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The Role of Interface Elements in Web-Mediated Interaction and Group Learning:
Theoretical and Empirical Analysis

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ABSTRACT

The Web has increasingly become an important avenue of the learning community; nonetheless, it is wanting in terms of effective interaction among learners. This paper posits that a well-designed user interface will capably address limitations of Web-based learning, and enhance team interactions and learning outcomes. It reports on an experiment that investigated the effect of interface elements on a set of interaction processes, attitudes, and learning outcomes. Availability of interface elements to engage and evaluate learning was found to promote participation, trust, and cooperation among learners. How these process variables impacted outcome variables, as intervened by attitudinal factors, was analyzed using structural modeling. Our analysis provided support to a theoretical model that causally links four sets of variables: input (interface elements), processes, attitudes, and learning outcomes. The paper expounds on the implications of the findings, which have significant importance with respect to the emerging issues in Web-based learning.

Keywords: interface elements; Web-based learning systems; Web-mediated interaction

INTRODUCTION

There is a pressing need to gain greater understanding on the role of Web-based systems in enhancing group communication. This effort has required the convergence of several fields of research toward a broader scope of information systems; some examples include educational psychology, communication, social psychology, and so forth. This paper focuses on Web-based group learning. Indeed, technology-mediated learning takes

many forms, of which the emerging concept of virtual learning deserves intense research attention. Virtual learning environments are "open systems that allow for participant interaction through synchronous or asynchronous electronic communication" (Piccoli, Ahmad, & Ives, 2001, p.409). The Web has increasingly become an important avenue of the learning community and sometimes a learner's sole interface with other team members. It can augment communication among instructors and learners by making interactions more accessible and continuous throughout the learning process. With the advent of networked technologies such as asynchronous learning networks (Hiltz, Coppola, Rotter, & Turoff, 2000), Web-based learning is a unique combination of temporal and spatial independent activities that will result in new pedagogical paradigms.

Learning is fundamentally a function of the context, activity, and culture in which it occurs. Yet, most technological systems are generally opaque to social information. The new collaborative learning paradigm should ideally incorporate different configurations that restructure knowledge to meet the new academic demands. Research should not only focus on the technological systems but also the socially-based process of learning appropriation. This includes the opportunity for interactive processes to construct and maintain mutual understanding (Alavi, Wheeler, & Valacich, 1995). The characteristics of face-to-face communication change remarkably when we move into cyberspace interaction. Unlike traditional learning models, the Web lacks certain aspects such as physical interaction among learners. User interface with essential elements can potentially overcome some limitations of Web-based learning by engaging learners in their learning process. While studies have investigated the patterns of the use of Web-mediated systems (Kraut, Mukhopadhyay, Szczypula, Kiesler, & Scherlis, 1998), they do not address the processes through which teams make sense of their learning experiences.

Web-based activities may be increasing at a phenomenal rate, but research on Web-based teams lags behind. Despite the growth of Web-based systems, there are few conceptual frameworks for interface design elements in facilitating group learning. This provides the motivation of the current study to examine how Web interface elements can influence group learning in terms of behavior and outcomes. Building on previous empirical and theoretical research on the use of distributed technologies, Web-based interaction is investigated in the context of higher level education. To gain a better insight into Web-based learning, we seek to address two key research questions: (1) Are interaction processes enhanced by the type of Web interface elements available? (2) To what extent are (social and technical) attitudes influenced by interaction processes and how do these attitudes influence perceived learning outcomes?

These questions are addressed by comparing the effectiveness of different elements of Web-based interface, and the consequential impacts of these elements on a set of group processes and outcomes. Drawing on literature in commu-