Reframing Learning in CSCL Environments

Teresa Cerratto and Claire Belisle

CNRS - IRPEACS, Institut de Recherche Pluridisciplinaire
sur les Environnements d'Aprentissage et de Communication de Savoirs, Ecully ,France

Abstract

The exploratory work presented here is part of a pilot study to identify users' communication and interaction needs when collaborating through on-line computer networking. The theoretical background is human action theory, situated learning and interactive learning process. Four groups of students were each exposed to two different collaborative tools. Preliminary findings show that such tools require an adaptation period, develop awareness and specific skills and can produce interesting learning and interaction outcomes.

Keywords — Human Action Theory - nteractive Learning Environments - Interface - Learner's actions and interactions - Actors - Meaningful and Social learning.

1. Introduction

Studies in collaborative learning (O'Malley, 1995) stress the need to " focus more on the processes involved in successful peer interaction, rather than just on learning outcomes ". With the functionalities afforded by new networked technologies, there is now the potential for students to share their learning experiences with each other and also interact more dynamically with their tutors. Although asynchronous computer supported collaboration has been a frequent research interest (Harasim, 1990), on-line synchronous work is an issue that has received very little attention in the area of CSCL. Because synchronous interactions are an essential part of academic training (Cf academic learning as second order experience of the world, Laurillard, 1993), we chose here to focus on synchronous tools, allowing for immediate active interaction and feedback between learners.

We are, therefore, particularly interested in whether technology-mediated synchronous communication and collaboration between students and tutors can facilitate the process of learning to learn. To this end, we consider the interface between networked co-learners to be a central issue. Our work focuses on determining the most appropriate way of distributing work and communication spaces such that collaborative learning, comprising both communication and working, can be seamlessly supported and co-ordinated.

2. Recontextualizing Learning from a Human Action Theory

Human action theory is an approach which provides theoretical tools for rethinking human cognition, its inherent complexity and its social and cultural dimensions. Overriding many of the shortcomings of information processing theory, the concepttual approach is based on the human being as a social, intentional, motivated and situated "human actor" with a personal history and a psycho-biological presence to the world. In the study of computer supported collaborative learning, this means taking into account the characteristics proper to a situated, psychological, social incarnated actor in studying his specific learning activity. In this approach the learner is seen as capable of transforming the objects at the same time that he transforms himself. In this perspective, cognitive objects and tasks only exist inasmuch as they are produced by a subject.

From a learner-centred and interaction point of view, learning activity is not a computation or manipulation of representations, learning is constructing meaning from information based on a human capacity to make sense and to share meanings with someone.We analyse real life learning situations and identify learning as a dynamic, multidimensional activity of intentional, motivated and self-organising actors rather than as "acquisition and modification of cognitive states and structures determined by an ordered set of functionalities and rational processes finalised by the causal necessities of a predifined task" (Linard,1993)

Human Action Theory shows us that cognition is a mental and psycho-biological action at the same time. Human Actors are social beings that need a meaningful context in order to planify goals and achieve them in an organisational perspective. What is at stake in learn-

ing is not only intelligence and knowledge construction but more basically self-identity and relating through interaction with other people. CSCL environments must provide for both dimensions if they are to have any significant integration in mass-education. Concerning Collaborative learning cannot be defined only as "extending instruction to off-site areas using communication technologies". CSCL brings into play other factors to pertaining human mediation through technology.

3. Context and Methods

The preliminary findings presented are drawn from empirical work carried out within a more comprehensive research on communicative interfaces for collaborative learning. Collaborative learning is not a new topic, but computer supported collaborative learning is. As the field is not sufficiently structured, we think it is necessary to produce exploratory findings, by setting up situations of use and observing, questioning and trying out different alternatives. We experimented with four different collaborative writing tools trying to assess the appropriate task framework and time span of observation to obtain the most significant results. The complete exploratory study is intended as a comparison between different collaborative writing tools, centred on the way students would move from one type of space to the other: shared vs private work spaces, and communication vs work spaces.

This exploratory work is designed to provide knowledge on learners' communication and interaction needs when collaborating through on-line computer networking. Because so few aspects of synchronous computer supported collaborative learning have been studied, we chose to work in real-life settings with motivated students personally interested in exploring these tools. Several studies were conducted comparing face to face collaboration with computer supported collaboration, or comparing uses of two different collaborative tools by the same group. Observations and analyses reported here are based on the use for synchronous collaborative learning of existing groupware by four groups of between two to five students. Each group was given a collaborative task and exposed to two different collaborative situations. Students were from different training programs: engineering, psychology and cognitive science. Two studies included interviewing participants before and after their task and others videorecording, taping conversations and recording the students' written communication and the resulting work.

Co-writing was chosen because it is based on one of the most popular uses of microcomputers, word processing, an application usually provided with all computers. Some of these tools have become standards, such as WordPerfect™ or MicroSoft Word™. This choice aimed at minimising the time span necessary to become familiar with the collaborative tool.

3.1. The tools

The tools used in the different studies had to provide basic functionalities for collaborative writing and editing and are :

- Reach Out™[1], a screen sharing tool for PC
- PictureTel LIVE PCs 100™[2], a desktop videoconferencing system for PC,
- ShrEdit™[3], an experimental CSCW prototype software, on Macintosh,
- Aspects™[4], a commercial CSCW software on Macintosh.

All tools allowed the setting up of a common workspace and a communication space. Two of the tools allow on-line writing and editing with each participant taking control alternatively over the shared document. The other two tools allow simultaneous writing and editing on a shared document. Tools selected had to be robust and compatible with the computers used in training, that is PCs or Macintosh.

3.2. Study Set-up

Different types of situations were observed such as:

- Students doing a collaborative task as an extra feature in a course which did not include computer use;
- Students working in a co-operation base group, doing a collaborative task as part of a curriculum which did not include collaborative tools,
- Students doing a collaborative task as part of a curriculum which included the use of collaborative tools.

4. Prelimirary Findings

Based on our preliminary analyses of the ongoing studies, we have established some findings that need

---

[1] Reach Out™ is a screen sharing tool allowing remote control, and is commercialised by Ocean Isle for PC.

[2] PictureTel LIVE PCS 100™ is a videoconferencing system for PC allowing the interconnection over an ISDN network with one or more videoconferencing system.

[3] ShrEdit™ is an experimental CSCW software allowing shared word- processing and drawing.

[4] Aspects™ is a commercial computer supported collaborative software for co-writing and drawingdrawing on Mcintosh, and allowing the interconnection with up to sixteen other computers.

further investigation. They are summed up in the following five points:

(1) **Intention and goals**
The decision to use these tools, in what way and for what task, is very important in determining the way the tools are used. Therefore knowing the intentions and goals of the users and their understanding of collaboration, is necessary to assess the uses. In such a situation, which is neither regular nor familiar, intentions have to be made explicit in order for everyone to understand what is happening. Goals partially determine and structure the activity and the learning going on has be understood in the light of the goals pursued. The human activity framework provides essential guidelines to understand the processes.

(2) **Complexity of tools supporting synchronous collaborative learning**
Synchronous collaborative tools, at this stage of their development and implementation, are not easy to use. They are very complex tools and, because of the interface and the situation of collaboration, can easily overload the learners. Initially, it is difficult for them to make sense of the interface, from which to learn an appropriate model of themselves, the collaborative task, the computer tool and the group working together. Users need to develop a conceptual model of what the computer does actually, what it enhances. In order to collaborate in any meaningful way, therefore, the learners have to develop a rich understanding and synchronised view of what is happening in the computer-supported environment.

(3) **Skills for computer supported synchronous collaborative learning**
Collaborative learning involves collaborative skills. " The skills especially important for co-operation are communication skills, skills in building and maintaining trust, and controversy skills. " (Johnson & Johnson, 1975). Very often these skills are practised without explicit reference. Students are often unaware of what is required of them in a collaborative activity even when they are able to cope rather well with the situation.

Collaboration is not technologically based in our culture. In computer supported collaborative learning, participant need to identify the different social skills that are being activated Collaborative tools oblige to a greater awareness of what collaborating with someone means, what it involves. Some aspects are amplified by the technology and come to the forefront such as explicit cues necessary to become aware of the others' actions at a distance.

Synchronous computer supported collaboration is a very sensitive situation. Unawareness can be very costly in terms of what is lost in a collaboration if there is no landmarks to appreciate whether communication is taking place or not. Typing is not a spontaneous or easy way to communicate for most people, for it slows down the exchanges, obliges to a structuring of the information and provides little feedback. Videolinks can be misleading for these is no immediate feedback on what the other person is actually doing or looking at.

One finding is that when using collaborative tools, collaborative learning does not happen immediately. It is necessary for the co-learners to spend considerable time familiarising themselves with the tool and communicating with each other at a distance. In turn this requires developing a social protocol as to how to coordinate their activities before even any collaborative learning can take place. This implies that collaborative learning needs to take place over along period of time before any significant benefits can materialise

Furthermore, in one study, it was found that having developed an initial shared understanding of the learning environment and the task that had to be carried out jointly, the participants then had little difficulty in dividing their attention between the separate interface spaces for communication and work.

In the videoconferencing situation, students found that contrary to their expectations, they had great difficulty in getting the attention of the other party, and never knew if they had succeeded in doing so, mainly due to lack of eye contact in a videoconferencing set-up. In another situation, limiting communication to typing in a chat box turned out to be experienced as more efficient, allowing for more reflexive and well prepared comments than in face to face or videoconferencing situations.

Another interesting finding was that the students could articulate for themselves what they had gained from the collaborative learning setting. Those who has communicated by typing were very interested in the log of their chat box. This contrasts with face-to-face settings where students find it more difficult to reflect on their learning and communication strategies. We suggest one reason for this difference is that computer-supported collaborative learning forces the students to be more explicit with each other of their intentions, goals, plans and current understanding of the task in order to collaboratively progress with the task.

(4) **Learning production or outcomes**
After a familiarisation period, students can expect specific gains when working with collaborative tools. Students developed, or felt the need to develop social protocols, so as to counterbalance the lack of usual social cues to communication and awareness of the other's reaction:

⇒ A more elaborated conception of collaboration, of each person participation;

⇒ Familiarity with the software tool;

⇒ Sharing more ideas,

⇒ Improved shared understanding,

⇒ Better quality output (essay, presentation, synthesis...).

(5) **Characteristics of target group users**
Collaborative computer-based tools select users: first of all, computer fluency is a must because of the synchronous type of work studied, the interaction between the users has to reach a minimum level of spontaneity; therefore collaborative writing tools can be easily integrated in a collaborative activity only by people already familiar with typing and fluent enough to rapidly produce or edit a text.

Users must also have time to experiment and train in order to develop fluency in the use of these tools. Time can be a very scarce resource with some groups. This is a real problem for studies such as these, for there is an important time span that has to be lived before the tools are integrated.

5. Conclusion

We are currently continuing with our detailed analyses to examine further how the structuring of the interface affects collaborative learning. At this stage, we propose to carry out further research in the following areas:

- the emergence of self-directed collaborative strategies - in particular how do the students themselves become aware of the benefits of collaborating via these computer systems and how does this subsequently improve their performance?

- the development of interpersonal, meta-cognitive and social skills - it appears that one of the main benefits of this kind of collaborative learning set-up is that student's mastery and awareness of such skills are increased.

- familiarisation and adaptation to the interface of collaborative learning tools - how do the students co-adapt to each other and the tool over a long period of working together and what are the longer term effects?

- identifying different communication channels and modes: how do students tailor their communication needs and activity in terms of the available channels and what are the basic functionalities needed?

Finally, besides pursuing our work on collaborative learning and communicative interfaces, we are interested in two complimentary projects dealing with fields that have received very little attention up to now: one is a study of synchronous interaction and asynchronous interaction in a pedagogical context in order to find out when each type of interaction is best suited to support the interactive critical construction of knowledge; the second is the study of interactivity for learning and the design issues and guidelines that could result.

References

1. Brooke, J. (1992), "User Interfaces for CSCW Systems", in Diaper D. & Santer, Colston, (Eds.), *CSCW Practice: An Introduction and Case Studies,* Berlin: Springer-Verlag.

2. Cerratto, Teresa & Belisle, Claire, (1995) " Learner Centred Approach in CSCL environments, " in Proceedings of *Cambridge International Conference* " Putting the student first: learner centred approaches in open and distance learning ", Cambridge, UK.

3. Collis, B.A. (1993), "Collaborative Learning and Work in an Internetworked Context: Research Issues and Perspectives", Paper prepared for the Working Group 3.3. *IFIP Working Congerence, "Lessons from Learning",* Theme B, Archamps, France.

4. Johnson, David W. & Johnson, Roger T. (1975, 3rd edition, 1991) *Learning Together an Alone,* Cooperative, Competitive and Individualistic Learning, Englewood Cliffs: Prentice Hall.

5. Linard, M. (1993) "From learners' styles to learners'activity: lessons from various learner-centered fields of researche", Invited paper for Working Group 3.3, *IFIP Working Conference "Lessons from learning",* Theme B, Archamps, France.

6. Ross, Susi, Ramage, Magnus, & Rogers, Yvonne, (1995) PETRA: Participatory Evaluation Through Redesign and Analysis , Cognitive Science Research Paper N° 375, University of Sussex, Submited for *Interacting with Computers.*

Authors' Addresses

Teresa Cerratto and Claire Belisle: CNRS- IRPEACS 93, chemin des Mouilles, 69130 Ecully, France. {Cerratto, Belisle}@irpeacs.fr.