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Learning and Understanding in Virtual Teams

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ABSTRACT

There are sufficient reasons to conclude that virtual education is not just hype. There are, among others, economic motivations such as bringing one learning module to a larger audience of learners, and pragmatic reasons such as achieving flexibility in time and space for learning, which is especially important for adult learners. However, from a pedagogic point of view there are some doubts. Current technologies meant for learning and working in teams are often designed for functional collaboration (e.g., sharing documents, communicating), but fail to support learning, understanding and team forming (e.g., carrying out pedagogically adequate tasks, understanding each other's work and group dynamic processes) in virtual teams. In order to understand virtual teams, we need to know how we can study learning and understanding in virtual teams. Interesting research questions are: Which concepts are important in understanding virtual teams? How can we measure those concepts, and in what type of setting (e.g., experimental study, case study)? The aim of this special issue is to provide and discuss concepts and pragmatic insights in research on learning and understanding in virtual teams. The aim of this article is to set the stage for those articles.

INTRODUCTION

Society is witnessing trends like globalization of economies, increasing multiculturalism, and decreasing half-life of knowledge and information. We find ourselves confronted with complex or wicked problems requiring multi-disciplinary and multi-stakeholder decision-making approaches. To meet these societal trends, education is focusing on open-ended problem solving tasks and heterogeneous, distributed teams using Computer-Supported Collaborative Learning (CSCL) technology, where individual team members contribute different perspectives to the task. But what is this CSCL actually?

CSCL is actually a misnomer. First of all, it is about learning, and in the twenty-first century, we are usually talking about constructivist learning. The proximate modifier (adverb) is the word collaborative. To collaborate is to work jointly with others especially in an intellectual endeavor. Thus, the work that is to be carried out is learning, and the way that it is done is together with others. Finally, the ultimate modifier is computer-supported (a compound adverb). That the computer supports something means that the computer (actually the computer within some type of network) enables something to occur and/or keeps something going. The "thing" that the computer supports is collaborative learning. In other

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words, LCSC or learning collaboratively with the support of computers.

HOW TO ACHIEVE GOOD CSCL

Collaborative learning implies different people with different backgrounds and different perspectives working together in a team to solve a problem or produce a product. Although the multiple perspectives that arise are expected to allow for richer problem analyses and solutions, they also put an additional burden on the collaborative problem-solving process. We consider three cases. First, there can be multiple compatible perspectives, for example when experts from different backgrounds work together. Here, the participants only have a limited set of completely shared representations of the problem.[1] Second, there can be multiple, conflicting perspectives, as is often the case in wicked problems. A classic example is where the environmentalist's and the urban planner's perspectives crash in a discussion on the trajectory of a highway. If the participants fail to at least negotiate some common ground, their problem-solving process will grind to a halt. The chances that computers can support and maintain these different views over prolonged time are dim.[2] Finally, as mentioned in several of the contributions in this special issue, there can be partially conflicting perspectives. In education, such cognitive conflict is seen as a stimulus for knowledge negotiation and co-construction. Argumentation among participants in a collaborative learning situation is therefore stimulated. Yet, the balance between maintaining common ground and prolonged argumentation is a delicate one as demonstrated by van der Puil, Andriessen, and Kanselaar (this issue).

Thus, the question is what is needed to achieve and maintain this common ground? The authors have previously presented a cognitive framework for collaborative problem solving in which representational and communicative demands were identified for a number of problem-solving states.[3] For this problem solving, a number of social preconditions—namely, shared understanding, trust, and accountability—must be met. Maintaining these social preconditions is, as demonstrated by the contributions to this special issue, a continuous process. Consider the steps essential to this problem-solving process in collaborative teams. Achieving and maintaining common ground is essential to these teams and to achieve this common ground, individual team members, with individual problem representations, begin discussing a problem. The route from contribution to newly constructed knowledge in a team goes through three intermediate forms via four processes, namely externalization, understanding, negotiation and integration[4] (Fig. 1).

This is easier said than done. Rourke[5] remarks that "if students are to offer their tentative ideas to their peers, if they are to critique the ideas of their peers, and if they are to interpret others' critiques as valuable rather than as personal affronts, certain conditions must exist. Students need to trust each other, feel a sense of warmth and belonging, and feel close to each other before they will engage willfully in collaboration and recognize the collaboration as a valuable experience." Northrup,[6], Gunawardena,[7] and Cockburn and Greenberg[8] stress the need for relationship building and sharing a sense of community and a common goal. Finally, Wegerif[9] noted "forming a sense of community, where people feel they will be treated sympathetically by their fellows, seems to be a necessary first step for collaborative learning. Without a feeling of community, people are on their own, likely to be anxious, defensive, and unwilling to take the risks involved in learning" (p 48).

This research suggests a social (psychological) dimension of the interaction in collaborative learning which relates to the socio-emotional aspects of group forming and group dynamics. In other words, it relates to processes that have to do with getting to know each other, committing to social relationships, developing trust and belonging, and building a sense of on-line community. These processes are not directly related to the task in the strict sense. If group members are initially not acquainted with each other and the group has zero-history (which is often the case in distance education institutions like the Open University of

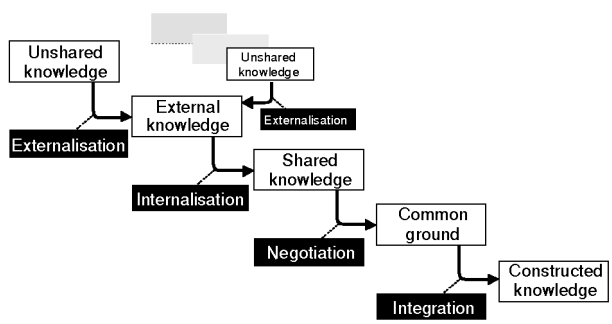

FIG. 1. From unshared knowledge to constructed knowledge.

the Netherlands), group forming, developing a group structure, and group dynamics are very important for developing a learning community. Otherwise, the risk is very high that learners become isolated and depressed because they are confronted with a lonely learning experience. Contemporary CSCL environments may not provide adequate opportunities for social interaction, the development of friendships and camaraderie.[10–12] Figure 2 depicts the educational and the social (psychological) dimension of social interaction.

Wegerif[9] emphasizes that "many evaluations of asynchronous learning networks understandably focus upon the educational dimension, either learning outcomes or the educational quality of interactions, overlooking the social dimension which underlie this" (p. 34). Adapting Gilroy's[13] formula we conclude that:

Valued learning experience =
F (pedagogy, content, community)

If any one of the three variables approaches zero, the function also approaches zero. This means that we need all the three variables to exist at the same time, i.e., a functional pedagogy for instruction, relevant content to be learned, and a performing community of learning. Otherwise the learning experience will be low or will not be there.

A community needs an affective structure. Building an affective structure entails a process of affiliation, impression formation, and interpersonal attraction to induce and promote social relationships and group cohesion. Ultimately, the social relationships formed will contribute to group cohesion, the degree of common understanding amongst group members, an orientation toward cooperation, and the desire to remain in their group (see Fig. 2).[14]

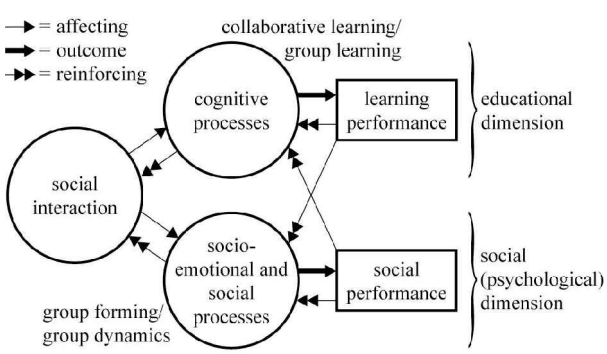

FIG. 2. The two functions of social interaction.

THE CONTEXT OF THE VIRTUAL TEAMS

The contributions to this issue demonstrate that learning and understanding in virtual teams is difficult and the level of communication and learning may prove disappointing. One of the possible explanations of these somber results (beside several others found in the contributions in this special issue) may be that neither the task nor the task environment requires learners to engage, for example, in those reflective behaviors that give rise to higher levels of learning.

An environment specifically designed to elicit reflection in action was the Virtual Business environment developed at the Open University of the Netherlands.[15] The Virtual Business environment aims to integrate learning and working. The concept has been applied in different domains with various levels of virtualization of teams, but here we choose to focus on InCompany, an environmental advisory firm. In this firm, teams operate in "virtual mode" for prolonged periods of time with sparse face-to-face meetings. From one perspective a VB operates as a regular business: projects are acquired and distributed to project teams where the participants are allotted different roles. A team works on project plans until both the VB management and the customer agree to it. During project execution there are periodic presentations and reviews of intermediate results, including lessons learned, until a final result can be presented.

Parallel to this business view and structure Virtual Business can be viewed as a learning context where learners are supported and encouraged to work on particular competencies. In the preparatory phase, the learner prepares a personal development plan that specifies the competencies and the roles that (s)he aims to improve at. During the execution phase, the growth of the individual learner is periodically assessed in individual reflective reports as well as by assessment by peers and the coach. A more detailed description of the InCompany implementation can be found in Jansen, van Laeken, and Slot's "Virtual business e-learning: an approach to integrating learning and working."[16]

Although the collaboration and communication within Virtual Business teams was not traced in detail, the results[17] are fairly clear: Learners tend to concentrate on project work and neglect their learning tasks. They, thus, neglect tasks such as documenting their achievements in their portfolios, reflecting on process feedback from others, and reflecting on their growth with respect to the goals in their personal development plan.

THE CONTRIBUTIONS

Mulder, Swaak, and Kessels, in their article "In search for reflective behavior and shared understanding in ad hoc expert teams," begin by providing a conceptual framework for collaborative learning and shared understanding based upon the interaction of social or group processes and cognitive or individual processes. To study these processes, they made use of four key concepts, namely questioning, conceptual learning, feedback and expression of affect that they deemed central to the process of reaching shared understanding. In an exploratory study they studied questioning behavior in distributed teams and found suboptimal question-answer and reflective behavior. To support the necessary reflective behavior (i.e., getting team members to pose questions and receive answers) they then developed a tool, the Q-tool. Their research provides important insights into the intricacies and complexities of stimulating, but also of measuring social and cognitive process which occur in virtual teams.

Kreijns, Kirschner, Jochems, and van Buuren, in their article "Determining sociability, social space and social presence in (a)synchronous collaborating teams," continue on this social theme stressing that the effectiveness of group learning in asynchronous distributed learning groups depends on the social interaction that takes place. This social interaction affects both cognitive and socio-emotional processes that take place during learning, group forming, establishment of group structures, and group dynamics. In their research on how software technology can be used to augment CSCL environments with social affordances devices to stimulate social interaction for socio-emotional processes and thus create sociable CSCL environments, they came across the problem that there are no valid and reliable instruments to measure sociability, social space, and social presence. Beginning from a theoretical framework based upon an ecological approach to social interaction, they report on the construction and validation of three instruments to determine sociability, social space, and social presence in (a)synchronous collaborating groups.

Littleton and Whitelock, in their article "Creating meaning through a community of collaborative learners," draw on data derived from an ongoing study of students enrolled in the Open University's MA in Open and Distance Learning. This course is delivered exclusively on-line to an international cohort of students from wide-ranging academic backgrounds. Littleton and Whitelock's analysis of the students' collaborative work afforded a distinctive opportunity to understand the means by which such students negotiate shared understanding and support each other in the process of learning at a distance. In this context, drawing on contemporary socio-cultural theory and research, they explore the salient input of the moderator and the role the moderator plays in supporting joint meaning making and fostering a collaborative community of enquiry.

Van der Puil, Andriessen, and Kanselaar, in their article "Supporting social and task regulation of learning interaction in collaborative writing tasks," explore the quality of learning interaction episodes in relation to the uses and effect of supporting the collaborative process through the communication-interface. In studying how support in the communication interface affects the collaborative relation and consequently the learning interaction coming forth from this relation, they address three main issues, namely, (a) the normative perception of the collaborative relation, (b) the dynamics of the development of this relation, and (c) the relation of the abstract concept of the collaborative relation with the overt interaction taking place during collaboration. With the help of a structured dialogue system (SDS) that makes use of roles and sentence-openers, they determine that the social dimension of the relation between participants suffers while a more task-functional approach of the participants appears to be stimulated. In the sessions reported on, argumentation appears to affect the relation between participants in a negative way since after an argumentative sequence, repair of the relation takes place. This "relational stress" tends to stifle argumentation.

Joiner, one of the authors in this issue, discusses different research contributions with respect to how they play a role in bringing theories and models of supporting collaboration in virtual learning environments a step further.

Finally, Häkkinen discusses the central findings of the studies in light of the recent research on computer-supported collaborative learning, the typical problems and challenges related to learning in virtual teams, and the various mechanisms that the different studies suggest for supporting and structuring learning in virtual teams. Her conclusion is that research on distributed learning groups needs to consider a complex set of variables: cognitive, social, emotional, motivational, and contextual variables interacting with each other in a systematic manner.

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