Collaborative Tele-Learning Issues and Observations

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INTRODUCTION

Teamwork is a fact of modern organizational life. College graduates are expected to be able to work productively in teams. The ubiquity of information and communications technologies, particularly the Internet, has contributed to the globalization of education as well as business (Adam, Awerbuch, Slonim, Wegner, & Yesha, 1997), and has added a challenging dimension to the management of teamwork. Specifically, it poses the question, "How can *remote* team members collaborate effectively?" With access to the Internet and communication technologies, students can now engage in activities that require remote team collaboration. Thus, it is important to understand the issues associated with creating a learning environment in which university students might best learn to be productive and effective team members in a remote collaborative setting.

Some of the important issues that have emerged through current research and experimentation revolve around four factors: task, process, time and technology. Questions related to these issues include: What task characteristics are most amenable to collaborative learning? What aspects of the collaboration process address the challenges of remote project management, foster sound decision making, and encourage project buy-in and motivation for students through the social opportunity to "meet" and communicate electronically with peers from other colleges and/or universities? The concept of building social communities is an important aspect of successful learning in a remote collaborative setting (Bruckman, 2002). How does time affect the choice of technology? For example, do students involved in a remote collaboration project require synchronous or asynchronous technologies? Synchronous technologies support simultaneous participation of all learners and instructors at distributed locations in real time and include immediate, two-way communication between participants. Asynchronous technologies do not require real-time, simultaneous participation of learners and instructors and support anytime, anyplace collaboration. Lastly, what technologies work best (and under what circumstances) for remote team collaboration among students in a university setting? We address these issues and attempt to answer these questions in this article.

BACKGROUND ON COLLABORATION AND LEARNING

The concept of technology-mediated collaborative learning has intrigued educators for quite some time (Acker 1995; Nunamaker, Appelgate, & Konsynski, 1996). Many authors have demonstrated how collaborative learning is a powerful and desirable way to improve the quality of education (Alavi, 1994) and that collaborative learning is enhanced when the learning partners bring different perspectives to a problem or topic (Alavi, Wheeler, & Valacich, 1995). Godhale (1995) observed that collaborative learning promotes critical thinking because of the diversity of views and experiences brought to the task. He found that students who participated in collaborative learning had performed significantly better on critical-thinking tests than students who studied individually. Rau and Heyl (1990) found that the social dimension of collaborative learning motivates learning. These results are in agreement with the learning theories proposed by proponents of collaborative learning (Vygotsky, 1978).

A look at some of the issues that have surfaced in business settings to encourage "learning organizations" through the effective implementation of team work sheds light on team development process factors to consider when forming collaborative work teams.

One of the most important facets of the collaborative process is forming teams so that the probability

of success is maximized. For example, Field (2001) conducted a longitudinal empirical study of the sustainable quality performance gains following the introduction of production work teams. She found, as did others (Leana, Locke, & Schweiger, 1990; Wageman & Baker, 1997; Wagner, 1994) that a common deterrent to successful team collaboration is conflict among team members. However, there are multiple dimensions to conflict, including relationship, task and process conflict. Relationship conflict involves difficulties with interpersonal relationships. Task conflict arises from difficulties with the content and/or goal of the team's collaboration. Process conflict revolves around how the task is to be accomplished. Ironically, they found that task and process conflict, if properly channeled, can be beneficial to team performance because the conflict heightens the potential richness of solutions resulting from the diversity of input achieved through team collaboration. Channeling task and process conflict involves shifting the emphasis from the conflict itself to incorporating the heterogeneity of perspectives into the problem-solving and decision-making processes. With moderate levels of task or process conflict, a team can succeed if there is little or no relationship conflict. Pronounced relationship conflict, however, leads to significant degradation in team performance (Amason, 1996). There are techniques to reduce the degree of relationship conflict (Lau & Murnighan, 1998). Ideally, however, studies have demonstrated (Field, 2001; Weingart, 1997) that it is best to form teams with the objective of minimizing or preventing relationship conflict while capitalizing on the potential learning opportunities afforded by moderate task and process conflict.

TECHNOLOGY TO SUPPORT COLLABORATIVE TELE-LEARNING

The pervasiveness of information and communications technology in university environments has encouraged experimentation with a variety of media to test theories about collaborative learning in an attempt to enhance the learning experience for university students. The challenge is to discover ways to enable "quality" learning through team collaboration via use of information and communications technology. Burgoon, Bonito, Bengtsson, Ramirez, Dunbar and Miczo (2000) discuss the effect of the design and adoption of communications technologies on the quality of collaborative work.

A number of computerized collaboration support environments have been used in business for quite some time. Group authoring and design tools (Jarvenpaa, Srinivasan, & Huber, 1988), group decision support systems (DeSanctis & Gallupe, 1985), computer conferencing and groupware products such as Lotus Notes™ and electronic mail (Ellis, Gibbs & Rein, 1991) are among the dominant computer tools designed to facilitate human communication. Table 1 summarizes issues associated with collaborative tele-learning that have surfaced in the literature and technologies that have emerged to address these issues.

Choosing the most effective electronic medium to enable collaborative learning depends on a number of factors, not the least of which is availability of the selected technology. Gay and Lentini (1995) outline the constraints associated with classes of communication resources for use in a networked collaborative environment.

For example, video conferencing primarily supports conversation among participants and allows presentation of objects and artifacts in real time. Chat boxes and video white boards can be received simultaneously or be separated by other activities. Electronic messages such as e-mail can be reviewed and revised, but lack the feeling of being in direct contact with another individual or group. Daft and Lengel (1986) recommend selecting a channel that most effectively reduces uncertainty and equivocality of communication. McCarthy and Monk (1994) insist that extra channels for communication are reassuring and psychologically important.

A variety of applications of student team collaboration using electronic media to support or augment learning is cited in the literature. For example, Gay and Lentini (1995) describe an exploratory study to examine student use of a prototype networked collaborative environment to support learning about engineering design. The study examined student use of multiple communication resources to augment activities in a three-way group collaboration. They found that students used different channels for a variety of activities to increase depth of communication, increase breadth of communication and overcome technical difficulty. For the particular task of engi-