

Interactivity in Distance Education and Computer–Aided Learning, With Medical Education Examples

M**D. John Doyle***Cleveland Clinic, USA***Patrick J. Fahy***Athabasca University, Canada*

INTRODUCTION

Webster's Revised Unabridged Dictionary defines interaction as: 1. intermediate action, 2. mutual or reciprocal action or influence; as, the interaction of the heart and lungs on each other. The *Oxford English Dictionary* defines interactivity as reciprocally active, allowing a two-way flow of information between source and user, responding to the user's input. This is the view advocated by many observers (Wagner, 1994; Wagner, 1997; Anderson, 2003). Notes Anderson: "Simply stated, interactions are reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another" (p. 8). The concept of "interaction" in education and training varies with subject domain (e.g., philosophy versus physics), with format (e.g., conventional versus distance education) and with other factors. Although the term is frequently overused and poorly understood, the notion of interactivity remains important and useful, and is especially topical given the availability of technologies designed to support advanced interactivity.

BACKGROUND

In his book *The Art of Interactive Design*, Crawford (2002) discusses the notion of interactivity in terms of a conversation: "a cyclic process in which two

actors alternately listen, think, and speak," and notes that the "quality of the interaction depends on the quality of each of the subtasks (listening, thinking, and speaking)." This model of interactivity avoids some of the pitfalls associated with some definitions offered in the past.

As noted above, educators place considerable importance on interactivity in learning (Anderson & Garrison, 1995; Fahy, 2005; Garrison & Cleveland-Innes, 2005; Lapadat 2007, Faghihi et al., 2016). Well-designed interactivity can help capture the learner's interest, has the potential to speed learning, and allows for continuous assessment of the degree to which the material is mastered. Technology (at least theoretically) can allow for high-quality interactivity by providing for frequent and relevant user feedback, by recognizing when students misunderstand a concept, and by providing aids such as animations or graphs that vary with user input. However, badly designed interactivity can also impede student progress, suppressing, or making more difficult, program flexibility and learner independence (Burbules & Callister, 2000; Faghihi et al., 2016) (*vide infra*).

The importance of interactivity in learning is illustrated by the fact that a number of journals address this topic. For instance, the *Journal of Interactive Learning Research* (JILR) publishes manuscripts dealing with "the underlying theory, design, implementation, effectiveness, and impact on education and training of the following interactive learning environments," including such varied

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topics as “authoring systems, cognitive tools for learning computer-assisted language learning, computer-based assessment systems, computer-based training, computer-mediated communications, computer-supported collaborative learning, distributed learning environments, electronic performance support systems, interactive learning environments, interactive multimedia systems, interactive simulations and games, intelligent agents on the Internet, intelligent tutoring systems, microworlds, virtual reality based learning systems,” and anything else related to these.

In this review, we will discuss interaction in distance education and training, with an emphasis on medical education. Since educational technologies are often used to support interactivity, an important theme will be how technologies can support or impede interaction.

Interaction in Publication

Few would argue that published documents form a very important component in education. Stevan Harnard (1992) has emphasized that electronic publication provides a dimension of interactivity in document publication that is radically new. While online journals are still in evolution, and the form they will ultimately take – combining reader access with content credibility and publisher concerns – is still being determined, there can be little doubt that online journals are here to stay.

Interaction in Distance Education

One simple definition of “distance education” is that it is the delivery of instruction that does not require the student to be present in the same location as the instructor. What then is “interaction” in distance education? We suggest that it is a generic or broad term, covering all manner of notions of amplification, appraisal, clarification, commentary, communication, exploration, feedback, involvement and participation in the context of an educational exercise.

In more concrete terms, interactivity may be based on, or supported by, communication technologies such as the telephone, e-mail, instant messaging, or computer conferencing, as well technologies such as computer-based simulation. As such, it may be hard to define the concept of interaction precisely. Regardless, the notion of interaction should become clearer as the reader reads on.

Finally, it should be noted that although many individuals (e.g., Gilbert & Moore, 1998) use the terms “interaction” and “interactivity” interchangeably, some authors draw a distinction between the two. For example, Wagner (1994, 1997) defines “interaction” in terms of an interplay of behaviors in which individuals and groups influence each other, while “interactivity” is defined in terms of real-time characteristics of technological systems.

Importance of Interaction in Distance Education

Moore & Kearsley (1996) describe three types of interaction within distance education. McIsaac & Gunawardena (1996) add a fourth type, which takes into account the interaction that occurs when a learner must use educational technologies as part of the learning process. In these descriptions, students in a distance education “learning environment” are thus said to interact variously with the instructor, the content, the technology, and with other students.

In addition to these four forms of interaction, further distinctions must be made between instantaneous (“real time”, “synchronous”) and delayed (“asynchronous”) interaction, as well as between “same-place” and “different-place” interaction. Generally speaking, delayed and different-place interaction offer the student more flexibility and opportunities for thought and reflection, while immediate and same-place interaction, some would say, may allow for a greater sense of spontaneity, impulsiveness and even exhilaration.

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