have different effects in terms of learner satisfaction (Fulford & Zhang, 1993; Sutton, 1999), learning outcome (Hirumi, in press; Kearsley, n.d.), and instructor preference (Soo & Bonk, 1998). For the purposes of this discussion, we will not attempt to resolve the issue of whether particular types of interaction are better for different instructors or learners under different circumstances. However, an instructor may, for a variety of reasons, want to incorporate a certain type of interaction into his or her instruction. To facilitate that purpose, I will now present a list of activities which an instructor might use in an Internet-based distance education course, arranged according to the types of interactions which were developed in the previous section. For the instructor who wants to include a certain type of interaction into his or her instruction, this list will provide general descriptions of activities which can be used as a guide for developing instructional activities. As a last note, it is important to recognize that the use of these activities does not guarantee that interaction will occur. Particularly with learner-self interaction, much of the outcome depends on the learners and on the support which is given to them by the instructor (Kearsley, n.d.; Peters, 2000a).

Activities for Learner–Instructor interaction

- Distance “lecture” or “demonstration” delivered by the teacher. In order for this to include interaction it needs to include opportunities for student questions and/or

responses. Also can involve learner-learner if students are allowed to respond to each other, and not just the instructor.

- Invite content experts, including faculty from the same department or authors of course texts (likely by e-mail) to participate as guest lecturers (Peters, 2000c). (See previous item.)
- Instructor-led “tour” of online resource or resources (most easily done synchronously).
- Virtual “office hours” or consultation between teacher and a student or students (Branon & Essex, 2001).
- Prior to a scheduled lecture or guest speaker, provide learners with a list of related readings and have them post questions based on the readings. The lecturer should then use those questions to structure the presentation, as a way of responding to the learners.
- Invite experts from the field to serve as mentors to students, either throughout the semester or on specific cases or projects (Peters, 2000c).
- “Twenty Questions”: The instructor gives the learners one clue, then the learners must ask clarifying questions to reach the complete answer (e.g. what a client wants in a project) (Eisley, 1995).
- “The Socratic Dialog”: The instructor asks a question, which one student answers; then the instructor asks another question, and another student answers; and so on (Eisley, 1995).
- “Guided discovery”: Rather than the instructor just giving the students the results of a particular research project, he or she tells them only the first thing that was learned.

The students then ask questions, and each time they ask a question which was raised and answered by the research, the instructor gives the results to them (Eisley, 1995).

- “Blind Man’s Bluff”: The instructor starts by asking an intentionally misleading question, and the students must ask questions to bring out the truth (Eisley, 1995).

Activities for Learner–Learner interaction

- Work in a team on a case study. This could also involve learner-instructor interaction by having the learners “interview” fictitious characters in the case (played by the instructor) (Peters, 2000c).
- Work in a team on a project, either a research project or a design/development project.
- Give learners a controversial topic related to class content for them to discuss. Require them to defend a position on an issue for the entire semester. Give students time to discuss what was learned and how. Later in the semester, require students to post a synthesis of postings from the semester (Peters, 2000c).
- Involve learners in a debate, assigning half the class to present a topic and the other half to present a rebuttal. Bonk and Cummings (1998) give reasons why this is particularly successful in asynchronous mode.
- Give learners an object (e.g. book or journal article; media such as video, photo, or image; sample computer program, etc.) and have them discuss the object as a group. This discussion can take the form of observation, analysis, synthesis—depending on the desired level of application for the learners.
- A variation: have learners work in small groups to critique objects (see previous item), then post their critiques to the public discussion area (Peters, 2000c).

- Another variation: give learners a document, asking them to indicate how they would improve it. Ask them to limit themselves to one or two comments until everyone has a chance to respond (Eisley, 1995).
- Another variation: have learners play roles such as discussion leader (who must start and continue contributing to a discussion), participant (who contributes, but in response to the leader(s)' postings), or monitor (who reads all posts and uses a specified rubric to evaluate the quality of the postings) (Galambos, 2001).
- Have one learner present an idea for others to consider (Bonk & Cummings, 1998).
- Have learners brainstorm "Letterman-like top ten lists" (Bonk & Cummings, 1998, p. 86).
- Have learners submit addresses of web sites with relevant information. Other learners then vote on their favorites, also providing reasons why they voted for particular sites (Bonk & Cummings, 1998).
- Have students engage in peer-tutoring activities, where a student tutor teaches a new idea or skill to another student (Peters, 2000b).
- Have learners post an idea of how they will implement a particular element learned in the course into future practice. Require each student to reply to other students' postings as well (Peters, 2000c).
- "The hot seat": the whole class asks one learner questions about something that learner has created (an essay, a multimedia element, etc.) (Eisley, 1995).
- Have learners work together to search for and collect data about a topic, then assemble the data into a database which can be searched by all learners. As a further

extension of the idea, have students in subsequent classes continue to add on to the data collection (Harris, 1994a).

- Have learners engage in a collaborative writing project, all working together to create one product (Harris, 1994b).
- “Sequential creations”: Have learners write or create a common object by having them add to it one at a time (Harris, 1994b).
- “Parallel problem solving”: Have groups of learners work independently to solve the same problem at the same time; then have all groups come together to discuss their problem-solving methods (Harris, 1994b).

Activities for Learner–Self interaction

- Have learners summarize information read or create an outline of a document, in an area where only they can access it (e.g. a “journal” space) (Bonk & Cummings, 1998).
- Have learners write a reflection on an experience or activity—perhaps an activity which involved a different type of interaction (Bonk & Cummings, 1998).
- Have students create a personal web page about their interests or ideas (Bonk & Cummings, 1998). Also can involve learner-learner if other students can (or are required to) view and post responses to those personal pages.
- Have learners create a personal study guide in preparation for an exam.
- Have learners respond to a poll or survey asking for their opinions on a subject (Kerka, 1996).
- Have learners create “interview” questions for an expert whose material is relevant (these questions do not necessarily have to be sent to the person). Have students read

about the person before formulating questions, and ask them to provide justification for their questions as well (Peters, 2000c).

- Have learners come up with definitions for a weekly list of key terms or concepts, in their own words. This could also involve learner-learner interaction if students then post their definitions to a public place for discussion (Peters, 2000c).
- Have learners participate “vicariously” in a discussion, either live (synchronous) or developing over time (asynchronous) (Sutton, 2001). Or assign students to read over a discussion which has already taken place and is no longer active.

Conclusion

This list of activities is not intended to be a comprehensive listing of all possible activities which can be used to promote interaction in online learning. Rather the hope is that these brief descriptions will help give the instructional designer insight into ways that they can be adapted for use in instruction. Through careful planning and experience, instructors will be able to help students have meaningful learning experiences through all the different types of interaction.

References

- Bonk, C. J., & Cummings, J. C. (1998). A dozen recommendations for placing the student at the center of Web-based learning. *Educational Media International*, 35(2), 82-89.
- Bonk, C. J., & Cunningham, D. (1998). Searching for learner-centered, constructivist, and sociocultural components of collaborative educational learning tools. In C. J. Bonk & K. S. King (Eds.), *Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse* (pp. 25-50). Mahway, NJ: Erlbaum.
- Bonk, C. J., & King, K. S. (1998). Computer conferencing and collaborative writing tools: Starting a dialogue about student dialogue. In C. J. Bonk & K. S. King (Eds.), *Electronic collaborators: Learner-centered technologies for literacy, apprenticeship, and discourse* (pp. 25-50). Mahway, NJ: Erlbaum.
- Branon, R. F., & Essex, C. (2001). Synchronous and asynchronous communication tools in distance education: A survey of instructors. *TechTrends*, 45(1), 36, 42.
- Davidson-Shivers, G., Tanner, E., & Muilenburg, L. (2000). Online discussion: How do students participate? Paper presented at the Annual Meeting of the American Educational Research Association, April 24-28, 2000.
- Driscoll, M. P. (2000). Constructivism. Ch. 11 in *Psychology of Learning for Instruction* (2nd ed.). Boston: Allyn & Bacon.
- Eisley, M. E. (1995). *Notes on instructional and performance technology* (4th ed.). Nampa, ID: Solnote Publishing.

- Fulford, C.P., & Zhang, S. (1993). Perceptions of interaction: the critical predictor in distance education. *The American Journal of Distance Education*, 7(3), 8-21.
- Galambos, D. (2001). Transforming Online Discussions: Getting the H.O.T.S.! Paper presented at the 2001 WebCT Users Conference, June 23-27, 2001. Retrieved February 18, 2002 from <http://www.sheridanc.on.ca/academic/edserv/wct2001.htm>.
- Goldberg, M. (n.d.). Synchronous vs. asynchronous: Some thoughts. *Online Teaching and Learning Newsletter*. Retrieved from <http://www.webct.com/service/viewcontentframe?contentID=2339346>.
- Harris, J. (1994a, March). Mining the Internet: Information collection activities. *The Computing Teacher*, 32-36.
- Harris, J. (1994b, April). Mining the Internet: "Opportunities in work clothes": online problem-solving project structures. *The Computing Teacher*, 52-55.
- Hillman, D. C., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: an extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education*, 8(2), 30-42.
- Hirumi, A. (in press). The design and sequencing of eLearning interactions: a grounded approach. *International Journal on E-Learning*. Retrieved February 11, 2002 from <http://elearning.inst.cl.uh.edu/elearning/interactions.html>.
- Jonassen, D. H., Davidson, A., Collins, M., Campbell, J., & Haag, B. B. (1995). Constructivism and computer-mediated communication in distance education. *The American Journal of Distance Education*, 9(2), 7-26.

- Kearsley, G. (n.d.). Tips for training online instructors. Retrieved April 24, 2002 from <http://home.sprynet.com/~gkearsley/Oltips.htm>.
- Kearsley, G., & Schneiderman, B. (1999). Engagement theory: a framework for technology-based teaching and learning. Retrieved April 24, 2002 from <http://home.sprynet.com/~gkearsley/engage.htm>.
- Kerka, S. (1996). *Distance Learning, the Internet, and the World Wide Web*. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education. (ERIC Document Reproduction Service No. EDO-CE-96-168)
- Moore, M. G. (1989). Editorial: three types of interaction. *The American Journal of Distance Education*, 3(2), 1-6.
- Peters, K. M. (2000a, April). Creative use of threaded discussion areas, part 1. *Online Teaching and Learning Newsletter*. Retrieved from <http://www.webct.com/service/viewcontentframe?content=898084>.
- Peters, K. M. (2000b, April). Creative use of threaded discussion areas, part 2. *Online Teaching and Learning Newsletter*. Retrieved from <http://www.webct.com/service/viewcontentframe?contented=898085>.
- Peters, K. M. (2000c, December). Concrete steps for on-line discussion, part 3. *Online Teaching and Learning Newsletter*. Retrieved from <http://www.webct.com/service/viewcontentframe?contented=2711014>.
- Scheel, N. P., & Branch, R. C. (1993). The role of conversation and culture in the systematic design of instruction. *Educational Technology*, 23(8), 7-18.
- Shotsberger, P. G. (2000). The human touch: Synchronous communication in web-based learning. *Educational Technology*, 40(1), 53-56.

- Soo, K., & Bonk, C. J. (1998). Interaction: What does it mean in online distance education? Paper presented at the ED/MEDIA/ED-TELECOM 98 World Conference on Educational Multimedia and Hypermedia & World Conference on Educational Telecommunications, Freiburg, Germany.
- Sutton, L. A. (2001). The principle of vicarious interaction in computer-mediated communications. *International Journal of Educational Telecommunications* 7(3), 223-242.
- Sutton, L. A. (1999, September). Vicarious interaction in computer-mediated communication: Comparative impact on student achievement and satisfaction. Paper presented at the 16th Annual Arizona Educational Research Organization Conference, Flagstaff, Arizona.
- Wagner, E. D. (1994). In support of a functional definition of interaction. *The American Journal of Distance Education*, 8(2), 6-29.