Chapter XII
A Generic Platform for the Systematic Construction of Knowledge-Based Collaborative Learning Applications

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ABSTRACT

This study aims to explore the importance of efficient management of event information generated from group activity in collaborative learning practices for its further use in extracting and providing knowledge on interaction behavior. The essential issue here is how to design a platform that can be used for real, long-term, complex collaborative problem-solving situations and which enables the instructor to both analyze group interaction effectively and provide an adequate support when needed. The achievement of this task first involves the design of a conceptual model that structures and classifies the information generated in a collaborative learning application at several levels of description. This conceptual model is then translated into a computational model that not only allows the efficient management of the knowledge produced by the individual and group activity but also the possibility of exploiting this knowledge further as a meta-cognitive tool for real-time coaching and regulating the collaborative learning process. The computational model becomes the central issue in this contribution while the conceptual model is briefly introduced.

INTRODUCTION

Computer supported collaborative learning (CSCL) is an emerging paradigm (Koschmann, 1996) for research in educational technology that focuses on the use of information and communications technology (ICT) as a mediation tool within collaborative methods of learning. When designing and implementing environments that support online collaborative learning, several issues must be taken into account in order to ensure full support to the online learning activity. One such issue is the representation and analysis of group activity interaction.

Interaction analysis is a core function for the support of coaching and evaluation in online collaborative learning environments. It relies on information captured from the actions performed by the participants during the collaborative process (Dillenbourg, 1999; Martínez, de la Fuente, & Dimitriadis, 2003). The efficient embedding of this information and of the extracted knowledge into applications sets the basis for enhancing monitoring, awareness (Gutwin, Stark, & Greenberg, 1995) and feedback (Zumbach, Hillers, & Reimann, 2003) to achieve a successful learning process in collaborative environments. Therefore, the success of CSCL applications depends to a great extent on the capability of such applications to embed information and knowledge of group activity and use it to achieve a more effective group monitoring (Gutwin, Stark, & Greenberg, 1995).

CSCL applications are characterized by a high degree of user-user and user-system interaction and hence are generating a huge amount of event information. This information can be conveniently collected and automatically processed by computers as a data source to extract relevant knowledge of the collaboration. Note that in this context information refers to the event data generated by the learning group and knowledge refers to the result of the treatment of this information. Knowledge is acquired by means of analysis techniques and interpretations that will be presented to the same group that generated it.

As a result, the event information management is the cornerstone in this context, aiming at achieving three main goals: (1) Provide an analysis of the group's information by obtaining and classifying the necessary information gathered from the collaborative activity into three essential types of categories (Daradoumis, Martínez, & Xhafa, 2006), namely the *outcome of collaboration* (the members' contributing behavior to the task), the *functioning of the group* (the management and organizational processes underlying the collaborative learning activities, such as participation behavior, role playing, etc.), and *individual and group scaffolding* (social support and task- or group functioning-oriented help); (2) Given that the large amount of information generated during online group activity may need much time to be processed, an effective way to collect, analyze and present this information is required; (3) Efficiently embed the information and knowledge obtained into CSCL applications so as to both facilitate tutors to monitor the learning activity and constantly provide group members with as much awareness and feedback as possible.

Achieving a clear and well-structured conceptual model constitutes a principled manner for the design of a computational model that implements the process of embedding information and knowledge into a CSCL application. Indeed, the structuring and classification of the event information into specific collaborative processes can contribute and facilitate the building of a portable, general and reusable collaborative learning ontology for the representation, learning and inference of knowledge about each collaborative process. This allows the design of effective computational models that reflect as accurately as possible task performance, individual and group behavior, interaction dynamics, members' relationships and group support.

To this end, a generic, robust, reusable platform is provided for the systematic construction