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Teaching and Learning about Virtual Collaboration: What We Know and Need to Know

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ABSTRACT

Virtual collaboration is an essential skill in today's organizations, but where and how do people learn it? What do we know about teaching and learning with respect to virtual collaboration? We examined this question from multiple perspectives: (1) best practices in virtual teams, in order to provide the content of what might be taught *about* virtual collaboration; (2) best practices in teaching techniques and in technology use, which provides guidance for *how* the material might be taught; and (3) examples of current practice in this area, which gives an idea of *what* is being taught. The combination of literature review and informal survey of current practice provides a foundation for discussion and speculation on how we might accelerate efforts to help people become highly effective members of virtual teams.

Keywords

Collaborative learning, virtual learning teams, distributed learning teams, virtual teams, computer mediated groups, collaboration technology.

INTRODUCTION

Organizations need team work for growth and innovation and they need to engage in on-going learning to increase the knowledge and skills of their employees (Evans and Wolf 2005; Johnson Suriya Yoon Berrett and La Fleur 2002; Munkvold and Zigurs 2005). More and more, team work and learning are taking place virtually and, as a result, a growing number of practitioners are experiencing what it means to work within a virtual team (Kochtanek and Hein 2000; Lipnack and Stamps 1997; Robey Khoo and Powers 2000; Townsend DeMarie and Hendrickson 1998). Virtual teams consist of people who work in different geographic locations, time zones, organizations, or cultures (Dubé and Paré 2004; Lipnack et al. 1997). Virtual teams rely on a variety of technologies for collaboration and their skill or comfort level with those technologies can vary. Advanced tools such as distributed project management software, electronic meeting systems, video conferencing suites, or "e-rooms" are still rarely used to their full potential. More collaboration tools are appearing in the marketplace, but little guidance is available for which tools work best in different contexts (Zigurs and Khazanchi 2008).

While collaborative learning benefits have been recognized for traditional face-to-face teams, the impact of virtuality on collaborative learning has not received as much attention (Johnson et al. 2002). Virtual teams need substantive and practical guidance on how to put tools together with a collaboration process that makes sense for their specific team, in their specific context. We seek to increase the knowledge and skills of workforce members who need to collaborate effectively in virtual teams. As a first step, our goal is to discover "what we know and need to know" about teaching and learning in virtual collaboration.

First, we assess what needs to be learned, that is, the content related to best practices for virtual teaming. Second, we assess the methods by which this content should or could be taught. That assessment includes both teaching approaches and the use of technology, i.e., both techniques and tools. Third, we provide the results of an informal survey of faculty in universities and what they are currently teaching students about virtual teaming. Finally, we provide a discussion and potential guidelines for what needs to be done in order to help people learn to become highly effective members of virtual teams by choosing the best tools and processes for different settings and tasks.

WHAT DO VIRTUAL TEAM MEMBERS NEED TO KNOW?

Before any team can start to collaborate effectively, it needs to learn the fundamentals of team work. Various theories exist in relation to group development, group dynamics, and group problem solving (Gersick 1988). Tuckman (1965) was among the first to develop a simple stage model for group development. Poole's Multiple Sequence Descriptive System (MSDS) provides a more complex view of group development, specifically in terms of group problem solving (Poole 1983). Yet

another view presents group development as a pattern of "punctuated equilibrium" that focuses on both group dynamics and group problem solving skills (Gersick 1988). These models serve as an important foundation for team work in general, to which must be added the concepts that are specific to virtual teaming.

Research specific to virtual team work focuses on team work and development through participation and the use of technology. For example, research on virtual team training has focused on the relationship between training and performance (Powell Piccoli and Ives 2004). Team member training helps to enhance participation, communication, and trust (Beranek 2000; Warkentin and Beranek 1999) as well as use of technology (Tarmizi Payne Noteboom Zhang Steinhauser de Vreede and Zigurs 2007). However, there is a lack of research that provides guidance "as to the technical expertise needed to be a proficient virtual team member and what constitutes effective training in the virtual environment" (Powell et al. 2004). Virtual teams have to overcome added challenges compared to traditional teams because they interact through different space and time (Robey et al. 2000). Some of the challenges occur as team members are required to act independently from direct supervision, create rules of conduct, social structures, and temporal rhythms, and establish electronic substitutes for visual and non-verbal cues (Robey et al. 2000). Team leaders face specific challenges, including a lack of feedback or forgetting who is present in a virtual team meeting, the difficulty of following a process from different geographical locations, and technology complications or unpredictability due to multiple communication channels (Mittleman Briggs and Nunamaker Jr. 2000). Despite the challenges, however, virtual learning teams are being used in both corporate training programs and education in order to augment cooperative learning experiences and overall collaboration (Johnson et al. 2002).

Best practices in relation to virtual team challenges can be taught. For example, research suggests that virtual teams should practice the process of establishing pre-meeting plans for synchronous meetings with specified goals and deliverables and be given feedback and fairly rewarded based on their achievement of those goals (Mittleman et al. 2000; Staples and Webster 2007). Additionally, virtual team members should participate in getting to know one another through viewing pictures or biographies as well as having constant reminders of who is participating in a virtual meeting (Mittleman et al. 2000). Other best practices suggest having access to adequate technology resources, possibly in the form of a technical support team for technology issues that may arise and making sure that the technology being used fits the task at hand (Mittleman et al. 2000; Staples et al. 2007). Virtual team members also need to be provided with the right skill variety in their teams in order to meet their objectives, possibly developed with adequate team skills training (e.g., communication, organization, interpersonal) (Staples et al. 2007). Many of these best practices are relevant to traditional teams as well, but special attention needs to be paid to them in virtual teams through explicitly applied training, awareness reminders, or process structures. Naturally, the best practices related to technology are unique to virtual teams, and the area that needs the most attention is – as is not uncommon with technology – learning the ability to seamlessly integrate technology support with work practices.

HOW SHOULD IT BE TAUGHT?

Collaborative Learning

Well-known theories of learning include the objectivist model, the constructivist model, the cooperative model, the cognitive information processing model, and the sociocultural model of learning (Leidner and Jarvenpaa 1995). The objectivist model centers on the concept that teachers should pass on knowledge to learners, whereas the constructivist model focuses on learner centered instruction rather than teacher centered, in that the learners should seek out and discover information rather than be have it passed on to them (Leidner et al. 1995). The cooperative or collaborative model of learning is a deviation from the constructivist model of learning (Leidner et al. 1995). This kind of involved approach for student learning is supported in the educational literature (Noteboom Zhang Tarmizi Payne Steinhauser de Vreede and Zigurs 2006). For example, Bloom et al. (1956) present a well-known taxonomy that proposes a continuum of learning from knowledge, comprehension, application, analysis, synthesis, and evaluation. Bloom's taxonomy measures learning from lower levels (e.g., understanding) to higher levels (e.g., problem solving and generalization) (Bloom et al. 1956; Shen Hiltz and Bieber 2006). Based on Bloom's taxonomy, students build structure from the knowledge they acquire and then put that knowledge together in another way to form new meaning or structure (Bloom et al. 1956; Noteboom et al. 2006). An updated version of Bloom's taxonomy refines the terminology of the continuum of learning to include remembering, understanding, applying, analyzing, evaluating, and creating (Anderson and Krathwohl 2001). The goal of the revised taxonomy is to help educators understand and implement standards-based curriculums by presenting a two-dimensional framework focused on knowledge and cognitive processes and including examples of the new taxonomy in use.

A significant amount of research relates to the idea of collaborative learning. Collaborative learning has been defined as "a learning process that emphasizes group or cooperative efforts among faculty and students" (Hiltz 1997). Collaborative learning is a team-oriented approach that centers on learning (Shen et al. 2006). This type of learning implies that different people with different perspectives and backgrounds can work together to solve a problem or produce a product and learning

emerges through that interaction (Kirschner and Van Bruggen 2004; Shen et al. 2006). A benefit of collaborative learning is that the different backgrounds and perspectives of team members allow for a richer problem analysis as well as richer solutions (Kirschner et al. 2004). However, diversity of the team members can also put a burden on the process of problem solving in cases where there might be: 1) multiple compatible perspectives, 2) multiple conflicting perspectives, or 3) partially conflicting perspectives (Kirschner et al. 2004). The collaborative method for learning appears to be superior to individual instruction for a number of reasons (Leidner et al. 1995). Collaborative learning results in more student involvement with the class and other students and more engagement in learning, problem solving, and critical thinking (Alavi 1994; Leidner and Fuller 1997; Shen et al. 2006; Sloffer Dueber and Duffy 1999).

A final method for virtual team learning centers on a category of studies which focus on learning that is situated in work practice rather than on knowledge acquired outside of the work context (Robey et al. 2000). Robey et al. (2000) propose that situated learning is quite different than training in that situated learning occurs as virtual team members interact with one another and adjust to each other's social, communication, and information needs. Through situated learning, team members learn to develop practices that reflect their unique task and social needs (Robey et al. 2000).

Teaching in Virtual Collaboration Settings

There is an increasing emphasis on learner-centered education environments (Sloffer et al. 1999), and a collaborative learning environment is an example of such an environment because knowledge is gained through peer interaction (Hiltz 1997; Leidner et al. 1995; Shen Cheng Cho Hiltz and Bieber 2000). The adult learning theory of andragogy suggests that adult learners are both mature and self-directed (Knowles 1984) and are accountable for their actions and decisions (Knowles 1984). Adragogy suggests that the teaching of adults should focus more on the process rather than the learning, which again reinforces the collaborative learning idea of the importance of interaction (Hiltz 1997; Knowles 1984; Shen et al. 2006). Instructors become more like facilitators and less like lecturers (Noteboom et al. 2006). Virtual learning communities are also a way to promote successful lifelong learning (Allan and Lewis 2006).

A self-reflective study of an experiential doctoral seminar (i.e., adult learners) provides an example of the theory of adragogy in action, including some of its challenges. Teachers were challenged to find a balance of structure and creativity in order to provide a successful learning experience for adult learners (Noteboom et al. 2006). The "challenge is to manage the team, to make students contribute to the best of their abilities, and to develop the synergy of the team to gain a wide range of meaningful outcomes" (Noteboom et al. 2006).

Technology Environments for Teaching and Learning

An increasing number of collaboration tools continue to appear in the marketplace (Zigurs et al. 2008), sometimes to the bewilderment and dismay of users who strive to stay abreast of new developments but cannot afford to be on a constantly high learning curve. Fortune 1000 companies have had access to enterprise collaboration solutions for some time; while tools such as Basecamp, Groove, and Intranets.com provide alternative collaboration tools for small to medium sized companies (Metz 2004). It appears, however, that advanced tools such as distributed project management software, electronic meeting systems, video conferencing suites, or "e-rooms" are rarely used to their full potential. The challenge remains to teach effective use of collaboration technologies via use of those technologies in teaching and learning environments.

Blackboard is a common learning environment (e.g., O'Dwyer Carey and Kleiman 2007) as is WebCT (e.g. Shen et al. 2006), though some instructors have begun to look to newer technologies. For example, USA Today reported that more than 300 universities are using the virtual world technology, Second Life (Sussman 2007). Law students at Harvard are using Second Life, as are organic chemistry students at Drexel (Sussman 2007). Professors have found that students put more time into the class when using the virtual world; however, not all students are comfortable with the technology (Sussman 2007). Experiences with Groove, a virtual workplace tool have also been reported (e.g., Noteboom et al. 2006). Social networking tools such as LinkedIn and Facebook have become common ways to form relationships, which can then lead to information sharing. General observations of how learning occurs in these different kinds of virtual environments may exist; however, little is known about best practices for effective collaboration that is specific to the various environments.

Practices and Resources

Davis (1993) proposes general strategies for collaborative learning including planning and explanation as well as strategies for designing educational group work and the use of task interdependence, relevance, and competitions. Davis (1993) emphasizes the importance of ensuring that individual student performance is assessed and that groups know how their members are doing as well as giving opportunity to all students to evaluate the effectiveness of their group and decide how to grade the members of the group.

Several organizations exist that support the advancement of collaborative learning. The Collaboration for the Advancement of College Teaching and Learning (http://www.collab.org/) brings together members from different colleges and universities in order to promote outstanding teaching and learning. The organization holds two conferences a year on such topics as "Promoting Deep Learning: Cultivating Intellectual Curiosity, Creativity, and Engagement in College" and "Critical Thinking in the Age of the Internet." The Center for Interactive Learning and Collaboration (CILC) (http://www.cilc.org/) is a non-profit consulting organization that offers consulting services, tools, and resources to improve student achievement and teacher expertise through the use of videoconferencing and other collaborative technologies. A wiki for teaching virtual work (https://collab.itc.virginia.edu/access/wiki/site/658f9a4a-9c21-4791-0015-02e440aabd66/home.html) has been set up for information technology educators to contribute and build a new community on this topic.

WHAT ARE WE TEACHING NOW?

To this point, we have reviewed the content (i.e., what should be taught, what individuals should learn) and delivery (i.e., how the content should be conveyed) for virtual collaboration. This section addresses existing practices for teaching virtual collaboration. We conducted an informal survey of colleagues at universities around the nation and world. The survey was sent to a convenience sample of 53 people, consisting primarily of professors of information systems doing work in virtual teams or related areas. We got responses from 49 people, for a response rate of 92%, which indicates the high degree of interest in this topic. Forty-three respondents were from universities in the United States, two were from Canada, and four were from countries in Europe and Asia. All but two of the respondents are located in business colleges; respondents answered the question from the perspective of what they themselves taught or knew was being taught in their school.

We asked the following questions:

1. Does your school have a stand-alone course that is focused on teaching students how to work in virtual teams?

2. If not a stand-alone course, is the topic covered as part of some other course?

    (a) If so, what is the name of the course?

    (b) What percent of that course is spent on virtual teams (as opposed to a traditional course on group behavior)?

3. What technologies are you using to give students experience with virtual teams (e.g., discussion boards, videoconferencing, IM, integrated workspaces like Groove, virtual worlds like SecondLife, etc.)?

4. What do you think we as educators SHOULD be doing to teach students how to work effectively in virtual teams (e.g., stand-alone course, integrate into existing courses with team projects, etc.)

Table 1 shows the responses to the first question about whether the school has a stand-alone course that teaches students how to work in virtual teams. All but three of the respondents indicated that they did not have a stand-alone course. Is this reply surprising? On the one hand, it is not, given the battle for "shelf space" in terms of the courses that a school can offer as well as the resource constraints of people available to teach those courses. However, 22 of the 46 respondents who do not have a stand-alone course also answered "no" when asked whether the topic is covered as part of some other course. Thus, 46% of all the respondents have no coverage of this topic at all. With the importance and increasing prevalence of virtual teams, it seems that this result reflects a topic in need of greater attention.

Reply	Number (%) of Respondents
No, do not have stand-alone course	46 (94%)
Yes, have stand-alone course	1 (2%)
Have a form of stand-alone course in that the course is team-based and all teams are virtual	2 (4%)

Table 1. Number (and Percent) of Schools with Stand-Alone Course on Virtual Teams

Table 2 shows the replies to the question of which course contains content on virtual teams, and Table 3 shows the distribution of the approximate percent of content that is devoted to virtual teams.

Name of Course	Number of Times Mentioned
Systems Analysis and Design, Development Methods	5
Introductory MIS course	4
Project Management	4
Innovation, Technology Management	3
Undergraduate capstone course	2
Management of IS	2
Managing Information for Executive Decision Making	1
Professional MBA	1
Team Development, Facilitation and Technology	1
Executive MBA standalone module	1
Information Based Organizations	1
Organizational Behavior	1
Business in Virtual Worlds	1
Business Process and Technology	1
Computer-Mediated Communication (A&S course)	1
Enterprise Information Systems	1
Collaboration Technology	1
Global Information Management	1
IT and Organizational Change	1
Knowledge Management	1
Telecommunications for Business	1
Virtual Reality	1

Table 2. Courses in Which Virtual Team Content is Taught

Percent	Number of Responses
5%	6
10 to 15%	5
20 to 30%	10
50%	4
70%`	1

Table 3. Percent of Course Content Devoted to Virtual Teams

Table 4 shows the responses to the question about what technologies are being used to teach people about working in virtual teams and the number of times that each technology was mentioned. The technologies that our survey respondents use to teach virtual collaboration are primarily course management systems like Blackboard. These systems include instant messaging/chat and discussion boards, which were mentioned as being used most frequently. Other technologies such as simulations, project rooms, videoconferencing, and wikis were mentioned by one or only a few respondents. Of special interest is that the virtual world of SecondLife was mentioned by eleven respondents, but most of them were still experimenting with that environment rather than using it on a regular basis.

Technology	Number of Times Mentioned
Instant messaging/chat	20
Blackboard or other course management system	17
Discussion board	16
Second Life (using or experimenting)	11
Groove	6
Email	6
Teleconferencing/desktop conferencing	6
Wikis	6
Videoconferencing	5
Skype	3
Project rooms	3
Other technologies mentioned twice each: Virtual worlds, Eluminate, Document repositories, WebCT	
Other technologies mentioned once each: Simulation/games, Centra, facilitatePro, Google products, Notes, D2L, 2L, Writely, First Class, WebX, Sensemaker, MS Project Server	

Table 4. Technologies Used to Teach Virtual Teams

Table 5 is an analysis of the responses from the fourth and final question, which asked what we as educators *should* be doing to teach students to work effectively in virtual teams. The analysis was done by identifying each comment in a major category of things we should be doing. Some respondents mentioned more than one strategy, thus the second column adds up to more than the number of respondents.

What We Should Do to Teach on Virtual Teams	Number of Times Mentioned
Use VT experiences in existing courses that have team projects	28
Have standalone course	3
Educate the professors first	3
Create modules that are usable across several courses	3
Integrate in general course on teamwork	1
Integrate throughout the curriculum	1
Other comments: Watch and mirror what is happening in industry. Standalone course should have both technical (networking) and behavioral/team content. Realism of the context of global workforce should inform the design of learning environments. One challenge is finding something to take out of the curriculum in order to put this material in. Use experiential exercises.	

Table 5. Teaching Effective Virtual Team Work

The majority of respondents felt that teaching and learning about virtual teams should take place as a component of existing courses. This "integration" approach is similar to the approach taken by many other topics that have become a part of our curricula, such as ethics and communication skills in general. The risk in combining with other courses is the lack of a focused knowledge set and the potentially wide variety in what is being taught. Our larger project, of which the current study is a component, is designed to support the integration approach by developing a repository of adaptable modules for teaching and learning in virtual teams. The results from our survey reinforce the importance of such an approach, to provide both flexibility and consistency in this important area.

WHAT CAN WE DO NEXT?

We have presented an assessment of "what we know and need to know" about teaching and learning in virtual collaboration. Our review shows that teaching how to be an effective virtual team member is an area that is ripe for improvement. The results of our literature review provide a foundation for development of learning modules. Learning modules can be used in university courses, training workshops, or other settings and can be combined in a mix-and-match way to teach people how to effectively deal with issues that create bottlenecks for effective functioning of virtual teams. But first and foremost, as a few of our respondents noted, we must "educate the professors first," and we hope this paper provides a starting point to help us in that direction.

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