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Learning Effectiveness of Cross-Cultural Virtual Teams

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ABSTRACT

The networked economy has left behind the familiarity of traditional face-to-face teams, enabling individuals to work in virtual teams which are often separated by geographical and cultural boundaries. Global virtual teams are culturally diverse work groups, whose members communicate electronically, being assembled on a temporary basis for the duration of a task. While virtual teams have radically increased in the business environment, the proliferation of distributed systems has also enhanced virtual collaboration in the educational field. The issue of cross-cultural communication becomes fundamental as learners involved have significant communication norms that are distinct across cultures. This paper explores the challenges of effective learning by examining cross-cultural communication in technology-mediated groups. We highlight a set of propositions delineating cross-cultural and media impact on learning outcomes. Cultural dimension of individualism-collectivism and media characteristic of social presence are found to influence outcomes such as performance, participation, and cognitive engagement.

Keywords

Cross-cultural communication, social presence, virtual teams, learning outcomes.

INTRODUCTION

The increasing globalization of learning activities has led to the emergence of environments in which intercultural cooperation and competition prevail. The growth of telecommuting has also encouraged virtual teaming (Vogel et al., 2000; Lipnack and Stamps, 1997). Educational institutions are preparing their students, the future knowledge workers, for the knowledge-based economy. The educational sector has to go 'virtual' to meet growing demands for training and learning, with the scarcity of financial and infrastructure resources (Aggarwal and Bento, 2000). Virtual teams use technologies such as desktop videoconferencing and Internet/Intranet systems in addition to those used in traditional teams (e.g., email, teleconferencing). Learners can use the Internet to access remote learning materials and communicate with instructors and other learners, without having to be online at the same time. Intranets can also help to streamline socialization of new members with quick and easy retrieval of archived information, video and audio recordings. Communication technologies allow instructors and learner to cooperate asynchronously while focusing on a common learning task. Asynchronous communication tools are critical for team coordination (Hiltz et al., 2000). The coordination-oriented technology helps provide the means to enable and intensify interactions in executing decisions or planning tasks (Harasim et al., 1995). These efforts in technological innovations have created opportunities for globally spanning learners to transcend time, space, and cultural boundaries.

With lowered costs and greater convenience, virtual learning teams can benefit from the heterogeneity of cultural background and experiences in addition to the homogeneity of interests and intellect of the team (Ives and Jarvenpaa, 1996). Cultural diversity is often a source of strength for the virtual teams as it generates better insight and ideas compared to their traditional counterparts (DeSanctis et al., 2001). Technologies have encouraged more cross-cultural communication. At the same time, a high degree of socio-emotional content observed in computer-mediated communication reflects the inherent communication and cultural characteristics of learners (Rice and Love, 1987). Understanding media characteristics such as social presence in cross-cultural communication is necessary with the advent of technological systems with features that could enhance distributed learning.

This study investigates which type of cross-cultural influence is the most effective for learning. By assessing cultural effects across important moderators such as social presence, we aim to provide insights into the circumstances under which learning effectiveness in virtual teams is contingent upon. The next section reviews the literature on related theories and concepts. Section 3 describes the propositions developed as part of an ongoing study to understand the effects of cross-cultural

communication and media on learning outcomes. Section 4 provides an overview of a preliminary experiment, followed by a discussion of the importance and implications of the study.

CONCEPTUAL FOUNDATIONS

Virtual teams in the education sector have their own unique characteristics. Previous research studies on the benefits and opportunities offered by networked technologies have shown positive results on individual and team performance (e.g., Alavi, 1994; Leidner and Fuller, 1996; Tyran, 1997). Most of these studies are built on theoretical foundations such as constructivism, cooperative learning, social interdependence, and situated learning. These sources of theories have highlighted important concepts from pedagogical theories in educational research, media theories in communications research, and group interaction theories in social psychology research (Hiltz et al., 2000).

Pedagogical theories that have influenced research in networked technologies consider approaches of objectivism and constructivism as the two extremes of a bipolar continuum. The objectivists, adopting an instructor-centered approach, believe in the objective transfer of knowledge from instructor to learner. The constructivists, adopting a learner-centered approach, believe in the active construction of knowledge by each learner via discovery, exploration and experience. E-learning, bearing similarities with e-commerce, is becoming "customer-oriented" with the shift of instructor's role from "sage on the stage" to "guide on the side". Web-based technologies allow more "knowledge-building" communities across different cultures to be formed for cooperative learning (Aggarwal & Bento, 2000). Under constructivist paradigm, heterogeneous cultural composition of virtual teams draws attention to the issue of cultural difference as a significant component of effective learning.

Media effects theories, such as media richness and social presence, highlight several characteristics of media that help in the development of networked technologies. According to the media richness theory, media vary by their ability to support task uncertainty and equivocality (Daft and Lengel, 1986). Task requirements that are matched to the medium's ability to convey information can help improve performance (Burke et al., 1999). While communication effectiveness does not always guarantee better performance, media characteristics that correspond to information content and context may result in improved outcomes (Trevino et al., 1987). One important characteristic of media, particularly in the context of virtual teams, is the degree of social presence. The social presence theory has been applied to computer-mediated communication in account of cues pertaining to interpersonal communication. Both the media richness and social presence theories concur with the possibility of media characteristics hindering relationship development, although some studies have found communication to be influenced by context and setting (Ngwenyama and Lee, 1997; Zack, 1993).

Group interaction theories can also be applied to virtual learning communities. The Time, Interaction, and Performance theory (McGrath and Hollingshead, 1994) describes groups as complex, multi-functional and multi-modal social systems that engage in multiple interdependent projects. Groups of learners, regardless of their cultural backgrounds, are required to perform inter-related learning tasks to meet educational goals. This theory seems to suggest that virtual teams need to engage in all group functions and modes (McGrath, 1991) to prevent negative impacts on group performance. The technological and environmental uncertainty may limit the group's functions and modes (Jarvenpaa et al., 1998). However, one objective of using networked technologies is to achieve a collective intelligence during the learning process. A suitable collaborative system allows learners to accumulate knowledge, and associate information to other fields. Although face-to-face is a rich learning medium, we believe that appropriate technological systems can potentially help perform pedagogical activities.

Several group process models have been discussed in the literature. The social interdependence theory (Johnson and Johnson, 1989) provides a conceptual framework for cooperative processes. The underlying premise for this theory is that the type of interdependence in a learning situation determines how individuals interact with one another, which in turn affect the group processes in a community. There is social interdependence when individuals share common goals, and actions of one another affect individual outcomes. In particular, positive interdependence can be structured into learning by incorporating interdependence in task, deliverable, resource, role, and reward (Aviv, 2000). Several learning theories, such as collaborative learning, have used social interdependence theory to explain the influence of interdependent interactions on learning. However, it is important to note that group process models in the literature are derived from studying traditional face-to-face learning groups. Applying traditional models to study virtual teams might violate the premises in the foundation of these models. In a virtual learning team, individual decision-making has to be integrated explicitly with group problem solving to understand the learning processes enabled in each medium. Therefore, new theories and models of learning have to be generated in view of cross-cultural communication. So far, only a few studies have compared groups from the same cultural background with groups from varied cultural backgrounds using different communication media (Anderson and Hiltz, 2001).

National Culture

As more educational organizations expand beyond geographic boundaries and distance learning becomes pervasive, the cultural dimension has to be considered in information systems theories. We define culture as the collective characteristics of the beliefs and behaviors that distinguish a particular group of people from another (Earley, 1993). As individuals of the virtual team may come from different national cultures, communication and learning behaviors may vary according to the composition of members. Each culture can be viewed as a set of shared values that members have developed to cope with adaptation and integration, and to acknowledge these beliefs as valid and the correct way to perceive and think. Culture can also be seen as the collective mindset of people who inhabit the same social environment, thus affecting the interpretation of communication between instructors and learners.

Although the concept of culture is multidimensional, individualism-collectivism has been used as a major dimension to distinguish learning styles. The *individualism-collectivism* dimension refers to the tendency to focus on the needs of self as opposed to community and society. It is the extent to which a society believes people should remain independent from groups, and captures the relative importance learners place on shared educational interests. Cultures characterized by high individualism promote individual identity (Hofstede, 1980). Learners tend to have opinions independent of the groups to which they belong. The school management plays the role of coordinating individual efforts to achieve collective goals. Countries where individualism is strong include United States and Australia (Hofstede, 1980). Conversely, collectivistic cultures are group-oriented. People are trained to adhere to the group since the interests of the group will take precedence over that of the individual. Instructors place a high priority on the maintenance of harmonious group relationships. Countries with a high group orientation include countries such as Singapore and Hong Kong (Hofstede, 1980). They believe in centralization of learning by transferring knowledge from instructor to learner, as opposed to individualistic cultures who believe in empowering learners. The distinction between individualism and collectivism is the level of independence (Hofstede, 1991). For collectivistic cultures, personal relationship prevails over task. Learners in individualistic cultures may perceive pedagogy differently from their collectivistic counterparts, and tend to adopt different strategies to learning. Thus, we suggest that the predisposition toward learning is systematically influenced by individualistic or collectivistic values that dominate a learner's culture.

Specific cultural composition of learners in a team may have more pronounced magnitude of learning effects than others. In particular, real life learning may be better for certain individualistic-collectivistic composition of learners. While it may seem that certain cultural mix will tend to use rich communication technologies and others will prefer lean forms of technologies, field studies and experiments by Massey et al. (2001) found significant cultural differences in the perceptions of task-technology fit, and that culturally driven communication behaviors can be both enabled and hindered by groupware technology. Hence, effectiveness of cross-cultural learning is contingent upon media characteristics.

Social Presence

Social presence refers to the degree of salience of the other learner in the interaction, and the consequent salience and immediacy of the interpersonal relationships (Short et al., 1976). The level of social interaction that people are accustomed to is often reduced in technology-mediated communication. Effectively communicating at a distance requires virtual teams to replace lost context in their communication. Despite more equitable collaboration and open team dialogue as a result of fewer physical cues associated with status or position, self-doubt and abrasive curtness may occur with the loss of authentic psychological encounter when two people share similar physical space. Social presence is an important concept since the isolation and alienating experiences of learners communicating online, when compared to the traditional face-to-face experiences, may directly relate to learning effectiveness. In most studies, the degree of social presence refers to the feeling that other learners are jointly involved in the communicative interaction, and is likely a communicator's perception of a medium's capabilities than a medium's attribute (Walther and Burgoon, 1992). The social presence theory predicts linear educational benefits from the use of technologies transmitting more verbal and nonverbal cues. Verbal cues include all aspects pertaining to vocal messages, such as voice tone and loudness, as well as rate and diction of speech (McGrath, 1991). Nonverbal cues and visual cues refer to static cues such as seating positions, and dynamic cues such as nods and frowns. There are several approaches to the creation of social presence. For example, a synchronous chat facility may enable real time communication and expression. Video-conferencing creates a sense of social presence by engendering higher levels of intimacy and immediacy. Improved perceptions of social presence may come from better interaction and conversation in mediated communication, especially when the learners come from different cultural backgrounds.

In the context of a learning environment, the social presence theory centers on social relations of individual learners during collaboration. Some studies of group dynamics in educational context (e.g., Gunawardena and Zittle, 1997) have found the content of computer-mediated communication to support expressions of feeling, humor, compliments and greetings.

Depending on the technology, the amount of social interchange among learners may be increased, and improved perceptions of social presence may directly affect pedagogical processes. In some cases, no significant differences for communication medium were observed in culturally homogeneous groups (Ho et al., 1989). In other cases, media effects have been found (e.g., Burke et al., 1999; Turoff and Hiltz, 1982). The availability of visual and acoustic information may determine a learner's perception of their peers. The paucity of social context cues makes it difficult to embellish meaning (Markus, 1994). While studies tend to indicate that social presence is highly correlated with favorable learning outcomes, interaction patterns should be structured to overcome the potential lack of social presence of the medium.

Learning Outcomes

Learning is a complex phenomenon influenced by the working environment and processes to optimize learning effectiveness. The traditional indicator of learning achievement is the performance of learners on tests. Moving beyond the limited perspective of grades, the effectiveness of a virtual learning team should be examined by other outcomes that represent interaction and involvement of learners. Past findings provide evidence that communication technologies improve learning from different aspects such as the social dimension (Wegereif, 1998), interactivity or responsiveness (Harasim et al., 1995), reasoning, and metacognitive processes (Henri, 1991). Adopting Webster and Hackley's (1997) technology-mediated learning outcomes and Leidner and Jarvenpaa's (1995) taxonomy of learning, we examine learning performance, retention, participation, attention, and cognitive engagement as educational outcomes related to cross-cultural virtual teams.
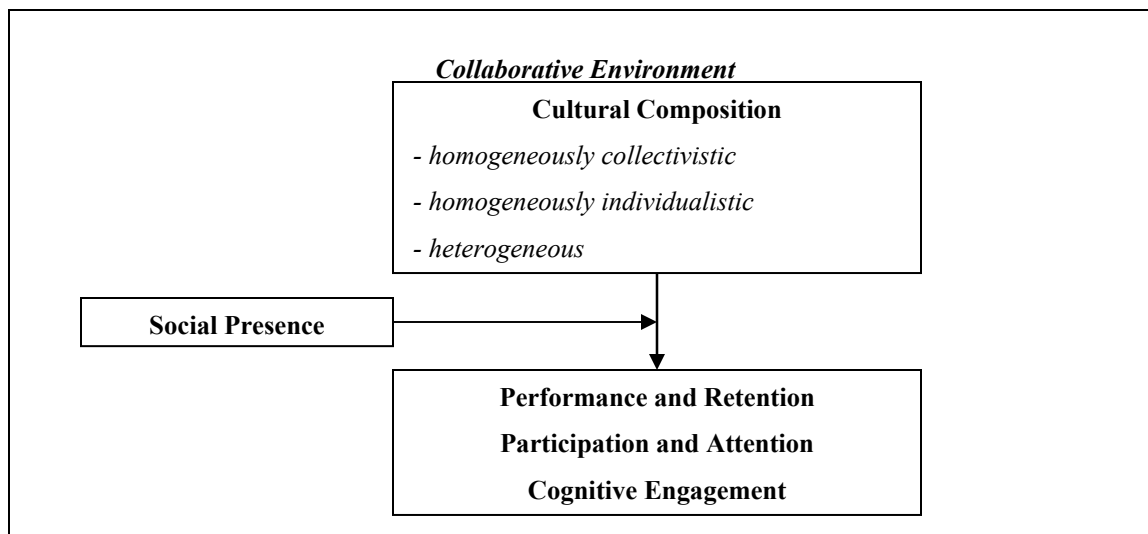
Learning performance and retention is a surrogate measure of the extent of learning in terms of the knowledge acquired and retained by learners. Academic performance is usually measured on a final examination to determine increases in learning. A learner displays skills and knowledge of solving problems in examinations, which are used as indicators of knowledge mastery, as well as measures of synthetic problem-solving ability. Knowledge retention, on the other hand, refers to the performance on a follow-up exam, usually the same exam as the first one, given some time after the completion of the instructional program. This outcome supplements academic performance by reinforcing that knowledge acquired by the learners is retained at least for a certain amount of time.

The social interdependence theory suggests that cooperation leads to greater responsiveness (Johnson and Johnson, 1989). Successful learning and collaboration generate active involvement of learners (Alavi, 1994). This level of involvement can be measured by the *participation and attention* of team members. Participation refers to the amount of verbal participation, and attention is a measure of nonverbal participation (Leidner and Jarvenpaa, 1995). It models the responsiveness, cooperation, and content-relevant communication between learners (Aviv, 2000). Social psychological literature suggests evidence that group-based learning shows superiority beyond the dominance of a problem solver. In the case of virtual teams, learning optimization requires the learners to be actively participating in the learning process. Eliciting participation and attention in virtual teams is particularly important because it is interdependent with performance.

Cognitive engagement signifies the degree to which a learner is interested in learning, and motivated by a particular method (Webster and Hackley, 1997). It refers to the processes by which the underlying needs or desires are energized. This learning outcome represents level of interest of learners, characterized either by the desire to display deep-seated personal investment in a targeted field, or a transitory and short-lived interest within an immediate situation. If a learner crosses the threshold into full engagement during the learning process, a change in the feeling of being outside to that of being a part of the community is observed (Wegereif, 1998). A cross-cultural interaction that is engaging has positive effects as it facilitates learning (Webster and Hackley, 1997). The variables in this study are summarized in Figure 1.

LEARNING EFFECTIVENESS ACROSS CULTURES

The type of cross-cultural communication can be intracultural (among learners with same cultural background) and intercultural (among learners with different cultural backgrounds). In this study, we compare learning effectiveness in various types of cross-cultural communication, moderated by social presence. As discussed above, there are four dimensions of national culture, among which we will focus on individualism-collectivism. We classify the cultural composition of learners as homogeneously individualistic (I-I), homogeneously collectivistic (C-C), and heterogeneous (I-C). Homogeneously individualistic communication comprises of a group of dispersed learners from individualistic cultures communicating with one another. Homogeneously collectivistic communication consists of learners from collectivistic cultures. Heterogeneous communication includes learners from individualistic cultures communicating with learners from collectivistic cultures. The impacts of the type of cross-cultural communication are considered with respect to the learning outcomes.

Figure 1. Research Framework of Cultural Composition's Impact on Learning Effectiveness and Moderating Effects of Social Presence

Performance and Retention

Learning performance is usually the most important outcome in the application of information technologies on education because learning is essentially a process of reasoning and critical thinking that is reflected by knowledge mastery. A learner's individual accountability, the "sense of personal responsibility for completing one's share of the work and contributing to the work of the group" (Aviv, 2000), contributes to a higher level of reasoning, as it prevents learners from relying on others. More superior reasoning strategies attained during the learning process may lead to greater academic performance, and result in better knowledge retention. In a heterogeneous academic environment, learners may achieve more in cooperative interaction (Johnson and Johnson, 1989). For individualistic cultures, the candid and independent learners tend to emphasize on individual achievement, accountability, and responsibility in completing one's share of the work (Stata, 1992), enhancing performance and knowledge retention. For collectivistic cultures, although collectivism does not degrade responsibility, it may not ultimately take an individual to account for the group's decision. Thus, high mutual dependence of collectivistic learners may create less positive outcome on performance and retention. We predict that learners have a higher level of reasoning in a homogeneously individualistic communication, and hence lead to better academic achievement. During heterogeneous communication, learners from individualistic cultural context may contribute more reasoning strategies than those from collectivistic cultural context. The impact on learning performance and retention during such communication is likely to be between that of homogeneously individualistic communication and that of homogeneously collectivistic communication.

Proposition 1.1: (Performance and Retention: I-I > I-C) *Learning performance and retention will be greater for learners in homogeneously individualistic communication than for learners in heterogeneous communication.*

Proposition 1.2: (Performance and Retention: I-C > C-C) *Learning performance and retention will be greater for learners in heterogeneous communication than for learners in homogeneously collectivistic communication.*

Participation and Attention

An effective outcome of web-mediated teams is a high extent of participation among learners. Understanding the interactions that lead to particular responses provides insight into how we can improve dialogues in learning networks. Some decision-making software allow for anonymity and loss of distinction among members' social and expert status, leading to greater participation. This participation can be verbal or nonverbal involvement in the interaction (Leidner and Jarvenpaa, 1995). During the learning process, a learner communicates with other peers by receiving and responding to information, with strategies to continue the discussion thread. Some team members may get frustrated as they cannot get immediate responses from their colleagues. A high degree of involvement can be fostered by consistent encouragement, help and feedback from each learner (Alavi, 1994). As learners from collectivistic cultural context care more about group harmony and mutual

relationship than those from individualistic context, they are likely to have more positive interdependence. Learners tend to provide more help, feedback, and resources to group members (Johnson and Johnson, 1989). Accordingly, we expect that during homogeneously collectivistic communication, learners consistently respond to one another, so participation is more apparent than homogeneously individualistic communication. Collectivistic cultures tend to value peer coaching and learning from one another, and individualistic cultures tend to focus on individual responsibility for learning. During intercultural communication, members from collectivistic culture may produce many responses to the instructor or other learners, and probably get active responses from those who are from individualistic culture. Participation and attention during such communication is likely to be between that of homogeneously collectivistic and homogeneously individualistic communication.

Proposition 2.1: (Participation and Attention: C-C > I-C) *Homogeneously collectivistic communication will have a stronger effect on participation and attention of learners than heterogeneous communication.*

Proposition 2.2: (Participation and Attention: I-C > I-I) *Heterogeneous communication will have a stronger effect on participation and attention of learners than homogeneously individualistic communication.*

Cognitive Engagement

Cross-cultural communication requires learners to exhibit good behaviors and motivation, in addition to display of analytical and problem solving abilities (Webster and Hackley, 1997). The same cultural context of homogeneously collectivistic or homogeneously individualistic communication may encourage greater cognitive engagement. Contribution of some educational content by one learner is likely regarded as accurate and easy to understand by other learners from the same culture. Learners from a different culture may not necessarily accept the indications of the information. Assuming that learners in intracultural communications will constantly reflect and analyze one another's behaviors, culturally homogeneous learners may be more motivated and engaged in these activities. Therefore, we propose that the impact on cognitive engagement is better during intracultural than intercultural communication. Furthermore, previous work suggested that individualistic learners have the tendency to praise others to promote self-esteem, while collectivistic learners emphasize criticism (Stata, 1992). This different cultural orientation propagates conflicts during heterogeneous communication. The conflicts on cultural expectations are likely to affect social information processing in a learning environment, and eventually affect the cognitive engagement of learners. Moreover, homogeneously collectivistic learners may have more positive interdependence than homogeneously individualistic learners (Johnson and Johnson, 1989). A higher interdependence indicates interests and vigor. Thus, we propose that cognitive engagement is more apparent among collectivistic than individualistic learners.

Proposition 3.1: (Cognitive Engagement: C-C > I-I) *Homogeneously collectivistic communication will have a stronger effect on cognitive engagement of learners than homogeneously individualistic communication.*

Proposition 3.2: (Cognitive Engagement: I-I > I-C) *Homogeneously individualistic communication will have a stronger effect on cognitive engagement of learners than heterogeneous communication.*

Moderating Effects of Social Presence

The presence of social cues is an important concept for understanding interpersonal relationships (Walther and Burgoon, 1992). A high amount of social presence supported by the media means that a learner is likely to perceive others as jointly involved in the interaction. The ability of some communication technologies to support simultaneous feedback can signal continuity in the interaction. In addition to sequencing of information, lack of immediacy can deter effective interaction. Although one-way transmission protocols can also enable synchronism, most responses occur at different times, and may lengthen the learning process. According to media richness theory, if information is delivered on a medium that is not suitable for the content and context, that information will likely be misinterpreted affect the responsiveness of that receiver (Daft and Lengel, 1986). A feeling of low interactivity can be created when an immediate response is expected but not received. Distant learners using desktop videoconferencing were found to be more committed and attracted to their teams than those in face-to-face situations (Alavi et al., 1995). Assuming that presence of informational cues enables friendly interaction, media supported by greater social presence can potentially enhance participation and attention.

Proposition 4: (Participation: C*-C* > I*-C* > I*-I* > C-C > I-C > I-I)[1] For all types of cultural composition, learners in teams with high social presence will participate more than those in teams with low social presence.

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[1] The asterisk sign (*) is used here to represent <u>higher</u> social presence; for example, for individualistic-individualistic communication, I*-I* connotes higher social presence than I-I.

Socially situated learning is usually regarded as a process of drawing a learner's central focus into the educational community (Lave and Wenger, 1991). Learning to adapt, manage and work in virtual teams is a skill that must be acquired through extended immersion in the wired world (Jessup and Wheeler, 2000). A virtual connection poses its own set of constraints for cognitive engagement. In a technology-mediated learning environment, the availability of visual and acoustic cues allows learners to process the learning situation and embellish meaning in the interaction, which is necessary to communicate accurately and clearly (Walther and Burgoon, 1992). Higher immediacy also increases the ability, whether in intracultural or intercultural communication, to interact and engage in activities detrimental to the learning process. Higher social presence can improve group reflection on learning, and enhance the decisions to make during the learning process. Along this line of thought, cognitive engagement may be impeded by low social presence.

Proposition 5: (Cognitive Engagement: C*-C* > I*-I* > I*-C* > C-C > I-I > I-C) For all types of cultural composition, learners in teams with high social presence will be more cognitively engaged than those in teams with low social presence.

PRELIMINARY EXPERIMENT

To investigate the impact of cross-cultural communication and social presence, a preliminary study was conducted with 72 undergraduate students in a large university. The 3x2 factorial experiment included independent variables: cultural composition (I-I vs. I-C vs. C-C) and media social presence (low vs. high). There was equal number of males and females, with an average age of 22. All participants are bilingual (fluent in English and Chinese), and communicated in English throughout the experiment. Course credit was given to motivate learners to participate seriously in the study. The participants were given a questionnaire that elicited their cultural and demographic information (Hofstede, 1980). Based on their individualistic-collectivistic cultural background, the participants were randomly assigned to the experimental conditions. Each condition consisted of either culturally homogeneous or heterogeneous dyads using technologies classified as either high or low social presence (Short et al., 1976). Each dyad worked on a standard case study. Measurement of learning outcomes were based on previously validated indicators: performance was measured by the score in an exam, retention was measured by the score in a follow-up exam two weeks after the first exam, participation was measured by the amount of verbal contribution in a text analysis of the communication logs (weighted measure of number of words and number of messages), attention was measured by the amount of nonverbal contribution in the coding of the video logs (weighted measure of head nods, facial expressions, and seating positions), and cognitive engagement was measured by a survey of eight items that represented the degree of interest and motivation of the learners (Webster and Hackley, 1997). The descriptive statistics are shown in Table 1.

Cultural Composition	Social Presence	Performance	Retention	Participation	Attention	Cognitive Engagement
I-I		t = 4.16 **	t = 3.90 **	t = 1.09	t = 2.87 *	t = 3.41 **
	High	32.58 (4.18)	22.82 (3.77)	20.53 (3.07)	23.81 (3.76)	26.72 (2.72)
	Low	18.79 (3.51)	16.35 (5.10)	19.45 (2.74)	18.38 (4.14)	20.29 (3.89)
I-C		t = 3.25 **	t = 2.03 *	t = 2.25 *	t = -0.23	t = 3.78 **
	High	25.31 (2.98)	20.62 (2.54)	25.72 (3.65)	25.63 (2.57)	34.91 (4.03)
	Low	17.43 (3.82)	16.45 (4.13)	20.35 (1.10)	26.35 (4.08)	28.88 (5.22)
C-C		t = 3.84 **	t = 3.65 **	t = 2.31 *	t = 0.11	t = 3.92 **
	High	21.15 (2.98)	14.63 (3.66)	29.42 (3.47)	28.82 (3.06)	23.82 (3.54)
	Low	13.46 (3.82)	10.84 (2.68)	23.31 (2.80)	27.35 (5.12)	15.38 (6.43)

* p < .05, ** p < .01

Table 1. Means (standard deviations) and T-Values on Learning Outcomes

Learning performance was better for culturally homogeneously individualistic learners than for culturally heterogeneous learners (t=3.47, p<.01). Heterogeneous learners also performed better than homogeneously collectivistic learners (t=3.53, p<.01). Social presence was found to moderate the effects of cultural composition on performance (see Table 1). Similarly, retention was greater for homogeneously individualistic learners than heterogeneous learners (t=3.38, p<.01), who retained more than homogeneously collectivistic learners (t=3.61, p<.01). In terms of participation, homogeneously collectivistic dyads were more involved than homogeneously individualistic (t=2.59, p<.05) and heterogeneous dyads (t=2.47, p<.05). Attention was also greater for homogeneously collectivistic dyads than for homogeneously individualistic (t=3.58, p<.01) and heterogeneous dyads (t=4.11, p<.01). However, social presence played a less significant role in moderating the impacts of

cross-cultural communication on participation and attention. Contrary to our propositions, cognitive engagement was greater for culturally heterogeneous learners than for homogeneously individualistic (t=4.01, p<.01) and homogeneously collectivistic learners (t=3.96, p<.01). Another interesting finding is that participation, attention, and cognitive engagement were significant predictors of learning performance (r=.86, p<.01), indicating that cultural composition has important ramifications on the outcomes.

DISCUSSION AND IMPLICATIONS

The preliminary findings show that cultural background and availability of communication channels to convey information have an impact on learning effectiveness. From the experiment, individual activity and achievement, a feature of homogeneously individualistic communication, benefits learning performance and retention. In contrast, group cooperation, a feature of homogeneously collectivistic communication, increases participation and engagement. As virtual teams are expected to repeatedly change membership without losing productivity, new members have to quickly acculturate and assimilate into the team. Learners from an individualistic cultural context might emphasize more on group achievement or relationship than before, and learners from a collectivistic context might become more independent and insistent on their own opinion. In web-based instruction, learning strategies and motivation are important student variables that can affect learning performance. When a course is offered in multiple formats, learners are likely to enroll in one that is compatible with their attitude and learning strategies (Sankaran and Bui, 2000). This may moderate the effects of cultural composition on learning processes. Future research should work toward understanding other moderators of cultural composition on group effectiveness. In addition, problems of cross-cultural learning might be due to differences in language and learning strategies preferred. Besides individualism-collectivism, there are other dimensions of national culture that can influence learning effectiveness. For example, power distance, which is an often-studied dimension in technological research, can affect group discussion or other activities during asynchronous learning. These dimensions await research.

Social presence is found to further strengthen the influence of cultural composition on learning outcomes, particularly on cognitive engagement. Understanding the importance of social presence may help direct future efforts in technological development. This may also suggest that virtual teams, in practice, have to deploy certain strategies to overcome cultural differences. Previous studies have investigated factors influencing choice of media (Burke et al., 1999). Since communication technologies allow people to learn together independent of time, place and pace, it is also interesting to understand media effects upon groups of learners over time. Once technologies are incorporated into actual learning environments, it is critical that group processes are tailored according to the cultural characteristic of the group.

CONCLUDING REMARKS

We propose that for the potential of communication technologies to be realized beyond its own publicity, the type of cultural composition and social presence of media must be taken into account, especially when these factors strongly influence learning outcomes. In this way, people from difference cultures can learn together collaboratively and conveniently. As a matter of fact, culture differences have become more embedded in learning processes with the occurrence of distance education. Cultural pluralism can create positive learning outcomes such as improved working relationships, better interaction skills, and growth in cognitive reasoning (Johnson and Johnson, 1989). On the other hand, cultural diversity can lead to negative relationships characterized by conflicts, hostility, rejection, stereotyping, and prejudice. In this study, we try to find out how well networked technologies are working within different types of cross-cultural communication. With a focus on social presence of culturally diverse learners, we can help a virtual learning team to achieve its potential.

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