Studying Social Aspects of Computer-Supported Collaboration with a Mixed Evaluation Approach

A. Martínez[1], Y. Dimitriadis[2], B. Rubia[3], E. Gómez[2], I. Garrachón[1], J. A. Marcos[1]

[1]School of Computer Science Eng. University of Valladolid amartine@infor.uva.es

[2]School of Telecommunication Eng. University of Valladolid {yannis, edugom}@tel.uva.es

[3] Faculty of Education University of Valladolid rubia@doe.uva.es

ABSTRACT

Studying and evaluating real experiences that promote active and collaborative learning is a crucial field in CSCL. Major issues that remain unsolved deal with the merging of qualitative and quantitative methods and data, especially in educational settings that involve direct as well as computer-supported collaboration. In this paper we present an evaluation methodology and its application to a university course that took place during the last two academic years. We have developed EL2AM, a tool that allows an automatic processing of computer logs using social network analysis. It has been used jointly with a commercial qualitative research tool in order to support the evaluation process. Experimental results allow us to reflect and draw conclusions on the changes of attitudes towards collaboration experimented by the students along the course.

Keywords

Qualitative and quantitative evaluation, social network analysis, project-based learning, ethnographic methodology.

INTRODUCTION

Evaluation of innovative curriculum experiences is a complex task that needs several perspectives in order to be fully understood. The application of computer networks to real classrooms provides a wide range of possibilities for interaction (Crook 1994), which demand a variety of evaluation methods. Computers can also generate automatic data logs, which offer new opportunities for evaluation, but at the same time present problems of data management and interpretation. We have applied social network analysis (Scott, 2000) to the automatic evaluation of *participatory* aspects of learning (Sfard, 98). Social network analysis is an approach that focuses on the study of patterns of *relationships* between *actors* in communities and therefore it is suitable for the study of social aspects of interactions in learning communities.

Our research goal was the study of the evolution of attitudes towards collaboration of the students in a real case that used BSCW (http://www.gmd.de) and other telematic tools as a means of collaboration. Automatic analysis of the data logs was complemented with traditional fieldwork data in order to study how the actual use of the software tools (measured with the social network analysis techniques) reflected the evolution of the ideas about collaboration in the classroom.

In the rest of the paper we briefly outline the evaluation techniques and tools we have used, as well as the results of their application to a real case.

QUANTITATIVE AND QUALITATIVE EVALUATION METHODOLOGY

As mentioned beforehand, our approach to evaluation combines qualitative and social network analysis in order to assess how the educational design and the tools used for its support favour collaboration among students of individualistic tradition. Qualitative analysis was based on students' questionnaires and formal observations performed along the semester. The social network analysis techniques were applied to the event logs generated by BSCW and to a special set of questionnaires. From all the possible social network measurements, we were interested in those giving information on structural properties of the network, such as c*ohesion*. We used *density* and *degree centralisation,* as they measure the extent to which all members of a population interact with all other members (Scott, 2000). Graphical representations of the networks called *sociograms* were also used in our study.

We have developed a tool called EL2AM (Event Logs to Adjacency Matrices) that performs several on the event logs provided by BSCW. First, a *parser* translates the non-standard format of the original files to XML, providing a more intuitive view and avoiding several redundancies detected in the BSCW logs. Then, a *configuration module* allows the researcher to select and configure the network she wants to analyse, selecting the type of network, the period of time, and the set of nodes to be included in the study. The above mentioned measurements are then calculated and presented to the researcher in tables. As an additional output, EL2AM provides files in a format accepted by commercial packages such as UCINET or Krackplot. A particular contribution of EL2AM is that it calculates measurements on two-mode networks that other commercial tools do not provide. The results obtained with EL2AM and social network analysis have been integrated in the qualitative evaluation using NUDIST Vivo, a well known qualitative analysis tool.

This evaluation method has been applied to an educational project in which we have been involved for the last two academic years. It consists in the introduction of project-based learning with case-studies in a course on Computer Architecture in studies of Telecommunications Engineering of our university (Dimitriadis, Martínez, Rubia, and Gallego, 2001). In order to face the problems posed by the individualistic and passive culture in Spanish university, the project promoted collaboration by different means. Students were organized in pairs that had to deliver three reports along the course. A final report was written in bigger groups of up to four pairs that shared the same case study. The students were encouraged to use BSCW to maintain asynchronous discussions and to share information. For the study, we considered collaboration at three levels: intra-group, inter-group and at a classroom level.

With the automatic measurements we perceived a lack of use of some of the computer–mediated communication means, which was confirmed by the overall analysis that showed that the students preferred to interact directly with their mates in the classroom. The social network measurements obtained with EL2AM allowed us to observe how the interactions mediated by BSCW increased during the period in which the groups were writing the final report. The fact that they had a common goal promoted collaboration, and this was reflected in the use of the system. The analysis also showed how BSCW helped to mediate interactions in which students *indirectly* shared their information and ideas with the rest of the classroom. We finally observed how the educational project and the tasks the students had to perform helped them to develop new collaborative attitudes beyond the ones they reflected in the initial questionnaire.

CONCLUSIONS AND FUTURE WORK

We have presented an evaluation methodology in which different views complement each other in order to gain a better understanding of the processes under study. Log files give information about the actual use of the computational environment, difficult to grasp by other means; social network analysis applied to these data provides a new insight in the social interactions that are established through the use of the tools; finally, qualitative analysis provides information that is needed to increase the validity of the study.

The design of EL2AM, that relies on a XML intermediate file as the source of data, makes it possible to apply it to the study of other systems, as long as they provide enough information so as to represent the interactions in the format that has been defined. The application of EL2AM to the analysis of new systems will also help to improve the definition of the interactions represented in the XML file.

Here we have outlined part of the results of the evaluation that was actually performed. These results have been considered to inform the design of the new semester and the refinement of the evaluation process, which is currently taking place. Additional information on this project can be found at http://www.infor.uva.es/~amartine/LAO.

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