CollabSS: a Tool to Help the Facilitator in Promoting Collaboration among Learners

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ABSTRACT
Several types of learning environments have been classified under the umbrella term of CSCL (Computer-Supported Collaborative Learning). Literature has acknowledged the importance facilitators have in CSCL environments. Nevertheless these environments still lack support to the activities carried out by facilitators during learning activities. In this work we address the needs of supporting the facilitator in his/her tasks while mediating the learning activities. We present CollabSS, a system intended to inform the facilitator about interaction and collaboration taking place during the learning activity. The approach was motivated by the context of manufacturing workers in a learning situation.

Keywords
CSCL, Facilitator, Constructivism, Conversation, Internet

Introduction
We can think of Computer Supported Collaborative Learning (CSCL), based on some concepts of Computer Supported Collaborative Work (CSCW), as both combine communications and computer technologies to support various activities involving groups in collaborative problem solving situations. The process of knowledge construction is promoted by activities involving internal negotiation and deliberate actions such as goal setting, negotiation, identification and discussion of problems and their solutions. In this kind of environment adult workers can experience a constructivist aesthetic approach to learning, motivated by their own professional work context. The important epistemological assumption of constructivism is that knowledge is a function of how the individual creates meaning from his/her experiences; it is not a function of what someone else says is true (Jonassen et al. 1995, Papert 1986). CSCL environments have a special participant, usually called a “facilitator”, who plays a fundamental role in coordinating and mediating the group discussions towards reaching the goals and learning objectives of the activities carried on. In this paper we address the needs of facilitators in CSCL environments and propose a system to support them.

The Factory Game (Baranauskas et al., 2000) illustrates our conception of a CSCL system for the context of learning manufacturing concepts. To support the facilitator in analysing aspects of collaboration among the workers during the learning activities, two systems were developed: one to support the facilitator in improving collaboration and learning among users during the course of the learning activity; the other one to help in a more detailed post analysis of their collaboration. In this paper we present CollabSS (Collaboration Support System), a tool to support the facilitator during the activity. A prototype of CollabSS was built according to some principles we have defined in previous work, based on the analysis of the Factory Game usage (Borges and Baranauskas, 2003).

The paper is organised in the following way: the next section presents our philosophical instance concerning understanding collaboration and learning. Then we describe the proposed support environment and present the CollabSS system. Finally, we summarise and conclude.
Understanding Collaboration in a Learning Setting

Collaboration and cooperation are terms that can be taken as synonyms; the first comes from Latin *co-laborare* (to work together), and the second means to act or work jointly for a common end, to work together with others (Williams, 1979). In the academia both terms have been presented with different meanings: Roger and Johnson (2002) define cooperative learning as a relationship in a group of students that requires positive interdependence, individual accountability, interpersonal skills, face-to-face promotive interaction, and processing. Scrimshaw (1993) defines cooperation as any independent activity which enrols more than one agent, and collaboration as a style of cooperation in which all the group participants take part in the task and negotiate the solutions. Collaboration presupposes a mutual effort to solve together a problem. It results from a continuous trial to build and maintain a shared conception of a problem (Brna, 1998). In this work we assume this latter meaning for collaboration.

Some influential literature has suggested that cooperative/collaborative learning situations seems to be more effective than the competitive ones (Light, 1993, Roger and Johnson, 2002, Santoro et al., 1999). Working in groups makes the task more fun or at least less threatening. Students can help each other in the learning process, acting as partners with the teachers, looking forward to reaching a common goal, which will result in constructing knowledge about a specific subject. The collaborative learning environment enables a student to solve problems and understand subjects s/he usually would have difficulties when doing alone. This empowerment is based on the distributed knowledge, the multiple perspectives discussed through the process, the way other agents help to remember important information and the way these agents could be models to imitate. The learner’s progress occurs during the interactive cycle of exchanging information. Talking about their problems help learners to clarify these problems. They pick up ideas from one another, going from different explanations to a high level shared meaning. The process of discussing ideas and constructing arguments can shape learning. Collaboration puts the responsibility for the learning into the peers themselves (Scrimshaw, 1993).

Computer-Supported Collaborative Learning (CSCL) concerns studies and proposals on ways of designing technology to support the learning processes promoted through collaborative efforts of students working in a given situation. In our previous work we developed and evaluated a computer based environment for collaborative learning in the work context and we could detect that this type of environment can support a qualitative change in the training of human resources in work organisations (Baranauskas and Borges, 1997). The studied scenario involved tasks in which there is a goal all collaborators have to achieve together. Learning is expected to occur as they collaborate with each other during the activity.

Collaboration among the learners was made possible in the system by providing a space for their communication - a chat tool embedded in the interface. Through this tool they could discuss and negotiate how to achieve the goals. Participants in a CSCL include not only the learners working in a given task, but also a facilitator. As “Collaboration conducts to learning under certain constraints and in certain situations which are dependent on both the individual and the group aspects of the learners involved in the collaboration process” (Paiva, 1997, p.216), the facilitator has the responsibility of keeping the group work in this collaborative learning atmosphere. Therefore, the main goal of the facilitator involves promoting the learners’ participation and collaboration towards the learning of the subject domain. In the next section we present ways of helping the facilitator in his/her job.

Analysing Collaboration in CSCL environments

In previous work we developed an example of CSCL environment to be used in the learning of systems production concepts in industries. The Factory Game is a collaborative tool designed for groups of up to 8 persons working together to reach a common goal in a simulated manufacturing line (Baranauskas et al., 2000).

In order to analyse the collaboration that takes place in learning situations through the Factory Game, we defined a Framework to Analyse Collaboration (FAnC) (Borges and Baranauskas, 2003). The Factory Game was used in different training situations and contexts, and analysis of collaboration using FAnC revealed that:

- Depending on the size of the group and the quantity of messages exchanged, it can be very difficult for the facilitator to reach his/her goals of promoting collaboration and creating learning opportunities during the activity;
- The analysis of collaboration *per se* is a time-consuming process that, without the support of a tool, is not feasible, especially during the learning activity (and also after it).
Based on these results, we designed an environment composed by two systems (CollabSS and CoPA), a database (the FAnC database) and its interaction with both systems. The CollabSS environment by itself interacts with the collaborative tool. The architecture for this environment is represented in Figure 1. Although the environment design was initially motivated by the Factory Game, it was designed to be integrated with any collaborative tool which has a discussion mechanism embedded in it.

The process of doing a detailed *a posteriori* analysis of the interaction is a very time consuming activity, despite very important to evaluate the collaboration occurred in a post event basis. CoPA (Collaboration Post Analysis) is a tool to support this analysis after the learning activities. CoPA provides support for evaluation and classification of each speech and conversation, to capture information about the types of interaction and collaboration present. CoPA saves “conversation starters” in the FAnC database. A “conversation starter” is a speech prompt that aims at initiating a conversation in order to promote collaboration (Borges and Baranauskas, 2003). Conversation starters are selected by the analyst from the first speeches of the large conversations in the analysed interactions.

CollabSS (Collaboration Support System) is a tool to support the facilitator in his/her goals by presenting hints and information concerning participation and interaction of the participants during the learning activities. CollabSS also presents graphical representation of the interaction taking place among the participants, to help the facilitator in evaluating it. It gets input from the discussion mechanism embedded in the collaborative tool and saves it in the FAnC database, which provides the “conversation starters”.

**CollabSS: the Collaboration Support System**

CollabSS is a tool to help the facilitator in identifying interesting moments, from the perspective of learning opportunities, to act on and to suggest actions for the participants. CollabSS receives the chat interaction from the collaborative tool and format and save that information in two ways: in an object structure to be used during the learning activity and in the FAnC database, to be used by CoPA. Figures 2 and 3 present snapshots of CollabSS main window.

CollabSS has an agent responsible for tracing the chat interaction and to detect moments when the interaction in the chat is not satisfactory; i.e. the density of speeches by time is low, some user is not participating in the discussion, etc. These moments as called “collaboration support moments”: special moments when the facilitator should act to instigate collaboration. When a collaboration support moment is detected CollabSS indicates that with the lamp button in the main window. Pressing that button, one of the conversation starters got from FAnC database is showed (CollabSS does not select a specific conversation starter, it just use a different one at each time). CollabSS also suggests to whom the facilitator should address this conversation starter. Clicking on that button, the system will present the “Sending a Conversation Starter” window (Figure 4) directed to that participant. That window presents a conversation starter in the message field. The facilitator can change the message, ignore it, send it to all users or, when the moment is based on the interaction of a specific user, send it to that user.
CollabSS also provides on-line dynamic representations of the chat interaction, based on the FAnC graphical representations. During a learning situation, these representations intend to make it easier for facilitators the goal of analysing the course of the conversations, how users are interacting with each other and how many speeches have been produced by user, by conversation and by time. These graphical representations are accessible from the CollabSS main window. The facilitator can make use of the conversation graphic (Figure 5), the condensed form of the conversation graphic (Figure 6) and the bar chart with the number of speeches per user (Figure 7).
Using the conversation chart (Figure 5) the facilitator can analyse the user’s participation, the speech density in a short interval of time and the pattern of conversations. The horizontal lines represents the selected users. During the course of a conversation, the facilitator can select the users s/he wants to see represented in the chart. The time is represented from the left to the right. In Figure 5 the extreme right is the current time and it decreases to the left till the past 25 seconds. The chart has a horizontal scroll, to enable an analysis of the whole course of the chat, since its first speech. Each speech is presented as a diagonal line, having the sender at the left side and the receiver at the right size. Sender and receivers are also distinguished by different colours (green for the sender and red for the receiver).

**Figure 6.** condensed conversation graphic window

Using the condensed conversation graphic (Figure 6), the facilitator can analyse the users’ participation and the speech density in a larger interval of time. Different colour scale represents the amount of speech sent by the user. The time scale can be configured to represent a bigger or a smaller time interval.

**Figure 7.** speeches by user window

The speech by user window (Figure 7) shows the number of messages each user has sent in the collaborative tool. It is useful to evaluate who is being more active participant and who could need more attention from the facilitator.

**Conclusion**

The community using computers in education and training has acknowledged the role the facilitator plays in constructivist learning and in CSCL. Nevertheless, the workload of a facilitator in CSCL systems can prevent him/her of paying attention to aspects of the interaction among the learners. In this paper we argue that the facilitator could be supported in promoting participation and collaboration, by some tools embedded in these environments. We proposed CollabSS: a tool that supports the facilitator in analysing aspects of collaboration during the learning activity.
Based on a framework for analysing the interaction that takes place among the participants of a collaborative learning through the Internet, proposed in previous work, CollabSS informs the facilitator with some graphical representations of participants’ speeches and conversations. CollabSS could also be useful in other communication-based collaborative environments such as CSCW, games and some activities carried out in distance education environments. The tool is being integrated with the Factory Game, a synchronous simulation game designed for training of workers from a manufacturing line. Further work involves evaluating CollabSS effectiveness in helping the facilitator to improve interaction and promote learning in real settings.

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