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Group awareness, learning, and participation in Computer Supported Collaborative Learning (CSCL)

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Abstract

The aim of this study is to analyze the relationship between student participation in Computer-Supported Collaborative Learning (CSCL) and the effects of this on learning outcomes. Within this context, we have taken into consideration the line of research called Group Awareness (GA) to facilitate the processes of interaction between teammates. Group Awareness Widgets (GAw) are tools based on the shared information displayed by the teammates throughout the course of collaboration. The theoretical results of this review demonstrate the need to determine how GA affects the facilitation of student interactions and the enhancement of the collaborative learning process. To this end, we have reviewed the current state of a line of research called GA, a research line that aims to facilitate the communication and coordination processes so as to help to increase the quality of work and the collaboration environments in CSCL. Next, we have briefly discussed the different conceptualizations of the GA focusing on the mechanisms used to support asynchronous GA in a CSCL Environment, and we haven then addressed some of the key dimensions considered, among which we can distinguish behavioral-awareness or participation, cognitive awareness, and social consciousness. The remainder of our work consists of analyzing the relationship between the GA, the students' learning performance, and their participation.

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1. Introduction

Computer-Supported Collaborative Learning (CSCL) has developed significantly during recent years in higher education. However, the results of extensive research in CSCL show a number of difficulties associated with the possibilities of communication and collaboration that are offered by Computer Mediated Communication (CMC). This development is largely based on the high expectations that are put on the use of information and communication technologies in regards to improving the efficiency as well as the quality of work processes and group learning (Dillenbourg, Järvelä, & Fischer, 2009).

In this context, one of the aspects that have acquired special importance is the study of participation, which can be considered one of the elemental factors of learning (Wenger, 1998). Participation is a concept that has been studied from different theoretical and empirical approaches, which range from cognitive science approaches to socio-cultural theories, the latter being the predominant approach in the field of research of CSCL (Dillenbourg & Fischer, 2007; Hrastinski, 2008).

The analysis of the effect of participation in the collaborative learning processes and outcomes has been one of the active lines of research in the recent years (Arbaugh, 2000; Bento & Schuster, 2003; Böhlke, 2003; Hrastinki & Keller, 2007). Several studies show that active participation in CSCL environments may be associated with the

achievement of learning by the student (Sivapalan & Cregan, 2005; Davies & Graff, 2005). However, other authors (Kanuka & Anderson, 1998; Kreijns, Kirschner, & Jochems, 2003) defend that a significant amount of participation and frequent communicative interactions among the participants do not guarantee better learning outcomes, and do not necessarily lead to a better collaborative learning process.

Considering the differences in the results of these studies, our research aims to empirically analyze the effect of participation in CSCL environments and their relation to the development of student Group Awareness (GA), which is defined as the “understanding of the activities of others, which provides a context for your own activity” by Dourish and Belloti (1992, p. 107). Considering the expected positive effect of GA on collaborative learning outcomes, we assume that the introduction of GAW (Group Awareness Widgets) may help to improve the perception of students in distance learning situations, from the information gathered from the activity itself and the activity of others in a collaborative situation (Romero, 2010).

We have considered the importance of investigating the development of GA to improve collaboration processes in CSCL (Bodemer & Dehler, 2011), as well as the expected impact on the achievement of the learning objectives, both individually and in groups. At the same time, we believe that participation in learning activities by the student generates a positive impact on the development of GA which should in turn improve the results of learning in collaborative tasks.

The work presented here is part of an ongoing doctoral research and aims to: a) conduct a review of the theoretical and conceptual foundations of collaborative learning in CSCL, b) address the relationship between participation and learning as a key factor for the development of collaborative processes, and c) introduce the concept of GA to establish the relationship between participation and learning outcomes considering the use of a GA tool (GAW), in an unchanged collaborative situation.

2. Participation as a modulating factor of the effectiveness of the learning process

Participation has become increasingly important in the study of CSCL, basically because it is considered one of the most important variables in understanding the processes of learning (Wenger, 1998). A review done by Hrastinski (2008), shows that the perception of researchers in regards to online participation vary greatly, but there is an agreement in that participation is an intrinsic part of learning and that the use of technology can facilitate and encourage participation of the students in these environments (Bento & Schuster, 2003).

2.1. Participation in Regards to Student Satisfaction, Group Belonging, and Efficiency in Their Teamwork

Different works (Lipponen, Rahikainen, Lallimo, & Hakkarainen, 2003; Ma, 2009; Schellens & Valcke, 2006), indicate that one of the main difficulties in CSCL is a low level of participation. Participation is of vital importance in CSCL to the extent that it increases group productivity, has a positive effect on the learning perception, and improves grades and evaluation of the quality of the results (e.g. Fredericksen, Picket, Shea, Pelz, & Swan, 2000; Hiltz, Coppola, Rotter, Turoff, & Benbunan-Fich, 2000). Moreover, it has been argued that participation influences the perception of satisfaction of the student (Alavi & Dufner, 2005), as well as retention rates (Rovai, 2002) positively. When students participate equally in the collaborative process, all group members have the opportunity to contribute to the knowledge construction process. However, it is also important to note that participation does not guarantee learning, so it is necessary to explore the forms this participation takes in CSCL environments. Hrastinski (p. 1761, 2008) defines participation “as a complex process of maintaining relationships with others including, for example, doing, talking, thinking, feeling, and belonging, which can be produced both online and in person”. From here arises the need to analyze how students can maximize the participation experience for these, considered to be basic conditions, to be given in the collaborative process. Among these conditions we consider the sense of belonging to a community or a group, a basic condition to maintain relationships with others. In fact, some authors have described participation as belonging to a community (Jaldemark, Lindberg, & Olofsson, 2006). This condition is based on the theories of cooperative and collaborative learning, with the understanding that learning is a social construction and not an individual process (Bonk & Cunningham, 1998). Littleton and Häkkinen (1999) argue that

collaboration is the construction of meaning with others and is characterized by a joint commitment to a common goal. For Dillenbourg (1999) collaborative learning is a situation in which two or more people try to learn something together. To the contrary, Wenger (1998) argues that participation should not be considered as equivalent to cooperation or collaboration, primarily because participation can include all types of relationships.

2.2. Tools Supporting Participation

Another important condition is that physical and psychological tools support participation. Säljö (1999) argues that people learn by making use of artifacts. Vygotsky (1978) distinguishes two types of tools: material and psychological. In most situations, the physical tools or materials are intended to help people to achieve certain objectives. Psychological tools however, are used in conjunction with the physical tools. For example, when using a computer connected to the Internet (physical tool) it is possible to communicate with others using language (psychological tool) (Hrastinski, 2008). On the basis of the above statement, the physical tools mediate our relationship with the psychological tools; an example of this mediation is TEL (Technology-Enhanced Learning).

At present, collaboration learning support and tools (instructional interventions), range from complex scripts of interaction that must be followed step by step, to simple messaging between participants in order to provide support throughout the collaborative process. (e.g., Weinberger, Ertl, Fischer, & Mandl, 2005). A proposed alternative are the GAw's tools, affordance devices that provide a group member's understanding of the activities of his teammates. These tools or collaboration support systems are used as an alternative and/or a supplement for face to face interaction in order to facilitate the GA development. The GA information allows participants to change their ways of acting in order to increase team effectiveness, providing information that is not available in such an environment, which is one of the greatest challenges of CSCL (Buder, 2011).

Nevertheless, in order to achieve the objective of engaging the students in productive dialogue, providing a script or tool support may not be enough to guarantee the achievement of collaborative learning process efficiency and the collaborative outcomes. We should consider that participation needs to be supported by tools, but should also be facilitated by the instructional design principles that are deployed in a wider environment of CSCL.

This has led to a significant number of investigations to examine how GAw affect the process of collaboration and their effect on the learning ability (Buder, 2011; Janssen, Erkens & Kanselaar, 2007; Jermann & Dillenbourg, 2008; Romero, Tricot & Marine, 2009). These factors have awoken our interest in exploring student participation and its relationship with GA. The GAw considered allow, on one hand the acknowledgement of the perception of participation and on the other hand, cognitive awareness development by participants in a collaborative activity.

2.3 Participation Analysis

The analysis and characterisation of participation is one of the challenges that researchers in the field have addressed in recent years. We consider the categorization scheme proposed by Hranstski (2008) for characterizing the typologies of participation in CSCL environments. Hranstski has found that research is dominated by the concepts of low participation, based on frequency counts as measures of participation. However, some researchers have focused on the more qualitative dimensions of participation such as the idea that participating means to join a gratifying dialogue, in which the student is part of a community. Therefore, we consider that participation requires certain characteristics that determine the students' knowledge construction process. As a result of this theoretical consideration we have proposed a theoretical approach based on the concept of learning as the creation of new knowledge, which incorporates the perspective of the acquisition and participation (Badia, Becerril, & Romero, 2010). Thus, learning occurs as a result of interaction with others (Säljö, 2000) which enables the joint construction of meanings in a shared task. There is an emphasis on understanding how the group builds knowledge through joint activity, different from the perspective which views learning as an individual process. The review of Stahl, Koschmann and Suthers (2006) noted that in early studies about collaborative learning, the group was treated as a contextual variable that influences individual learning. By contrast, in current CSCL studies, learning is analyzed as a group process, in which analysis is necessary for both the individual and the group as a whole.

For analyzing the participation, the quantitative data related to the number of interventions, distribution of the interventions, amount of writing, amount of time, among others, (called by some authors ‘structural indicators of activity’ (Dimitracopoulou, 2008)), are useful as a first approach to participation. However, this structural approach is insufficient for the investigation of the learning process. We know that the mere fact that participants have access to an online environment, is no guarantee that participation helps the collaborative construction of knowledge, therefore, it is not enough to only access and meet the participation requirement, but it is necessary to know if such participation is perceived by the other participants as important or influential in the collaborative process and the qualitative aspects of the participation. Thus, participation is considered as a central issue in the process of collaborative construction of knowledge. However, the central question is how to know if participation is influential in the process of collaboration.

3. Implications and prospectives

3.1 Group Awareness

An important approach to be considered in the study of the relationship between participation and learning is the theoretical approach called Group Awareness (GA), as it can identify more complex dimensions of participation. Group Awareness has acquired a significant importance in the investigation of CSCL, from the idea that the lack of contextualized information, and in particular in regards the knowledge of other group members, contributes to the typical problems in CSCL (Engelmann, Dehler, Bodemer, & Buder, 2009). The background of this research is based on the idea that such environments reduce the availability of information and contextual cues on a number of features needed in the process of collaborative construction of knowledge (Clark & Brennan, 1991).

From a psychological perspective the GA in CSCL environments arises as a need to compensate the lack of co-presence, visibility, audibility, and sequence in distant learning which is present in face-to-face communicative situations (Engelmann *et al.*, 2009). However, this does not mean that face-to-face communication provides all the necessary information. For example, information on other cognitive states (knowledge, beliefs, or goals of the members of the group), is not directly available, both face-to-face and through Computer Mediated Communication (CMC) in online learning. The lack of information about the state of knowledge is especially critical in collaborative learning tasks, since they are based on the exchange and co-construction of knowledge (Buder, 2011).

The studies on the GA in the field of CSCL have allowed further study of the context and in particular on the knowledge of members of a collaborative group (Bodemer & Dehler, 2011; Janssen, Erkens, & Kirschner, 2011). This knowledge may include, for example, information of the activity both individual and in a group, the design of learning activities, the characteristics of the media, among others. In summary, any information which contributes to, or facilitates the collaborative construction of the knowledge processes (Phielix, Prins, & Kirschner, 2010).

3.2 The Different Typologies of Participation

The factors previously discussed have led to the need for participants in these types of environments to be informed on specific aspects of their activity (Gross, Stry, & Totter, 2005), for example, the presence of group members, what they are doing, what interests them, or how others feel about them. As a result of this, the design of tools for visualizing information was undertaken (Janssen, Erkens, Kanselaar, & Jaspers, 2007; Jermann & Dillenbourg, 2008). Visualization can make it easier to collect and interpret this information, because it allows an external representation of a complex concept of work, facilitating visual and verbal memory work (Ware, 2005).

According to Gross, Stry and Totter (2005), GA is defined as “the information of various aspects of the group and its members” (p. 327). That in part may be associated with both the task itself, and the information about the activities that members develop. Following this course, the tools of group awareness are developed to increase the efficiency of group work and at the same time to guide the activities in CSCL (e.g., Gutwin, Greenberg, & Roseman, 1996).

Bodemer and Dehler (2011) in a recent review suggest that the GA can be defined as the knowledge and perception of contextual information, of the behavior, both cognitive and social in a group or in one of its members. GA also aims to develop tools that help implicitly guide student behavior, communication and reflection by presenting information, whether individual or collective, and thus help to control, (self) regulate and (self)evaluate student activity. It is argued that the development and application of tools should be complemented by systematic explorations into the mechanisms that moderate the relationship between group consciousness and learning (Buder, 2011).

Thus far we have shown in the review of the history and current state of knowledge, that the capacity to provide information regarding various aspects of the interaction is a key factor in the learning process. The focus of our analysis is based on the idea that participation is a learning process that is generated from the interaction and maintenance of complex relationships with others, and can be facilitated by collaboration tools focused on GA. Within this framework, further studies are needed to determine the relationship between the types and forms of participation and its relationship to GA that participants develop in a collaborative situation; at the same time it is important to determine how this relationship affects learning outcomes. Few studies have deeply explored this line of research, and the research currently available shows very preliminary results. In summary, we can consider that learning in collaborative environments seeks to foster areas of discussion among students, while at the same time exploring concepts of interest to elucidate or problematic situations that could be solved by encouraging social interactions that can contribute to individual and collaborative learning.

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