

A Methodological Approach to Networked Collaborative Learning: Design and Pedagogy Issues

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Abstract

This work presents a report on research carried out in the field of networked collaborative learning. In particular, we present a theory/model-based approach applied to a distance education course that is developed and taught in a virtual learning environment. In this educational practice, our objective has been twofold: first, to improve distance teaching and learning, and second, to facilitate social interaction among students and between tutor and students via the Web. To that end, our research approach has been based on the following actions: First, we analysed the goals, needs, expectations and preferences of our students, based on a previous pilot experience on distance collaborative learning, in order to understand what is actually happening in networked learning when collaboration becomes an integrated part of the whole learning process. Second, we proceeded to the design, development and implementation of a new pedagogical practice, called Virtual Study Group, to encourage and enhance learning through collaborative construction of knowledge and reflective interaction which contribute to a deeper understanding of the course contents. The paper focuses mainly on the latter. Finally, we provide a critical analysis and evaluation of the outcomes of this experience and of the many issues arising from applying this collaborative pedagogical practice to a virtual learning environment.

1. Introduction

Supporting quality teaching and learning has been one of the critical issues in distance education. The rapid development of the information and communication technologies has initiated a shift away from conventional distance learning to networked learning. The result of these technological advancements has given rise to virtual learning environments or virtual campuses where the communicative process is more central. Following this line, the Open University of Catalonia (www.uoc.es) has built a large and complex organisational virtual campus that provides an innovative pedagogic model for distance learning and teaching.

In this broad networked learning community infrastructure, our work seeks to investigate and facilitate learning and social interaction. In particular, we have started exploring the possibilities for new forms of learning and teaching by proposing a methodology design that promotes and encourages learning and collaboration through smaller communities of learners working together. Our involvement in this project is justified by the following arguments.

In the context of distance learning, one of the students' critical problems is the feeling of isolation. A virtual learning environment can offer a sense of communication and contact with other students and teaching staff through a community forum, a space for debates and a classroom forum. Yet, experience has shown that students' motivation level to learning and to participation in global common activities can still be very low, and thus they need a considerable amount of support to their studies. Often, students have the feeling that global spaces provoke diversion and they do not focus on handling their particular problems effectively. This can diminish their desire for learning. For this reason, they need a more

intimate space where they can share their knowledge, ideas, worries and difficulties with a small number of classmates who join this space having the same objectives.

From this point of view, collaborative work in small groups could be considered as a strategic tool to improve the study conditions and the quality of the learning context. In addition, collaborative work can be an important element of motivation and support for the challenges students face during their university studies. In a broad sense, through a process of collaboration, students are given the chance not only to discover a new way of learning and working together in a virtual environment but also to construct social interactions and establish human collaboration networks for the rest of their studies.

In this particular scenario, our research focuses on designing a methodological approach that aims to support and enhance active learning through collaboration in a virtual environment. To that end, first, section 2 describes our research method, and summarises the results of a preliminary study. The next section discusses the pedagogical issues and methodology design applied to a real situation. Section 4 presents an initial analysis of the experimental results and the obtained benefits. Finally, section 5 discusses the basic implications of the study, and sets the stage for the next phase of this research.

2. Research Method

The main goal of our research is to investigate how collaboration can facilitate and encourage learning and social interaction among distance learning students in a virtual learning environment. On the one hand, traditional research on cooperative learning focuses on the questions how different group structures, labour division, and collective incentives can optimally improve speed and quantity of learning (Slavin 1995). On the other hand, the emerging research on Computer-Supported Collaborative Learning (CSCL) involves the mutual engagement of participants in coordinated efforts to build new knowledge and to solve problems together (Dillenbourg, et al., 1996). In fact, some recent research approaches examine the conditions under which effective collaborative knowledge building is achieved (Baker, et al. 1999). Yet the omission of social interaction in computer-based learning environments has been a particularly worrying issue (Baker 1985; Cuban 1986). Nowadays, however, this situation tends to change since recent research on CSCL is exploring the ways technology can facilitate social interaction (Lehtinen, et al., 1998).

Despite the growing practice around social learning both in research and in pedagogy, we are still rather ignorant about the processes involved in social learning, particularly, in virtual collaborative learning and shared knowledge building. In fact, we need theoretically well-grounded development of collaborative learning practices and tools that can be adequately embedded in a more global virtual educational environment. Although there exist a few well developed pedagogical models for CSCL (Cognition and Technology Group at Vanderbilt U., 1997) and networked learning environments that support collaboration (Koenemann, et al., 1999), it is not still studied how different practices and networked learning environments can fit in different virtual learning community needs and cultures, and support social learning and different group structures and styles.

To face this challenge, we designed, developed, analysed and evaluated authentic collaborative pedagogical practices within a virtual learning environment. In particular, we followed a theory/model-based approach which consisted of first apprehending the problem with a "theorisation" of the application domain for understanding cooperative work and learning in a virtual environment. This initial model was based on the concept of *communicative situations* (Marquès & Daradoumis, 1999). The next step of the approach consisted of running a preliminary experiment in a distance education course to test how our initial model could be used to support a cooperative problem-solving situation carried out by small virtual groups of students.

The outcomes of this study shed light on several important issues, such as the factors that influence virtual group formation, the characteristics of effective learning teams as regards the learning process followed, the group dynamics (communication, interaction, group organisation and cohesion), and the students and tutor roles. In addition, we drew interesting

insights about the management and building of shared knowledge, the software products that supported collaboration and the principles used for the individual and group assessment.

After the preliminary studies, our theoretical framework to virtual collaborative learning was modified to account for the observed outcomes and to explore new ways of virtual collaborative learning. In particular, we initiated a new pedagogical practice with a virtual class of 32 students divided in small virtual groups of three to four students. Our objective was to promote a new way of studying and learning the contents of the computer-science course, "Information Structure", based on the realisation of collaborative learning activities through the BSCW shared workspace system (<http://www.gmd.de/bscw>), a web-based groupware tool for asynchronous and synchronous cooperation (Bentley, et al., 1997). We call this new learning structure *Virtual Study Group (VSG)*, and we explain it in more detail in the next section.

3. Virtual Study Groups: Design and Pedagogy Issues

This section provides a critical examination and analysis of the design and pedagogy issues arising from applying a collaborative learning methodology to the BSCW virtual shared workspace. The key design issues concern the conceptualisation, planning and setting up of a networked learning structure, called Virtual Study Group (VSG), which can be arranged to support different collaborative learning experiences according to the specific way a learning group is organised (i.e., depending on the learning objectives and styles specified).

Our conceptual model of VSGs integrates both synchronous and asynchronous communication, though at the present collaboration is mainly based on the later due to the characteristics of our distance learning students. Its organisational structure is planned in three consecutive layers: *initiating*, *forming* and *performing*. All the three layers are set up on the BSCW networked collaborative environment which allows easy interaction between students on shared workspaces.

The first layer serves to initiate the students into the new experience and get to know each other. The second is used to carry out the rather complex task of group formation and organisation and thus establish an accepted group normative. A learning group is formed and organised in a variety of ways depending on the following key elements: individual and group goals which are related to the types of learning task to be realised; the cohesion level of the group, that is, the commitment (strong or weak) and involvement (active, passive or variable) level of the group members; the communication mode (synchronous, asynchronous) and the type of interaction (explanation, argumentation, negotiation) that can take place among the group members; the tutor's involvement level and particular roles, as well as the students' specific roles and attitudes; the number of participants who join the group; the members' specific characteristics, beliefs, needs and desires; the appropriate combination of different technologies that provide comprehensive support to communication, interaction and collaborative learning activities. Under these circumstances, different collaborative settings are proposed and established for acting at the third layer.

The third layer is where the actual collaborative study and learning of the subject matter is performed by the different learning groups. At this stage of collaboration, two key related factors have to be taken into account. First, we consider the working methodology followed by a group to carry out a learning task/activity at two levels, the discourse and action level. At the discourse level, the essential element is the interaction among peers (participants need to interact with each other to plan an activity, distribute tasks, explain, clarify, give information and opinions, elicit information, evaluate and contribute to the resolution of problematic issues, and so on). At the action level, task objects (e.g., documents, graphics) are created and manipulated.

Second, we need to keep track of how learning evolves and knowledge is built as well as how the learning process is affected by the following factors: the type of interaction (contributions) made, the type of cognitive and social actions performed, the social dynamics, roles and interrelations developed among the group members, as well as the role the tutor has to take in supervising and guiding the learning-process of the students.

Moreover, for effective collaborative learning to occur, both actions and interactions need to be well organised in the shared workspace of the group. In particular, on the one hand, we need to provide the means for the management and structure of the student interactions; on the other hand, we should care for the efficient organisation and management of the information and knowledge produced when interactions and collaborative or individual actions take place.

In this context, two other important issues complete and influence our collaborative setting and determine the ways collaborative study and learning is focused and performed. The first concerns the technological and training supports both on the technology and the methodology to be used for collaboration. The kind of support offered depends on the type of collaborative learning activities, the individual and group goals, the characteristics and commitment level of the learning group, and the interaction type. The purpose of providing this support is to help, direct and motivate the students to participate, and clarify the objectives and perspectives related to this experience.

The second issue concerns the evaluation policy and reward that students can obtain for being engaged in collaborative activities. In the current pedagogical practice, since participation in learning groups was optional, there was no formal evaluation of the work done. Thus, more emphasis was given on designing learning activities that could offer the students a reward materialised through shared knowledge-building and development of critical thought and reflection about their learning process. This fact proved to be a crucial help when students resolved individual assignments and final exams. In fact, our approach to relating and integrating collaborative learning activities with individual ones had beneficial effects for the students involved in group-learning.

Finally, several questions arise further methodology and research design issues. For instance: First, how do different learning styles affect group composition, the learning process, group interaction and cohesion, the task planning and working methodology, and the learning outcomes? Second, what kind of techniques can be used to provide effective measurement of student success? And, third, is it possible to map learner outcomes and achievement? How is the effort made related to successful outcomes? Is always effort accompanied by successful outcomes?

4. Benefits of collaborative study and learning

At this stage of research, our approach to networked collaborative learning aimed to support and promote effective and efficient learning in a distance education course. Apparently, VSGs constitute a very important shift from self-studying and learning of a conventional distance education system. Yet their integration to virtual universities/learning environments contributes to extend the options and possibilities of virtual classroom forums (where the whole class can interact and share information asynchronously). Indeed, the current pedagogical practice, developed and performed in our virtual campus, indicates that there is often much to be gained by arranging for distance students to collaborate in small virtual groups to achieve a common goal than just offering them a virtual shared space for the whole class. This new form of studying and learning suggests new expectations and benefits for both the students and tutors involved. As regards the students, we distinguished two main benefits.

First, collaborative learning creates the potential for cognitive and metacognitive benefits. On the one hand, it reinforces and improves the study and learning of the subject-matter contents. On the other hand, it engages students in a situation that requires them to make explicit both the process followed to carry out a learning activity and the strategies applied to resolve a problem. Making these facts available to everybody in the group can give rise to further discussion and reflection about issues of the learning process itself.

Second, collaborative learning promotes affective and social benefits in distance education. In particular, it increases the student interest and value that gives to the subject matter. It also increases positive attitude and social interactions among students, which results very positive and enriching for students with different knowledge levels and others

characteristics. Finally, students are given more opportunities to participate in the resolution of learning activities specifically planned for small groups rather than for the whole class; especially, shy students are more likely to feel comfortable expressing their ideas or doubts in these more intimate settings.

As regards the tutor, our analysis revealed two main effects on the teaching process, which suggests new forms of teaching and the need to encourage a new teaching approach in order to support this paradigm shift. First, pedagogically, it seems important that tutors should pay closer attention to the design and evaluation of learning tasks and activities which are well suited to a variety of collaborative formats and learning styles and can be normally carried out by small virtual groups of 3 to 6 students. Second, we need to clarify the role that the tutor has to take in supervising and guiding the learning-process of the learning groups. Making the learning process of a group explicit, the tutor can be aware of the students weak and strong points and thus be able to intervene in order to repair deficiencies and thus monitor the group more effectively, using different strategies according to the situation.

5. Conclusions and Future Trends

Based on our pilot experience, the implications of this approach on learning have been quite positive and, most importantly, very promising. Both the tutor and the students involved have experienced, mentally and in practice, an important shift from existing methods of networked teaching and learning to new emerging pedagogies and methodology/research design, based on constructionism and collaboration. For this reason, on the one hand, we need to further encourage and train both students and teachers to make them more ready to overcome their hesitations and thus increase their willingness to follow this shift. On the other hand, we have to keep on working to develop reliable, robust and effective approaches to networked collaborative learning that have clear cognitive and social benefits for all the participants.

To face these challenges, we conduct our research to pay closer attention to three different levels of analysis and design, namely theoretical, methodological and educational ones. Theoretically, it is necessary to elaborate a coherent conceptual framework for understanding cooperative work and collaborative learning, as well as to analyse reflections and perspectives about social interaction in learning and instruction.

Methodologically, we need to design and develop theory-driven CSCL methodologies and analytical tools which are adequately embedded in a practical educational context and which are capable to untangle social processes and conditions that promote learning.

Pedagogically, it seems important to focus more on the design and evaluation of *collaborative learning situations* and instructional support systems which give possibilities for authentic constructive and social learning.

We believe that only based on such a multi-dimensional perspective we will be really able to develop techniques and tools which contribute to our comprehension of collective learning and facilitate its process. This fact will also enable us to deepen our understanding about "collective knowledge" and how different dynamics of social working modes and structures affect learning and instruction.

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