Student Perceptions of Cognitive and Social Learning in Global Virtual Teams: A Pilot Study

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Abstract

The global work environment requires graduates to have skills to work collaboratively over distance and time. This pilot study presents the findings of a survey of student perceptions concerning a global virtual team (GVT) experience that used both synchronous and asynchronous collaboration. Our findings revealed that while students experienced enhanced cognitive and social learning through the GVT experience, they found the activity to be frustrating and time consuming. However, students acknowledged that the experience was beneficial to their learning and should be incorporated in future course offerings.

Keywords: Global virtual teams, virtual teams, cognitive learning, social learning, collaboration.

Today's educators are expected to adopt teaching and facilitation techniques that meet the learning needs of 21st century students. Globalization of business and increasing reliance upon communication media means that today's graduates must develop effective virtual teamwork skills (Cascio, 2000; Maynard, Mathieu, Rapp, & Gilson, 2012; Kauppila, Rajala, & Jyrama, 2011; Scovotti & Spiller, 2011; Townsend, DeMarie & Hendrickson, 1998). Among the types of virtual teams, global virtual teams (GVTs) offer several advantages and disadvantages to organizations. One advantage is that such teams can spend 24 hours a day on a project, thereby increasing the execution and productivity on a project. The 24-hour model along with opportunities to work on different global teams allow for shared leadership, according to Lerner (2008). Additionally, organizations can realize significant cost savings by using technology to communicate as opposed to moving around team members to enable face-to-face interaction. The disadvantages to virtual teams, however, include cultural nuances of operating globally; role ambiguity; feelings of isolation; and the difficulty in decision making via GVTs.

Organizations recognize that to be competitive in today's marketplace they need the ability to quickly and economically serve their customers. These processes are often conducted by GVTs. Maznevski & Chudoba (2000) note that virtual teams are commonly assigned the most critical organizational tasks, such as developing new global products, coordinating global account management programs, and negotiating and managing global

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acquisitions, mergers, and alliances. For example, Microsoft uses GVTs to support major global corporate sales and service (Dittman, Hawkes, Deokar, & Sarnikar, 2010) and organizations such as VeriFone, Intel, Alcoa, and Exxon rely on GVTs to run many of their business operations.

Virtual environments also have great potential to foster collaboration between and among students and schools located in different countries. Electronic communication has removed barriers for participation and has allowed students across the globe to become members of virtual learning communities, independent of place and time (Whatley & Bell, 2003; Wu & Hiltz, 2004). Online interactions facilitate social and collaborative learning processes and thus support the shift away from a teacher-oriented, instructivist approach toward a student-centered, constructivist teaching paradigm (Stacey, 2002). Further, learning through virtual teams to accomplish tasks allows students to develop important teamwork skills. Tseng, Ku, Wang, and Sun (2009) discovered that online collaborative learning, through the use of virtual teams, has been shown to improve learning efficiency and facilitate critical thinking and communication skills.

The main objectives of this study were to determine students' perceptions toward participation in global virtual teams toward the achievement of course learning outcomes, identify what students found useful or not useful about the virtual experience, and offer strategies to enhance cognitive and social learning through the implementation of GVTs.

Modern teaching practice emphasizes student-centered or collaborative learning where knowledge is constructed by individuals and groups on the basis of their experiences, rather than through a one-way information transfer by teachers (Gupta & Bostrom, 2004; Whatley & Bell, 2003). Thus, collaborative learning is grounded in a learner-centered model that treats the learner/student as an active participant and the instructor as facilitator (Harasim, Calvert, & Groenboer, 1997). Learning is gleaned through discovery, inquiry, and problem solving by direct observation and interaction of interests, needs, and values (Law, 2007). Previous research has identified active and collaborative learning approaches, meaningful feedback, and opportunities for team collaboration, resource sharing, and collaborative writing as keys to fostering collaborative learning in virtual distance education (Palloff & Pratt, 1999). As Palloff and Pratt (1999) explained, learning is driven by the interactions among students themselves, the interactions between the instructor and students, and the collaboration in learning that results from those interactions.

The influence of constructivism has seen radical transformation of the expected roles of students and teachers. The traditional view that learning was a process of structuring and transmitting information from the teacher (expert) to student (learner) has been replaced by the idea of the learner playing a more central role in constructing their own knowledge, and the teacher having a facilitating role in that learning (McDonald, 2007). In this constructivist paradigm, teachers become facilitators of learning by placing greater emphasis on peer interactions for cognitive development (Curtin, 2002), and knowledge is viewed as being socially constructed (Bonk & Cunningham, 1998). Team-based dis-

cussion, reflection, and assessment allow collaborative learning to occur and encourage the development of important teamwork skills for students.

Social constructivism is based on the idea of learning as a social rather than an individual activity, where social interaction, both face-to-face and virtual, influences cognitive development and is important for improving the quality of learning programs (Moore, 1989; Wilson & Stacey, 2004). Learning involves both cognitive and social processes, and under a social constructivist paradigm students are encouraged to collaborate and engage in active dialogue with team members to create knowledge (Jonassen, 1999). Learning is promoted from a physical perspective through building virtual relationships as well as from a cultural perspective through generating and exchanging knowledge and ideas. Providing students with opportunities to work together as a team and extend their current knowledge as a "community of learners" (Ligorio & Van Veen (2006) helps them move from simply answering questions to actively engaging in dialogue with other students (Garrison, Anderson, & Archer, 2001; Hausfather, 1996). Muirhead and Juwah (2004) argue that interactivity is critical to supporting the learning process in face-to-face and virtual education. They contend that interactions serve to promote and enhance the quality of active, participative learning in an educational environment. Virtual educational environments fosters these interactions electronically through the creation and development of a community by offering a context for interaction among distant partners and providing opportunities to actually build one's own environment (Kommers & Zhao, 1998).

The emphasis placed on social interaction in a constructivist context, and the opportunities for interaction provided by technology, reflect the growing importance of collaboration and team knowledge construction in online learning and teaching (McDonald, 2007). Asynchronous and synchronous online discussions allow students who are studying at a distance to construct knowledge together as part of a team, sharing and reflecting upon their experiences and perspectives to arrive at collective meanings and perspectives (Goodyear, 2001; Wilson & Stacey, 2004).

To prepare students for personal and career success, educators have increasingly taken advantage of the internet to build classroom partnerships that link learners to peers for collaborative projects designed to emphasize learning in globally distributed environments (Sapp, 2004; Starke-Meyerring & Andrews, 2006; Zhu, Gareis, Bazzoni, & Rolland, 2005). Indeed, globalization has transformed both how we teach and what we teach in many courses (Starke-Meyerring, 2005). However, while it may appear at first glance that traditional teaching methods such as presentation, discussion, and team-based learning can be easily adapted to virtual contexts, in reality research has shown that teaching and learning in virtual environments is very different from face-to-face instruction (Luetkehans, 1998).

Education is recognized as a leading agent of global change and understanding and educational virtual environments have great potential to foster collaboration among individuals located in different countries. Through these virtual environments individuals learn to interact effectively with different cultures, organization, and individuals. They also gain

insight into their own cultures and social dynamics (Noronha, 1992). Virtual teams working on shared goals across cultures, space, and time have a key role in the successful performance of contemporary organizations as well as in university learning. The findings from a number of studies indicate that multicultural teams, both virtual and traditional, have the potential to perform better than homogeneous ones and further support the role of universities in developing students with the skills to work in this manner (Summers & Volet, 2008).

Greenberg (2004) pointed out that if universities are to compete in the ever-growing competitive online higher education market, they need to realize that in the instructional realm, semesters are no longer 16 weeks, faculty are no longer the only "experts," and the classroom is no longer time and place bound. More than 6.1 million students took at least one online class during fall 2010 - a 10.1 percent increase over the year before. Online classes are generally defined as courses where more than 80 percent of all content is delivered online, and there are typically no face-to-face meetings with instructors. (Babson Research Group, 2011)

The benefits of virtual learning and collaboration - the ability to engage students in a rich learning environment and to stimulate additional conversations and experiences - far outweigh the risks if virtual learning can be planned and designed effectively (Mindrum, 2011). This paper describes a virtual learning environment where students from Taiwan and students from the U.S. collaborated on a semester case study.

Case Study

A virtual team assessment was integrated into a graduate course in Executive Communication, a popular MBA elective that was being simultaneously taught to student cohorts in the U.S. and Taiwan. The students in both locations were required to collaborate on a case analysis that accounted for 25% of the course grade. Students were placed in teams of five and were encouraged to use collaborative communication technology, e.g., such as Skype, Google+, and email. Since case analysis can be quite a difficult task, a team-based approach to analyzing and assessing the assignment in a collaborative learning environment was adopted. A detailed explanation of the task was provided at the very beginning of the course as well as periodic reminders throughout the 8-week project.

The goals of the case assignment were a subset of the overall course goals. Specifically, the case had two goals:

Cognitive/Pedagogical - students will learn how to learn in a global classroom. To accomplish this goal, students were expected to learn to use distance education technologies, acquire team learning experience and skills, contribute sound, creative, and intellectual content to the analysis and write-up of the case, and reflect on their strengths and weaknesses as part of a GVT.

Social/Cross-Cultural - students will develop skills and learn methods that are effective in communicating across cultures. To realize this goal, students were expected to learn

basic cultural similarities and differences between Taiwanese and U.S. students, apply cultural considerations when analyzing the case and recommending a course of action, and develop relationships with colleagues from another culture.

Each team had to meet deadlines on several project (case) milestones (completion of drafts case segments). The instructor reviewed these drafts and offered feedback students could use to improve their final version. These milestones offered students the opportunity to revise and improve their work. They also allowed the instructor to monitor project progress and assess student learning, thus the instructor was able to make adjustments to teaching and facilitating accordingly. Grading was assigned for both the content of the case and the contribution of each team member to the task. The instructor used a common grading rubric to assess the creative content and writing quality of student submissions. This ensured that students in both countries received comparable grades for their efforts.

Method

This study employed both quantitative and qualitative data to provide more depth to the findings. The initial step was to collect demographic data on gender, age, employment status, place of study (U.S. or Taiwan), and prior access to communication technology to allow analysis of findings across the 17 different student cohorts. Using the recommendation of Lipnack & Stamps (1997) that appropriate team size should be between 3-12 people, 17 cohorts of between 5-6 students were created with the provision that country of origin was as equally dispersed as possible.

Students responded anonymously to the survey about their GVT experiences and, thus, the researchers could only generate a summary of responses. Students were asked to express their level of agreement on a number of statements about working in GVTs using a five-point Likert scale. Many statements were based on a review of the literature (Hu, 2009; Jonassen, 1999; Newman & Hermans, 2008; Scovotti & Spiller, 2011; Wilson & Stacey, 2004) which identified a number of cognitive and social learning outcomes of working in virtual teams. Such statements included "GVT discussions were useful in understanding how to respond to the case", "The GVT's recommended solution to the case was better than what I could have developed on my own", and "Preparing the case analysis through the GVT was more time consuming than preparing it on my own." Other statements reflected course objectives such as developing effective virtual teamwork skills "The GVT helped me to develop more effective virtual teamwork skills" and improving skills in using communication technology such as "Working on a GVT helped me to develop more effective electronic communication skills".

For clarity of presentation of this data the five-point Likert scale ranging from 5 = (SA) strongly agree to 1 = (SD) strongly disagree has been collapsed to a three-point scale by combining strongly agree (SA) and agree (A) and strongly disagree (SD) and disagree (D). See Tables 1-2 for these findings. Qualitative data were also collected using open-ended questions which asked students to express what they liked most and what they liked least about the GVTs.

Findings

Seventy six valid responses from the 88 (56 students from the U.S. and 32 from Taiwan) students who completed the virtual team self-assessment were collected representing an effective response rate of 86 percent. Females represented approximately 55 percent of the respondents and males 45 percent. The average age was 24.5 years. Most of the students were employed full-time (67%) while another 22 percent were employed part-time. The remaining 11 percent were full-time students and/or were unemployed. Most of the respondents (63%) were U.S. students and the remaining 37 percent accounted for the Taiwanese students. Overall, 64 percent of the respondents had prior access to communication technology such as wikis, Skype, and Google+.

Quantitative Data

Students were asked to indicate the extent to which they agreed or disagreed with a number of statements concerning their work on GVTs. Responses were measured on a five-point Likert scale with 5 = strongly agree and 1 = strongly disagree. For the purpose of reporting these findings the responses for "strongly agree (SA)" and "agree (A)" were combined as well as for "disagree (D)" and "strongly disagree (SD)". Thus, a three-point scale is reported (SA/A, Neutral, D/SD).

Cognitive Learning in GVTs

One of the major objectives of the GVT experience was to enhance student creativity in resolving the problem in the case. This objective seems to have been met with almost two-thirds (65.5%) agreeing that GVT discussions were useful in understanding how to respond to the case and one-half (51.1%) agreeing that the solution to the case was more creative than what they could have arrived at on their own. However, only 44 percent indicated that GVT discussions helped them write their section(s) of the case. This finding could be attributed to the time consuming nature of the project. Interestingly, the majority of students relied on email as their primary form of communication. Media richness theory (MRT) proposes that team members engage in communication in order to reduce complexity about a given task and that media differ in their ability to handle multiple, conflicting interpretations of sent information (Daft & Lengel, 1986; Daft, Lengel, & Trevino, 1987; El-Shinnawy & Markus, 1997). MRT suggests that communication media can be ranked on a richness continuum where rich media (telephone, videoconferences) are useful for complex messages while leaner media (email) are better for sharing simple and explicit information (Majchrzak, Rice, King, Malhotra, & Sulin, 2000). The basic assumption of MRT is that the richer the media, the more cues on a given task will be provided, and the more ambiguity will be reduced.

Many of the students felt that although the GVT was more time consuming (69.4%), it did help them develop more effective virtual teamwork skills (56%) and that the experience was beneficial to learning course concepts (59.3%). Over half of the students (57.6) agreed that the GVT should be used in future offerings of the course. Perceptions of the

TABLE 1. Student perceptions of the cognitive learning outcomes of the GVT (%).

Statement	Strongly Agree/ Agree	Neutral	Disagree/ Strongly Disagree	Mean	StD
GVT discussions were useful in understanding how to respond to the case	65.5	15.2	19.3	3.6	1.0
GVT discussions helped me to write my section of the case analysis	44.4	11.5	44.1	3.1	1.3
The GVT's recommended solution to the case was more creative that I could have developed on my own	51.1	10.3	38.6	2.9	1.2
Working on a GVT helped me to develop more effective electronic communication skills	45.1	30.2	24.7	3.2	1.0
Preparing the case analysis through the GVT was more time consuming than preparing it on my own	69.4	11.8	19.8	3.8	1.0
The GVT helped me to develop more effective virtual teamwork skills	56.0	29.4	14.6	3.4	0.9
The GVT was beneficial to my learning in this course	59.3	25.3	15.4	3.5	0.9
The GVT should be used for future offerings of this course	57.6	19.5	22.9	3.4	1.3

time consuming nature of the project may be due to how the students communicated with each other. Research by Rusman, van Bruggen, Sloep, and Koper (2010) noted that communication may not be spread equally in time. Team members often communicate sporadically in the initial phases of a project but, when facing a deadline, they can be perpetrators or victims of overload. Also, students make just be exchanging bits of information without building on each other's knowledge, thus failing to take their team to the level of collaborative knowledge construction.

Social Learning in GVTs

The overwhelming majority of students (84.3%) agreed that the GVT helped them to stay in contact with other students in the course and more than half (56%) indicated that the GVT allowed them to develop closer relationships with other students in the course.

One-third (33.3%) offered that the GVT helped them to reduce feelings of isolation sometimes felt in working in virtual teams. However, approximately one-third (34.3%) of the students expressed concern over the perceived unequal distribution of work on the case analysis and agreed that they contributed more than other GVT members. The interdependence between cognitive and social factors may lead to a situation in which the GVT does not function the way it intended, even though contextual factors such as the working environment seem to be sufficient. Kerr and Bruun (1983) have shown that if teamwork is counteracted by social loafing, collaboration is unbalanced among team members. Social loafing may occur because team members' expectations of praise for hard work decreases with increasing group size. This may occur because members feel that their contributions are less noticeable in larger groups or members perceive that the effectiveness of their efforts declines as team size increases (Latené, Williams, & Harkins, 1979). Another problem may be the free rider effect (Salomon & Globerson, 1989; Leinonen, Järvelä, & Lipponen, 2003). There may also be situations when team members do not exert maximal effort in the team or the team fails to coordinate or combine contributions of individual members.

TABLE 2. Student perceptions of the social learning outcomes of the GVT (%)

Statement	Strongly Agree/ Agree	Neutral	Disagree/ Strongly Disagree	Mean	StD
The GVT helped me to stay in contact with other students in the course	84.3	10.8	4.9	4.0	0.7
The GVT allowed me to develop closer relationships with other students in the course	56.0	32.6	11.4	3.5	0.9
I felt that I contributed more to the GVT than other team members	34.3	46.9	18.8	3.4	1.1
I felt that some GVT members were too dominant	16.8	41.1	42.1	2.6	0.8
The GVT was an enjoyable part of the course	42.1	16.8	40.1	3.0	1.3
The GVT was a frustrating part of the course	51.9	30.3	17.8	3.5	1.1
The GVT helped reduce the sense of isolation that I sometimes feel with working with virtual teams	33.3	35.5	31.2	3.0	1.1

Less than one-fifth (16.8%) indicated that member domination was not a problem in their teams. Slightly over one half (51.9%) of the students agreed that the GVT was a frustrating experience. Taiwanese students indicated that they were frustrated by the perceived "rudeness" of the U.S. students who did not attempt to build a personal relationship at the start of the project as well as the procrastination exhibited by several of the U.S. students; U.S. students experienced frustration mainly due to the desire of their Taiwanese counterparts to begin working immediately on the case as well as their weak written communication skills. Less than half (42.1%) of the respondents enjoyed the GVT experience.

Qualitative Results

Following are summaries of the open-ended comments students conveyed anonymously concerning the GVT experience. Students were asked what they liked most and what they liked least about GVTs.

What Students Liked and Disliked About GVTs

Responses indicated a mixed reaction to GVTs with several students indicating that it was a "valuable part of the course and an excellent way to incorporate global perspectives on the case analysis". One student, however, did indicate that this was "the most frustrating and least enjoyable part of the course."

The main issues identified by respondents in terms of what they liked most about the GVT experience included:

- the opportunity to develop teamwork skills and get to know individuals from another country/culture (21 students)
- the ability to apply and develop communication technology skills to a specific task (9 students)
- the international aspects of the case (3 students)

The major issues identified by respondents in terms of what they liked least about the GVT were:

- difficulty working with other students, specifically in terms of differences in work styles and lack of participation by some team members (12 students)
- difficulty in connecting with global counterparts because of language differences and time differences (12 hour difference between the U.S. location and the Taiwanese location) (12 students)
- disappearing team members (both in the U.S. and Taiwan) (5 students)
- the time the task required for only 25 percent of the course grade (4 students)

Suggestions for improving the GVT experience included the following:

- facilitating synchronous discussions (4 students)
- requiring participation from all team members (3 students)
- eliminating other course assignments to counteract the time allocated to the GVT experience (2 students)

Eleven students did volunteer that this was an excellent learning experience and that nothing should be changed. Other comments raised included offering ideas to reduce the time difference between the U.S. and Taiwan (mandatory morning/evening meetings) and some of the cultural differences between the two classes (providing biographical sketches of students from both countries).

Discussion

Over the last few years the central factors and motivations behind how we work and how we learn have significantly moved toward GVTs that encourage the creation and sharing of information and knowledge. The result has been an increase in the number of organizations employing GVTs and an increase in the number of universities offering courses in virtual environments. As a result of the findings in this research, a number of strategies for the effective implementation of GVT's are recommended. First, due to the diverse opinions on working as part of a GVT, particularly the vast investment in time, it is proposed that the experience be optional in future offerings. However, due to the potential cognitive and social learning outcomes of GVTs, students should be actively encouraged to work in some type of virtual team.

Greater direction on operating as a GVT should be provided to students, such as the need to establish group roles, assign tasks and responsibilities, and establish ground rules for participation. Further, clear criteria for evaluating the task should be provided so that students are aware that they are being graded for their contributions to the task and how they function as a GVT, not solely for the written output of the GVT experience. Research has revealed that large variations in team interaction and performance can exist between teams that do not differ in composition and assigned task (Barron, 2000). This work underscores how productive collaboration is not merely a case of putting people with relevant knowledge and skills together. Understanding the factors that make up successful collaboration is necessary.

The data revealed that GVTs appeared to function more effectively when one member of the team adopted an informal leadership role and where participation by team members started earlier in the semester and meetings were more consistent. Therefore, discussing the nomination of a team leader and the use of project planning aids such as timelines and progress reports are recommended implementation strategies. Technologies with the best chance of success in assisting virtual teams will need to increase member communication as well as help manage and coordinate their work through better dividing of tasks by location, managing dependencies among tasks that bridge locations, and synchronizing how tasks are integrated across locations (Cummings, 2011).

It is also recommended that peer evaluation be included in the evaluation process to help overcome the problem with "disappearing" team members and widely varying contributions by team members. The role of the teacher continues to be essential as research indicates that when a proactive role is adopted by the teacher, in terms of facilitating the operation of the GVT, student activity is increased and higher-order thinking is supported (Fabro & Garrison, 1998).

Today's graduates need to develop important skills including the ability to communicate virtually across distance and time. In this study, the findings revealed that while the students did not necessarily enjoy the GVT experience, having found the case assignment to be both frustrating and time consuming, they agreed that the experience was beneficial in terms of achieving cognitive and social learning outcomes, and for enhancing skills in virtual teamwork and for using electronic communication media. Despite some drawbacks, students agreed that GVTs should continue in the course. Implications for educators include making the virtual task optional, reducing the time demands on other course assignments to offset the time needed to make the GVT a success, and providing more direction (student bios) to enhance the operation of GVTs.

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