The role of roles in the analysis of interactions in collaborative environments

José Antonio Marcos, Alejandra Martinez, Yannis Dimitriadis

The role of roles in the analysis of interactions in collaborative environments

José Antonio Marcos[1] and Alejandra Martínez[1] and Yannis Dimitriadis[2]

Abstract. Analysis of interactions has become a basic function in the field of collaborative learning, as a means for supporting both students' *self-regulation* as well as *formative evaluation* processes. However, we observe a lack of methods and tools for the analysis of interactions in CSCL that considerer the different *roles* implied in collaboration management processes, both from the point of view of the actors that take part in a typical CSCL scenario: teachers, students or the system itself, as well as of the different facets with which they can act as evaluators, observers, facilitators, etc. depending on the level of the students. The synchronous or asynchronous nature of the systems, as well as the temporal dimension of collaboration also influence the needs of these roles.
In this document we present and discuss the ideas of the authors regarding this problem, as part of the initial steps of an ongoing research process oriented towards the development of systems that integrate online regulation and evaluation support functions.

1 INTRODUCTION

In recent years, the main research effort of GSIC (Collaborative and Intelligent Systems) group at the University of Valladolid has been the development of a system for supporting formative evaluation in Computer Supported Collaborative Learning (CSCL), oriented both to the improvement of the systems themselves as well as to the learning they support. These are priorities of investigation within the CSCL field [1], shown by the great interest among the researches on the elaboration of interaction analysis tools and methods that allow to know how the collaborative processes develop and what is the relationship they have with the learning that is achieved with them [2].
Analysis of interaction serves both to the support of students' self-regulation, as well as to task monitoring and evaluation on the part of the teacher. There are several proposals of tools of both approaches: evaluation [3][4], self-regulation [5][6]. Some authors state that these two approaches rely on the same basic functions [1], and that information obtained by teacher with a evaluation tool, for example, can be presented at students to obtain self-regulation [13], as if were a meta-cognitive tool. Thus a same type of analysis of the collaborative action would be valid for actors and purposes different. Nevertheless, no tools exist that integrate them.
In our point of view, a way of facing this problem would be to consider it from the perspective of the different actors that participate in each type of process, and of the needs that each one of them presents. Following this approach, this article discusses the main implications for collaboration management methods and tools that derive from considering the roles implied in it.

[1]Depart. of Computer Science
[2]Depart. of Signal Theory, Communications and Telematics Engineering
University of Valladolid, Valladolid, Spain
jamarcos@ulises.tel.uva.es, amartine@infor.uva.es, yannis@tel.uva.es

This paper is structured as follows: the next section presents the background of this research. Next section exposes the discussion about the identification of roles and their needs in collaboration management processes. The paper concludes with an overview of our future research plans related to this topics.

2 BACKGROUND

Our interest on the evaluation of the collaborative process and analysis of interactions has its origin in DELFOS, a telematic-educational framework whose main objective was to support the design of CSCL applications with an constructivist perspective [7]. The evaluation of learning was mainly oriented to the individual aspects of the knowledge, following the *electronic portfolio* paradigm. In order to include the social aspects of the learning in evaluation, the *Mixed Evaluation Method* was proposed [8], a method for formative evaluation that combines three types of analysis: quantitative, qualitative and social network analysis. Although both proposals were designed for their use in real environments, the tools developed for the analysis of interactions did not consider the different actors and roles implied. This is what we are currently addressing, as part of the refinement of the proposals of our group related to analysis of interaction.
A revision of the tools that support collaborative learning shows that the significance of the roles has not yet been sufficiently considered. A possible exception are some awareness systems and tools [9][10]. Some of them consider explicitly the fact that the amount of awareness needed by each participant in a collaborative application varies depending on the specific roles that participants take during collaboration [9], while others state that the awareness facilities should depend on the actual roles of the participants [10]. Thus, depending of his role, the user will have access to a specific type and amount of information of awareness.
From the experience of these awareness systems can be deduced that the collaboration-support tools would benefit from considering this aspect. Nowadays the interest on these aspects is an emerging field in research work inside CSCL [11]. The next section summarizes the main implications derived from this perspective.

3 TOWARDS ANALYSIS SYSTEMS THAT CONSIDER ROLES

In our point of view, one of the possible causes of the problem that has been exposed in the previous section is the fact that the majority of the proposals for the analysis of interactions in CSCL have been oriented to the construction of experimental prototypes oriented to support the students' learning processes. Due to this fact, the researches have concentrated on the majority of their works toward the students, forgetting the meaning of teachers role during the collaboration[2], and the fact that subsequently they should analyze the process observing or participating with their

students in the CSCL environments [12]. Recently other proposals have focused on teachers' support in a classroom [13][14]. We can consider that this perspective is just at opposite side of the previous one, since it not implement the possibility that the tools can be utilized on-line by students' for self-regulation purposes.

Therefore, it can be argued that despite that the analysis of interactions serves both for regulating collaboration as well as to support its evaluation, no proposals exist that integrate both functionalities. Given that these functionalities are offered to different users (roles), a prior step to obtain this integration is the identification of the roles that can appear in a collaboration management process together with the requirements that these roles pose to the analysis of interactions processes.

The traditional roles pre-established in the classroom are the *teacher* and the *student*. Besides, we can find other different roles in a collaborative environment, as the designer, the evaluator, the coordinator [16], the intelligent tutor in advising systems[1][15].

Besides, we should keep in mind that these actors can change dynamically their roles during the collaborative processes. Thus during the development of a same task would be able to pass from the initial *teacher-guide* when students need more help to the *teacher-observer*, when the students have reached some autonomy.

In order to be able to characterize correctly the requirements of the different roles, is very important to consider if it is a synchronous or a asynchronous scenario. For example, the interventions of the teachers will be produced on-line in a synchronous system, while in a asynchronous system these interventions can be produced by the next collaborative session, in such a inform that the teacher may have studied previously the students' dialogue and action based interactions [2].

The issues discussed so far in this paper: roles, nature of the systems and temporary dimension are highly related to the problem of the monitoring of the activity and the presentation of this information to different roles. For example the information that will need a primary student will not be the same one that need a high-school student, since the level of the students will influence the type of information they are able to interpret.

4 FUTURE WORK

This paper has presented the need of considering roles when designing tools and systems for the analysis of interactions, as an initial step towards the end objective of developing an analysis system able to analyze data collected of the interactions and to exploit them in function of who is the user (different roles) and what is the purpose (regulation and/or evaluation).

On the one hand we should advance in the description of the roles that are involved in collaborative learning scenarios, and in establishing their functional and interface needs, i.e. what information is needed in each moment of the process and how this information will be shown depending on the role each actor is playing in that moment. For it we will begin with the observation of collaborative processes in the classroom and interviewing the actors implied in order to know their needs. We will confront the information collected with the proposals of awareness tools and with other incipient studies in this matter, as [11] that treats the teacher interventions during the collaboration in synchronous and asynchronous environments.

From there we will try to set the requirements of design and implementation that should have the analysis of interaction tools so that they can serve to support students' self-regulation as well as the tasks monitoring and subsequent evaluation on the part of teacher (integration of regulation and evaluation). Regarding the evaluation support we have to identify appropriate indexes so that individual and social aspects of collaboration can be analyzed. For this, we will draw on previous work done on analysis tools proposed students' self-regulation [5] [6] and evaluation [3] [4], and we will try to verify what aspects can be reused or to be complemented among them. Finally, the supporting tools will be tested with real users in order to validate them.

ACKNOWLEDGEMENTS

This work has been partially funded by European Commission Project EAC/61/03/GR009 and Spanish Ministry of Science and Technology Project TIC2002-04258-C03-02. The authors would also like to thank the rest of "Intelligent & Cooperative Systems Research Group" at the University of Valladolid for their support and ideas.

REFERENCES

[1] Jermann, P., Soller, A., & Muehlenbrock, M.(2001). "From mirroring to guiding: a review of the state of the art technology or supporting collaborative learning". Proceedings of European Conference of Computer Support Collaborative Learning (EuroCSCL´2001); Maastricht.

[2] Dimitracopoulou A. & Petrou A. (2003) "Advanced Collaborative Learning Systems for young students: Design issues and current trends on new cognitive and metacognitive tools". In THEMES in Education International Journal; 60 pages.

[3] Martinez, A., Dimitriadis Y., Gomez, E., Rubia, B. & De la Fuente, P., (2003): "Combining qualitative and social network analysis for the study of classroom social interactions". Computers and Education, special issue on Documenting Collaborative Interactions: Issues and Approaches, vol 41, no. 4, pp. 353-368.

[4] Avouris, N., & Komis, V.C. (2002): "OCAF:An object-oriented model of analysis of collaborative problem solving". G.Stahl. Proceedings of the International Conference on Computer Support for Collaborative Learning (CSCL´2002); Colorado. Lawrence Erlbaum Associates.

[5] Zumbach,J., Hillers, A. & Reimann, P. (2003). "Supporting Distributed Problem-Based Learning: The use of Feedback mechanisms in online learning". In T. Roberts (Ed.), *Online Collaborative Learning: Theory and Practice*. Hershey, PA: Idea.

[6] Jermann, P. (2002). "Task and Interaction regulation I controlling a traffic simulation". In G.Stahl (ed). Proceedings of Computer Support for Collaborative Learning (CSCL 2002). Colorado, January 7-12, pp.601-602

[7] Osuna, C. & Dimitriadis, Y. (1999): "A framework for the development of educational collaborative applications based on social constructivism". Proceedings of the CYTED RITOS International Workshop on Groupware (CRIWG'99). (p. 71-80). Cancún, Quintana Roo, México: IEEE Computer Society Press.

[8] Martinez, A. Dimitriadis Y. & de la Fuente P. (2003). "Interaction Analysis for Formative Evaluation in CSCL". *Computers and Education: Towards a Lifelong Learning Society*. Netherlands: Kluwer Academic Publishers; pp. 227-238.

[9] Drury, J. & Williams, M. G. (2002) "A framework for role-based specification and evaluation of awareness support in synchronous collaborative applications". Proceedings of the 11th international Workshops on Enabling Technologies for collaborative enterprises (WETICE02); Carnegie Mellon University, Pittsburgh. IEEE Computer Society Press.

[10] Dourish, P. & Belloti V. (1992): "Awareness and coordination in shared workspaces". ACM Press. Proceedings of the Computer Support for Collaborative Working (CSCW) Conference; Toronto, Canadá. ACM Press; 1992.

[11] Petrou, A. & Dimitracopoulou, A.(2003): "Is synchronous computer mediated collaborative problem solving 'justified' only when by

distance? Teachers' point of views and interventions with co-located groups during every day class activities". In (Ed) U. Hoppe, Computer Support for Collaborative Learning: Designing for Change in Networked Learning Environments, CSCL 2003 congress: 14-18 June 2003, Bergen, Norway.

[12] Lund, K. & Baker, M.J. (1999). "Teachers' collaborative interpretations of students' computer-mediated collaborative problem solving interactions". Proceedings of the International Conference on Artificial Intelligence and Education, Le Mans, July 1999. S.P. Lajoie & M. Vivet (Eds.) *Artificial Intelligence in Education*, pp. 147-154 Amsterdam : IOS Press.

[13] Avouris, N., Komis, V., Fiotakis, G., Margaritis, M., & Tselios, N. (2003): "Tools for interaction and collaboration analysis of learning activities". Proceedings of the 6th CBLIS Conference; 2003; Nicosia, Grecia.

[14] Martínez, A. (2003). "Método y modelo para el apoyo computacional a la evaluación en CSCL". Doctoral Thesis. Department of Computer Science. University of Valladolid.

[15] Zapata, J.D. & Greer, J.(2002):"Collaborative Construction and Inspection of Learner Models". Proceedings of the International Conference on Computer Support for Collaborative Learning (CSCL´2002); Colorado. Lawrence Erlbaum Associates.

[16] Winter, M. and Mcalla, G.(2003): "An analysis of group performance in terms of the functional knowledge and teamwork skill of group members". Proceedings of the International Conference of Artificial Intelligence and Education (AIED'03). Sydney, Australia, July 20-24 2003.