Techniques for Fostering Collaboration in Online Learning Communities:

Theoretical and Practical Perspectives

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Chapter 11
Employing Collaborative Learning Strategies and Tools for Engaging University Students in Collaborative Study and Writing

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ABSTRACT

This chapter addresses several issues and challenges that one faces when carrying out a real collaborative learning experience following a blended learning design that includes a mixture of face-to-face and online collaborative learning processes. The chapter presents an experience based on a blended course on "Collaborative Educational Systems". This scenario employed a variety of collaborative strategies, methods and tools to support and enhance debate and information exchange among peers in order to complete a specific task: writing an essay collaboratively. Carrying out this task entails a preliminary study and analysis of the subject matter, which are also performed in a collaborative manner. The authors describe the educational scenario in detail, including the structure of the activities, the rules the groups were asked to apply and the procedures the students had to follow to accomplish the task. They finally analyze and evaluate this learning experience with a critical point of view as regards the collaboration strategies adopted, the way students built their own strategies combining the ones presented in the course, and the collaborative learning process and product.

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INTRODUCTION

Computer-Supported Collaborative Learning (CSCL) is one of the most influencing research paradigms dedicated to improve teaching and learning with the help of modern information and communication technology (Dillenbourg, 1999). Collaborative or group learning refers to instructional methods where students are encouraged to work together on learning tasks. Collaborating in small groups may constitute a powerful means for promoting and enhancing learning and social interaction. Recent studies of e-learning have pointed out that involving learners in collaborative learning activities could positively contribute to extending and deepening their learning experiences, test out new ideas, improve learning outcomes and increase learner satisfaction, at the same time decreasing the isolation that can occur in an e-learning setting (Palloff & Pratt, 2004). Furthermore, collaborative learning situations can provide a natural setting for demanding cognitive activities which can also trigger collaborative learning mechanisms such as knowledge articulation as well as sharing and distributing the cognitive load (Dillenbourg, 1999).

However, many teachers remain unsure of why, when, and how to integrate collaboration into their teaching practices in general as well as into their online classes (Panitz, 1997; Brufee, 1999). In addition, the effectiveness and success of a group of learners depends on a variety of issues during its lifecycle (Pipek & Wulf, 1999). Furthermore, during task realization, students learning via CSCL technology and methods need guidance and support in order to collaborate effectively and achieve their learning goals successfully. This fact is especially critical when it has to do with collaborative learning practices that are carried out over a long period of time, employing a blended learning approach (a traditional classroom with face-to-face interaction supplemented by online resources), and engaging students to work together to solve a complex real problem and participate in a variety of activities (Kiesler & Sproull, 1987; Dobson & McCracken, 1997; Cameron, Barrows, & Crooks, 1999; Thomas, 2000).

The essential role of appropriate tools to help teachers and students with their mindful and appropriate learning has been acknowledged by many researchers (Lloyd & Wilson, 2001; Babiuk, 2005). Such tools are essential in all types of education. Essentially, in web-based education and blended education, the existence of this kind of tools is crucial for the teachers' and students' more effective involvement (Koper & Tattersall, 2005).

This chapter reports a real collaborative learning experience that has been carried out following a blended learning design approach that includes a mixture of face-to-face and online collaborative learning processes employing a variety of collaborative strategies, methods and tools to support and enhance debate and information exchange among peers in order to complete a specific task. The task consisted in writing an essay collaboratively, which includes a preliminary study of the subject matter which is also performed in a collaborative manner.

In particular we present an educational scenario which is implemented in a real classroom of a fourth year undergraduate university course, called "Collaborative Educational Systems", which lasts a term (13 weeks). The scenario specifies a structure for the activities to be carried out, dictates the rules that learning groups should apply in order to collaborate and indicates the procedures to be followed by students to accomplish the task at hand. Given a pool of collaboration strategies, techniques and tools, students are encouraged to build their own strategy that fits better the dynamics and idiosyncrasy of their group. This results in developing self-regulated methods which foster collaboration and tackle the task more effectively. However, it also presents some risks and problems that we had to face during the collaborative process. We provide an extensive

discussion of the issues involved in the design, management, monitoring, and evaluation of the learning processes that take place in the realization of this scenario.

In our study, we show the many benefits of a blended collaborative learning approach: increased classroom size, accessibility of material and flexibility, but also noted that motivation and technological ability are major factors in the success of a student in a blended environment. Our approach brings new expectations and requires changes in attitudes and reward structures for both the learners and the teachers, such as new roles, different pedagogic and learning methods, and technological and training supports that enable learners build up social structures, encourage learning and develop critical thinking skills.

The organization of the chapter is as follows. First, background issues are addressed in the field of collaborative blended learning which concern the design and application of collaborative learning scenarios, collaborative strategies, collaborative tools, etc. The subsequent section provides a detailed description of our case study, specifying the context of the collaborative learning experience. This context will be presented in terms of participants, course and task description. Then, we present our methodological approach that fosters collaborative study and writing in a blended learning environment. We describe the conceptual framework of our approach that includes the given tasks, the activities to be carried out, the collaborative strategies and tools employed, the specific contextual requirements for a strategy/tool to be adopted. The fifth Section proceeds to discuss the technological aspects that can better support collaboration. We try to give an answer to the question of what technical features are necessary to match the design of the collaborative learning scenario and make the use of the collaborative strategy chosen feasible and effective. The sixth Section then addresses monitoring and evaluation issues of the collaborative learning scenario. We discuss how to monitor, understand, and evaluate group learning as well as how to assess individual and group learning and how to evaluate both the learning process and product. The final two sections summarize the results of the empirical study and draw the conclusions and future directions of our research.

BACKGROUND

Our collaborative learning experience takes part in a blended learning environment that includes a mixture of face-to-face and online collaborative learning processes. Blended learning is an approach to learning and teaching which combines and aligns learning undertaken in face-to-face sessions with learning opportunities created online (Littlejohn & Pegler, 2006). The aim of blended learning is basically to join the best of classroom or face-to-face learning with the best of online learning. Recent research has started to focus on the aspect of collaboration in a blended learning environment, in which both benefits and drawbacks have been identified. On the one hand, the opportunities presented by an online collaborative activity are many and have been accounted in the literature (Browne, 2003; Macdonald, 2003; Pallof & Pratt, 2004; Roberts, 2005; Van Eijl & Pilot, 2003). On the other hand, several constraints of online collaboration are presented in five categories: perceptions, negative attitudes, skills, technology and reality (Nel & Wilkinson, 2006).

As regards *perceptions*, several students may have no prior experience with online collaboration, as it is in our case. Then, it is understandable that many of them may initially have various misconceptions. In our context, which is described in next section, our students had never carried out collaborative activities in an online environment, and had no clear idea about what it would require of them to be successful learners in this setting. They really did not expect that participation in an online learning mode would require them to play a more active role in their own and their fellow

students' learning experiences (Masiello, Ramberg, & Lonka, 2005). Moreover, some students may perceive online activities to be more difficult and time-consuming than any face-to-face activity (Taylor, 2005), whereby others may believe that the course would be easier to pass (than a traditional face-to-face course) due to the inclusion of an online element (Springfield, 2005). From all this, it becomes apparent that many students perceive e-learning as "easy-learning." As a result of this misconception, as we will explain in Section 4, we had to make a plan for striving against students' belief that they did not need to attend the face-to-face sessions if some of the course content and activities were available online.

As concerns *negative attitudes*, according to Roberts (2005) it is fairly common for students to initially show resistance to the idea of working in groups. While some students' negativity might stem from prior experiences in similar situations, others might just not like group work (Taylor, 2005). In our case, some students had worked in pairs through contact meetings to carry out an assignment in previous courses, so they participated in some kind of informal, voluntary collaboration with a classmate they knew very well, so they were feeling confident and comfortable with collaboration. But in general, there are several students that probably do not like to be dependent on others and consequently prefer to work on their own. In our case, where they had been asked to form groups of four members in order to collaborate, it became apparent that some students were not very excited to live this experience. So, a special care had to be taken in order to overcome students' reluctance and anxiety to collaborate, as explained in Section 4.

When it comes to the requirement of specific *skills/knowledge*, most students are not usually aware that active participation behaviour (both synchronous and asynchronous), well-balanced contributions and role playing, self- and peer-evaluation, peer involvement and commitment, etc. are very important factors of online group success (Daradoumis, Martínez, & Xhafa, 2006). They therefore do not realise that they need different/additional skills and knowledge to successfully interact/operate in this environment (Muirhead, 2001; Masiello et al., 2005). Macdonald (2003) also warns that the extent to which students will collaborate and interact in the online environment is dependent on their level of competence. In our case, students had limited experience of real group work and hardly any experience with online interaction/ collaboration. In such cases, students are unlikely to possess the group/collaborative skills needed to successfully complete an online collaborative activity or participate in an online discussion (Browne, 2003; Macdonald, 2003; Roberts, 2005; Taylor, 2005). For this reason, specific collaboration strategies should be provided to the students that will allow them to structure their activities efficiently as well as apply effective rules and procedures to accomplish the task. These issues are also discussed in Section 4.

Technology is another important issue and means for supporting the whole enterprise. Several tools can be used to help both teachers and students engage into a real, fruitful and effective collaboration. The matter here is the type of tools that should be chosen, among a rich variety of existing collaborative tools, as well as the appropriate combination of them in order to provide an effective and costless support. Even though the use of technology is intended to enhance the student learning experience, this is certainly not always the case. Indeed, technology may cause negative results to those students who may be dominated by anxiety and confusion when trying to use new tools due to their inexperience or time constraints (Masiello et al. 2005). Students may be also reluctant of staying online on a steady basis or simply they do not realize the importance of being aware of the state of their shared workspaces or what their peers have recently done so that they can react on time and thus maintain a fluent and consistent group interaction. It therefore becomes apparent that students need both some initial guidance and

continuous support in the use of the various collaborative e-learning tools (Pallof & Pratt, 2004; Masiello et al., 2005). Another problem that hinders the efficient use of technology is that some students do not have access to a personal computer and the Internet at home, which prevents them from participating during the evenings and over weekends (Browne, 2003). In Section 5, we try to provide solutions to these issues and suggest those technological tools, aspects and features that are necessary to best match the design of the collaborative learning scenario and support the collaboration more efficiently. For instance, since students were completely dependent on technology to carry out discussions aiming to support learners' collaborative knowledge construction (no face-to-face discussions were allowed), specific tools were chosen to facilitate asynchronous or synchronous discussion according to the collaborative task that had to be carried out.

Finally, *reality* is an important factor that one should always take into account. As Nel and Wilkinson (2006) mention, any teacher wants to create an ideal environment for online collaboration, but reality will (in most cases) prevent him/her from achieving an idyllic vision. Some students may encounter difficulties to find the most ideal group members; others might not even be prepared to collaborate in order to learn (Browne, 2003). Some students may be more demanding and active than others; other students may have difficulties to keep to deadlines (Masiello et al., 2005). Some consistent group members will prepare before participating in an online activity or discussion, or attending a face-to-face session, while other members will not do so. Another factor that plays an important role to the success of group work is the duration of the course. Courses, like ours, that last a whole term (13 to 15 weeks) may offer the teacher and the students a comfortable amount of time to prepare, design and implement an interesting long term collaborative learning scenario, but specific care should be taken so that students remain active and constantly engaged into their collaborative activities during the term, since it is easy that some students feel relaxed or get disconnected for some time, thus losing their rhythm or hindering the smooth realization of the agreed group plan and organization (Daradoumis & Xhafa, 2005).

All in all, the above issues dictate a careful and proper design and application of a collaborative learning scenario, which includes the use of appropriate activities and collaborative strategies, efficient rules and procedures, as well as suitable collaborative tools. Very similar considerations can be also found in Delfino and Persico (2007). Our approach will take all the above constraints into account and will deal with as many of the issues listed by trying to provide a most effective solution to the majority of them. All these important aspects are discussed in detail in the following sections.

THE CONTEXT OF THE COLLABORATIVE LEARNING EXPERIENCE

The educational scenario of our case study is a real classroom of a fourth year undergraduate university course, called "Collaborative Educational Systems", which spans over a term (a 13-week period). The size of the class is rather small: there were 18 enrolled students, from which 12 participated in the collaborative learning experience actively, whereas the rest of them decided not to be involved in the group work and preferred auditing the course and the experience. The main reason of the auditing choice is that these students were lacking confidence in participating into such a demanding practice, and they were not feeling sure about their real involvement and commitment toward collaboration. Evidently, these 6 students were not awarded any final grade and they had to repeat the course next term. However, the contact they had with the experience, even in a passive way, proved to be very beneficial since they saw

that the venture was feasible, so any fears or hesitations they had about online collaboration were substantially reduced.

Case Study Description

The blended learning design of the course includes a three-hour face-to-face contact session per week. During this session, first some theoretical aspects of the course are exposed by the teacher, and then the focus of the lesson shifts to discuss the matters that concern the realization of the online collaborative learning practice. The general aim of the course is to introduce students to basic concepts of Collaborative Educational Systems, that is, to environments that promote and facilitate learning through collaboration. Then its specific goals are to let students become familiar with theoretical models and methodological approaches as well as with systems and tools that support collaborative learning. The challenge of the course is to engage students into this new field in a real and practical way and, most importantly, produce changes in attitudes and perceptions, define new roles, introduce different pedagogic and learning methods, and provide technological and training supports that enable learners build up social structures, encourage learning and develop knowledge and critical thinking skills.

To this end, the introductory face-to-face session is dedicated to inform students about the course design and requirements, and basically turn their focus of attention into the collaborative spirit of the course. Thus, students are asked to form groups of four members and an open discussion about the benefits and difficulties of online collaboration is organized, aiming at initiating students into this endeavour. Since students are in the last year of their studies, most of them know each other, so it is not difficult for them to take the initiative to create good synergies and groups. The role of the instructor here is to invigilate the group formation process and assure the creation of well-formed groups. In our case, three groups are created. As a consequence, the first objective of the course is accomplished.

Then, the main course requirement is explained. This is the online implementation of a collaborative practice, which spans all over the term and consists of the elaboration of specific tasks which are thoroughly explained to the students. The successful realization of the collaborative practice includes the following steps:

1. Given the big variety of collaboration strategies/methods that exist in literature (Kordaki, Siempos & Daradoumis, 2009), the instructor facilitates the students a list of twenty selected ones which are briefly presented in class. In particular, the instructor explains the steps of each strategy and the way it is used in a context-free situation.
2. Students are required to choose a small set of the above strategies (up to four) that best fit their individual characteristics, preferences and styles. Students are encouraged to search the literature in order to find more details about how the chosen strategies have been used in practice, and which are the benefits and limitations of their application in real collaborative settings. This will give them a clear idea of the goal, function and dynamics of each strategy.
3. Based on this knowledge and the tasks that should be accomplished, students are then asked to design and build a new collaboration strategy that best fits the dynamics and idiosyncrasy of their group, by combining ideas and techniques of the strategies they analyzed as well as applying their own ideas, and use this innovative collaborative approach to carry out all the phases/tasks of their collaborative practice (from studying a selected chapter to writing an essay about the chapter topic). This new strategy should clearly describe its goals and general function

and, most importantly, it should specify all the steps and actions that group members should take to accomplish the collaborative practice successfully.

4. To carry out the collaborative practice, each group should first choose a chapter of the course manuscript. Each chapter describes a specific topic on theoretical models, methodological approaches as well as systems and tools that support collaborative learning. As such, each group chooses a different topic to work on. This task engages students into an online synchronous discussion which gives group members the opportunity to experience a rather relaxed and informal interaction that allows them to perform a decision-making process and initiates them into a long-term collaborative endeavour.
5. Each group member should individually study the chapter. To check whether students understood the topic, the instructor creates a forum for each group with the aim to engage group members into asynchronous discussions. The asynchronous mode of discussion allows group members to reflect upon their peer responses, evaluate them and then compose a common answer which will be assessed by the instructor. This task may last between 7 and 10 days.
6. Specific tools are also supplied to students to support online collaboration. Each tool has a particular role and function and thus is used to support specific tasks of the collaborative practice.
7. Groups have to elaborate specific progress reports and present their on-going work every four weeks in the face-to-face sessions. This produces open discussions in the class among the students and the instructor as a moderator, which makes students reflect not only on their own work but also on the others' work and achievements.
8. The instructor sets up specific criteria for assessing both group and individual performance. We need to give both formative assessments (how are they doing?) and summative assessments (did they achieve learning and project goals?). We also need to assess both the individual and team contributions, including both the collaborative process and its individual and collective outcomes.

We explain this learning scenario in more detail in the following sections.

THE CONCEPTUAL AND METHODOLOGICAL FRAMEWORK OF OUR APPROACH

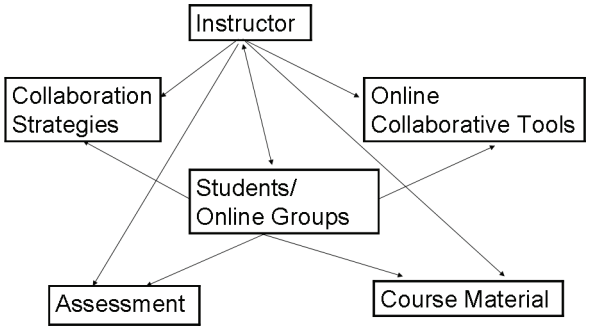
The basic components of the conceptual framework of our approach are presented in Figure 1.

The students and their online groups are situated in the center of the learning process. So, they will receive input from all possible components/ sources that take part in the support of group work and which contribute to the successful realization of their collaborative practice.

First of all, the *instructor* participates in a double mode. He/she interacts with and supports the students both in the face-to-face sessions and in the online collaborative environments where groups deploy their work and learning. The instructor's role and function are important since he/she also contributes in a variety of ways. In particular, he/she:

- facilitates students the collaboration strategies they will use to build their own collaborative approach to accomplish their task;
- provides students the necessary and most appropriate tools to support their work;
- supplies all the necessary materials that provide the basis for students' work;.
- will specifies useful criteria for assessing individual and group work, following a formative and summative method.

Figure 1. The conceptual framework



Moreover, each of the other sources contributes in its own particular way to the success of group work and individual performance.

More specifically, *collaboration strategies* are used to facilitate students' work, overcome the limitations and problems students face due to false perceptions and lack of experience in such settings, combat their fears and negative attitudes, help students acquire the specific skills/ knowledge they need, guide them in the best use and exploitation of the different online tools that support their work, and finally orientate them to adapt themselves to the reality and the true conditions of their situation in the best possible way.

To this end, the instructor provides the students with a set of twenty representative context-free collaboration strategies and asks the students to make the best use of them so that they build a full, flexible and effective collaborative context within their group which will lead them to a successful realization of their tasks. These strategies were selected as being representative of the achievement of diverse learning objectives. A detailed description of such strategies can be found in (Kordaki et al., 2009). The following are examples of these strategies, and the learning objectives they allow to achieve:

- *Brainstorming* (Osborn, 1963); focuses on the generation of a large number of ideas for the solution of a problem.
- *Student Teams Achievement Divisions* (STAD; Slavin, 1978); motivates students to encourage and help each other, while at the same time accelerates their achievements.
- *Jigsaw* (Aronson, Blaney, Sikes, Stephan, & Snapp, 1978); emphasizes interpersonal inter-dependence while allows groups to get to know a topic in depth, by making individuals become experts on a sub-topic and teach each other until the whole topic becomes familiar to all members of the group.
- *Group Investigation Method* (Sharan & Hertz-Lazarowitz, 1980); promotes the use of learning activities/problems that groups analyse in sub-problems, studied by each group member, discuss and draw conclusions and then perform a collaborative writing of reports which are assessed in discussion with teacher.
- *Co-op Co-op* (Kagan, 1985); enhances collaboration by means of discussion, open-ended problems and activities, problem decomposition into suitable individual tasks, and composition of the group solution through discussion.
- *Guided Reciprocal Peer Questioning* (Palincsar & Brown, 1984; Martin & Blanc, 1984; Kagan, 1992; 1994); encourages discussion and critical thinking through open-ended questions.

- *Three Step Interview* (Kagan, 1994); enhances team building and in-depth understanding of the topic that students deal with through their engagement into an interview and role-playing.
- *Think-Pair-Share* (Lyman, 1981); students have the time to think individually of an answer to a given question and then share their opinion with a peer (forming pairs); finally, each pair shares its common answer in a larger group of four or more members (it may include the whole class).
- *Paired Annotations* (Millis & Cottell, 1998); promotes cooperative learning through accountability and positive interdependence (students discuss key issues, exchange ideas and questions, look for differences, comment and prepare a common attitude and treatment of the subject matter).
- *Double entry journal* (Berthoff, 1981); gives students the ability to unfold their thoughts regarding a topic which help them concentrate on important terms and develop critical thinking and knowledge.

The most important contribution and innovation of our approach here is the way we suggest students to use these strategies. In particular, students should design a new collaborative strategy and use it to carry out their practice, following specific steps:

- Students should first study and analyze the existing collaborative strategies, understand their functioning and use (look for more information in literature, if necessary), and then choose a small set of them (up to four) that best fit their particular characteristics, preferences and styles as well as the specific tasks of the practice they have to carry out.
- Students get in their groups and exchange their ideas, preferences, goals, attitudes, perceptions, skills and knowledge, while they also take the tasks and the reality under which they will collaborate into account. Based on all these factors and their preferred individual collaborative strategies, students discuss and design a new common collaborative strategy for their group that combines ideas and issues of the existing strategies but can also contain personal ideas of the group members.
- Each group should thoroughly describe the functioning of their strategy in a document that will be handed over to the instructor who should evaluate and approve it. In particular, groups should provide the following information:
  - which are the existing strategies that the group has used as a basis for creating the new group's strategy;
  - justify clearly the reasons that guided the selection of the aforementioned strategies, and specify what type of actions of these strategies can be useful and contribute toward both the accomplishment of an effective collaboration (and consequently of the activity goals) and the composition of the new strategy;
  - state why the new strategy suits the idiosyncrasy, goals and preferences of the group, how it can help in the organization of the tasks that members will realize, and how it will support the structure and functioning of the group;
  - thoroughly describe the steps and actions which the new strategy consists of and the way they can be applied in the whole process of collaborative work, starting from the study of the selected chapter/topic to the realization of the new article. More specifically, each step of the new strategy will have to specify clearly and ex-

pressively the goals it sets: what each group member will do, that is, the tasks that a member will undertake to fulfill; how he/she will carry them out (e.g., through which tools, methods, etc); how he/she will collaborate with the rest of group members; and, which is the role that the various discussions (in forums and chats) play when they are performed within the group;

- for each step of the new strategy, the students should state the existing strategy it came from (that is, in which idea or issue it relies on) or whether it is a member's new idea.

- The new collaboration strategy should then be applied for accomplishing the following tasks (in this case, the collaboration strategy urges students to interact with the *course materials* which are an important component/source of the collaborative learning experience):
  - Students should collaborate in their group to select and study a chapter from the course manuscript which contains 18 chapters. Each chapter refers to a specific topic, ranging from theoretical models and methodological approaches to systems and tools that support collaborative learning. Consequently, the choice of a chapter binds the students and their group to a particular topic which they have to study, understand and finally elaborate it further significantly, writing a new article/essay through collaborative writing, which incorporates new ideas, issues and trends.
  - Collaboration occurs from the beginning of the practice. During the initial phase, to support a more effective study and understanding of the chapter topic, group members participate in online asynchronous discussions, where each member sets at least one specific comprehension question to the other members. The instructor may also set questions to the whole group. This procedure allows group members to reflect upon their peer responses, evaluate them and then compose a common answer which will be assessed by the instructor. This task may last between 7 and 10 days.
  - At the end of the above process, each group prepares a presentation of its topic and exposes it in a face-to-face session. So all students of the class obtain some basic knowledge of several topics of the course book. After each presentation the instructor encourages discussion of the presented topic, by urging students to ask questions to the presenters.
  - Having obtained valuable knowledge and understanding of their topic, each group then starts a process of searching for new *materials* about the topic in the literature. After each member has identified and selected various new information about the topic, the group gets together to discuss, analyze and decide which information to keep and how to structure the new article. To support the realization of this difficult task through an effective collaboration a specific tool is used, the CMapTools, as explained in next section.
  - After the structure of the new article is clearly defined, each group should write it collaboratively, using a wiki, as explained in next section.

The next sections describe how technology can support collaboration in this scenario and how evaluation issues are addressed.

HOW TECHNOLOGY CAN SUPPORT COLLABORATION

Technology plays a key role in accomplishing this collaborative learning scenario successfully. At the same time technology may raise important obstacles and create problems to the students. We must find a way to balance the advantages of technology with its possible negative effects so that it finally results into a positive experience that will foster collaboration and enhance learning outcomes.

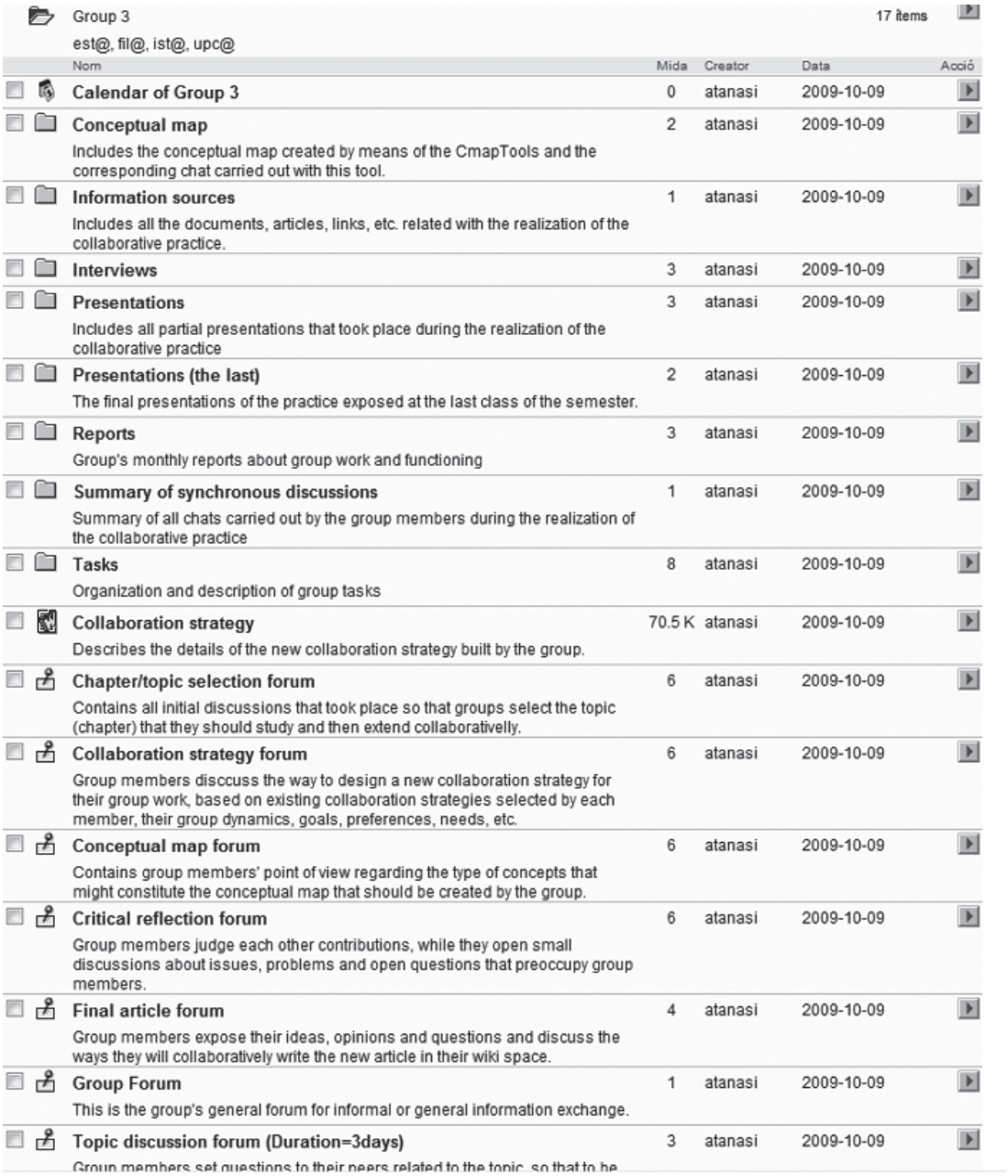
To select the most appropriate technologies to support each step of the experience effectively, we were guided by the specific tasks that groups had to carry out, as explained in the previous sections. Each task has its own needs and demands, so tools have to satisfy them in the best possible way, providing at the same time flexibility and ease of use; that is, they should not add any heavy workload either to the students or the instructor.

To this end, we used the Basic Support for Cooperative Work (BSCW) system, a groupware tool that enables mainly asynchronous collaboration over the web (Bentley et al., 1997). BSCW offers shared workspaces that groups can use to store, manage, jointly edit and share documents, realize threaded discussions, etc. This collaborative platform proved to be very useful to both students and the instructor since it offered the following functionalities.

- *Workspace structure and group organization*: BSCW gave the students the opportunity to create a unique online workspace, representing their group, where they could store the files, documents, information sources, etc. that they used during the realization of their practice. Each group could then define its own way to structure its workspace and represent the main interactions among its members as well as determine the most suitable organization of group tasks and activities (Figure 2).
- *Group calendar*: This functionality allowed groups to define a common calendar where they annotated the start and end date of the group learning tasks and other activities.
- *Task planning and realization*: All groups used this functionality to determine and organize the tasks that they had to carry out in order to achieve the goals of the collaborative practice. This included the assignment of specific members that were needed to accomplish a task, the explicit definition of the needs of each task, as well as the specification of the outputs produced by each task.
- *Asynchronous discussion forums*: As Figure 2 shows, several discussion forums have been created to achieve the various needs of the group. Each forum addressed a specific need and goal and proved to be very useful for the continuous and effective communication among group members.
- *Activity awareness*: An important feature of the BSCW platform is the awareness service that offers to all participants. BSCW sends a daily activity report to the e-mail address of all participants with all the activities and events that took place the previous day at the group workspace. In addition, it sets a special symbolic icon besides the workspace objects which denote that a change has occurred (e.g. a new object was created, an existing object has been read, modified, moved, erased, etc.). All the functionalities allow both the instructor and the group members to be aware of what is happening in the group workspace.

Another important tool that has been used in the collaborative practice is the *CmapTools*, a tool that is used to build concept maps collaboratively (Cañas et. al., 2004). This task proved to be a valuable middle step before the final task of writing the article/essay collaboratively. During

Figure 2. Extract from workspace structure and group organization



Group 3 — 17 items

est@, fil@, ist@, upc@

Nom	Mida	Creator	Data	Acció
Calendar of Group 3	0	atanasi	2009-10-09	
Conceptual map Includes the conceptual map created by means of the CmapTools and the corresponding chat carried out with this tool.	2	atanasi	2009-10-09	
Information sources Includes all the documents, articles, links, etc. related with the realization of the collaborative practice.	1	atanasi	2009-10-09	
Interviews	3	atanasi	2009-10-09	
Presentations Includes all partial presentations that took place during the realization of the collaborative practice	3	atanasi	2009-10-09	
Presentations (the last) The final presentations of the practice exposed at the last class of the semester.	2	atanasi	2009-10-09	
Reports Group's monthly reports about group work and functioning	3	atanasi	2009-10-09	
Summary of synchronous discussions Summary of all chats carried out by the group members during the realization of the collaborative practice	1	atanasi	2009-10-09	
Tasks Organization and description of group tasks	8	atanasi	2009-10-09	
Collaboration strategy Describes the details of the new collaboration strategy built by the group.	70.5 K	atanasi	2009-10-09	
Chapter/topic selection forum Contains all initial discussions that took place so that groups select the topic (chapter) that they should study and then extend collaboratively.	6	atanasi	2009-10-09	
Collaboration strategy forum Group members disccuss the way to design a new collaboration strategy for their group work, based on existing collaboration strategies selected by each member, their group dynamics, goals, preferences, needs, etc.	6	atanasi	2009-10-09	
Conceptual map forum Contains group members' point of view regarding the type of concepts that might constitute the conceptual map that should be created by the group.	6	atanasi	2009-10-09	
Critical reflection forum Group members judge each other contributions, while they open small discussions about issues, problems and open questions that preoccupy group members.	6	atanasi	2009-10-09	
Final article forum Group members expose their ideas, opinions and questions and discuss the ways they will collaboratively write the new article in their wiki space.	4	atanasi	2009-10-09	
Group Forum This is the group's general forum for informal or general information exchange.	1	atanasi	2009-10-09	
Topic discussion forum (Duration=3days) Group members set questions to their peers related to the topic, so that to be	3	atanasi	2009-10-09	

this phase, each group collaborated closely, using also the chat functionality of the tool, to build the concept map of their article, by determining the main and secondary concepts that constituted their topic as well as the relationships between them. At the end of this process, the groups had managed to obtain a clear enough idea of the article map, so, it was easier for them to proceed to the next and final step of their work, that is to translate this concept map into text, structuring and expressing their ideas into an article form.

The final and also very important tool used by groups in this process was a wiki. Again this tool allowed groups to work collaboratively to share and write down their ideas in a multimedia fashion, combining different media: text, images, even video as additional, auxiliary means when need. The result of this effort was a well-written article easily accessible in the web.

MONITORING AND ASSESSING THE COLLABORATIVE LEARNING EXPERIENCE

One of the most difficult tasks of an online collaborative learning experience is the monitoring and assessment of group work (Daradoumis et al., 2006). The most important challenge is how to evaluate not only the final (and intermediate) products of collaboration but also the collaborative process itself. The approach adopted in this case study was to establish specific criteria (expectations) and then measure against them. This technique was found to be quite successful.

At a first stage, the awareness information offered by the BSCW platform allowed the instructor to monitor and assess the progress of each group and its members effectively, since he/she was able to have a clear enough picture of the individual and group contributions. Group members could also apply peer evaluation easily since they were aware of their peers work and were also able to react rapidly since they were receiving notifications of their peer contributions.

Most importantly, our approach points out the importance of aligning course goals and objectives with group activity and assessment. To this end, the instructor provides clear specifications of what he/she wants the students to come up with and explains why they are doing it. Students know that the instructor wants them to come up with something interesting and creative, and that further motivates them. Students were very excited about that, and tried to meet the established criteria as closely as possible.

As a consequence, *a Team Policies and Expectations Agreement* is proposed: it includes a list of expectations and policies created by the instructor for group work, and a form where students create their own team policies and expectations agreement. Students work together in their groups to create their own agreement which provides them with a clear picture of what is expected of them and what they can expect from their peers.

The criteria used to motivate, monitor and assess students' work are listed below, with a weight beside each criterion:

1. Design of a new collaboration strategy: 15%
2. Application of the collaboration strategy: 10%
3. Design and implementation of the various activities (tasks) of the collaborative practice, as well as of the discussions carried out on the BSCW platform and via other means: 15%
4. Collaborative planning and conceptualization of the group's new article by means of the CmapTools: 10%
5. Collaborative writing of the group's new article through the Wiki tool: 10%
6. *Group Processing form*: this is a form for students to fill in to evaluate the team's progress toward effective group functioning. This form is meant to provide formative feedback to the students and encourage them to reflect on how their team is working together. Both self- and peer-assessment reports were created every three weeks: 10%
7. Evaluation of quality of the final product (new article): 20%
8. Presentation of the partial and final work to the class: 10%

As regards the actual artifacts created by the three groups and their quality, we can say that one group reached an excellent work, whereas the other two, although they tried hard, produced rather moderate quality outputs. A major issue in the presented scenario was the "creation and

application of a new strategy" (criteria 1 and 2). This is not a straightforward achievement. Besides, the analysis of the work done showed that the successful accomplishment of these two criteria was a very important factor that contributed to a more effective realization of the whole collaborative practice.

As an example, Table 1 shows an effective new strategy designed by one of the groups., This strategy successfully evolved during collaboration, several challenges were confronted by the students during the process, and all this endeavor contributed to accomplish the tasks and goals of the collaborative practice. The group chose the following four collaboration strategies to build their new strategy: *Group Investigation Method*, *Co-op Co-op*, *Think-Pair-Share*, and *Three Step Interview*. The selection of these strategies was mainly guided by the interests, idiosyncrasy and styles of the group members as well as the way they intended to achieve the learning goals of the collaborative practice. The subject they chose to deal with was "Virtual Collaborative Environments". To this end, they produced a list of the main tasks/phases that constituted the basic steps of the new collaboration strategy.

All the above steps provide an example of how our approach has been applied in a real situation, how collaboration evolved in a specific successful group and, in particular, how a group is able

Table 1. A new collaboration strategy built by a learning group

Interview between group members: This step is based on basic actions taken by the *Three-step Interview* method and its purpose was not only to allow the members to get to know each other better but also to be aware of each member's knowledge of the subject. The interviews were carried out by means of a chat tool.
Information search and collection: With this step, each member is assigned the task to look at the Web and the University Library for material related to the subject matter. Here, the group applies the reasoning dictated by the *Group Investigation Method*, according to which the selected material is judged by each member for its relation to the subject matter and is classified according to the domain structure.
Meditation about the content that the article should address: Based on the *Think-Pair-Share* method, each member sets a question so that the other members think about it, answer it and share their opinion with the others. In this way, several parallel asynchronous discussions take place (through the BSCW forums) aiming at meditating on the material found and making suggestions on the subtopics that their article should address.
Evaluation and determination of the specific and final subtopics of the article Following the *Think-Pair-Share* and *Group Investigation* methods, and based on the discussions of the previous step, each member writes reports arguing about the subtopics he/she thinks appropriate for the article and shares them with the rest of the team members. Each member evaluates the reports based on criteria such as the feasibility of the ideas and solutions proposed and a final group report is produced stating the decisions taken, the conclusions made and specifying the final subtopics of the subject matter.
New information collection/re-elaboration: Each member is assigned a specific subtopic to search, analyze and elaborate. Previous information found is re-elaborated, and new possible complementary pieces of information are added.
Presentation of the subtopics: This step is based on the *Co-op Co-op* method. Each member makes a presentation of the subtopic he/she was responsible for in front of the other members. This is supported by a PowerPoint presentation and lasts 15 minutes so that each member is sufficiently informed on each subtopic of the article. After each presentation the other members ask questions and further explanations.
Evaluation of the current situation: Based on the *Group Investigation Method*, at the end of all presentations, the group performs a discussion into a BSCW forum in order to evaluate the situation and draw the final conclusions. In this step, all members have the opportunity to be evaluated for the work done as well as to evaluate the others (each member can express his/her critical opinion about the presentation of the rest of the members). The group is now ready to pass to the two final stages of its collaborative work: the design and writing of the article.
Creation of the concept map of the article: During this phase, the group collaborates closely, using the CMapTools and its chat functionality, to build the concept map of the article. The group members determine the main and secondary concepts that constitute their topics as well as the relationships between them.
Writing the article: In this last phase, students collaborate to write the content of the article based on the concept map produced before and using a Wiki tool to elaborate and publish it in the Web.

to construct and apply a new collaboration strategy to achieve a given learning goal. All in all, this experience gave students the opportunity to develop several skills, both methodological and technological, as shown below.

More specifically, collaborative writing had the following effects:

- *Skills developed*: Critical thinking, brainstorming, negotiation, delegation of tasks, writing.
- *Technology support for student's work*: Ability to author and edit content collaboratively -- asynchronously and in real time; ability to maintain versions; ability to track changes and contributions.

Students Critiques (such as the ones emerged when group members view/read the work of their peers and provided constructive feedback) had the following effects:

- *Skills developed*: Productive criticism.
- *Technology support for student's work*: ability to upload work, ability to control access (viewing/editing), ability to comment, track participation.

Student Reflections occurred in the shared workspace of the group and the discussion forums, and had the following effects:

- *Skills developed*: reflection, exposure to different opinions.
- *Technology support for student's work*: ability to control access; ability to control rights (edit/view); attribution of comments to a person (non-anonymous).

Group Presentations allows students work to combine their different perspectives on a topic, research it, and create a presentation that reflects the groups' conclusions. It had the following effects:

- *Skills developed*: working in groups to develop consensus, presentation skills, delegation of tasks, encouraging accountability for assigned tasks.
- *Technology support for student's work*: a way to author and edit presentation content asynchronously and in real time; ability to narrate presentation with audio and video, if necessary; ability to store and maintain past versions; ability to control access rights (viewing/editing).

In any case, we need to improve further the experience and consolidate it, applying a number of methods and techniques, which we did not use in the way we wished. For instance, as regards the ways to use to prepare students for collaborative learning, we possibly need to:

- set up clearer rules about tasks that will be assigned as ''collaborative tasks'';
- involve students themselves in creating the rules/policies for collaborative learning;
- give them clearer expectations, let them shape the project, assess often and clearly;
- prepare and train the instructor adequately;
- communicate that risk-taking is acceptable and normal;;
- get comfortable with trial and error and develop a high tolerance for experimentation;
- let students know that collaborative learning will provide both the teacher and themselves a way to innovate. Then, let them feel confident that they will receive teacher's support and monitoring all the way long;
- allow them to self define success.

As regards the strategies we can employ for fostering true collaborative learning, we possibly need to:

- Create authentic learning experiences that are real world, messy, with no clear path to

decision, and invite learners to bring their knowledge, experiences, skills, etc. to the table and solve.
- Cast a spotlight on process and engage learners in critical self-reflection.
- Be creative when assembling a number of different elements that will be composed and lead to student's collaborative work/ projects.
- Reward true collaborative learning.

Certainly, different situations and challenges may appear in other cases (e.g., in less successful groups) which deserve a thorough study and analysis. Some of these issues are discussed in the following sections.

FUTURE RESEARCH DIRECTIONS

In the previous sections, we described the realization of a collaborative learning scenario that took place in a blended learning environment. We explained the complexity of such an endeavour in detail, and we suggested both methodological and technological solutions to support the whole process. Several other issues still need a broader and more effective answer, so our research continues along this line and focuses on several directions, such as:

- Describe the group dynamics that spring out from the application of a collaboration strategy.
- Analyze the tutor's role and how the tutor can anticipate and influence such dynamics.
- Discuss how technology can support the tutoring activity more effectively, especially monitoring and assessment issues.
- Provide a thorough analysis of the collaborative learning experience and interpret the results from a critical point of view.
- Propose improvements for a future implementation of the experience.
- Investigate whether the design and application of a new collaboration strategy by the group itself accomplishes more *social support* (McGrath, 1991) by the group members, that is:
  - improves and enhances the members' contribution to the achievement of mutual trust;
  - encourages members to provide more motivational and emotional support to their peers;
  - achieves a better participation and contribution to conflict resolution.
- Explore whether the proposed collaborative scenario achieves better *help services* (McGrath, 1991) by all participants in the collaborative process (both the instructor and group members), that is:
  - Help is timely;
  - Help is relevant to the student's needs;
  - Help is qualitative;
  - Help is understood by the student;
  - Help can be readily applied by the student.
- Investigate different ways to construct and use collaboration strategies and tools as well as effective ways to measure other factors that influence task performance, such as: cognitive empowerment (self-esteem, self-knowledge, self-efficacy in the domain of interest), locus of control, self-knowledge, ambition, general efficacy, motivation to action and community orientation, capacity for life-long learning, attitudes to information technology, and attitudes to collaborative work.
- Experiment how different technology can be used to enhance collaboration, since there are cases where the amount and nature of collaboration between partners has less to do with the availability of computer

software and more to do with the way the instructor designs and structures the collaborative practice (Kozma, 1999).

- Determine what metrics we can use to decide which tools are "pedagogically sound"; how would the students learn to use them; how we can integrate these tools better to support successful collaborative learning experiences; and, how we can scale up the use of these tools without significantly adding to the students' and the instructor's workload.
- Provide a more thorough analysis of the specific contextual requirements that one has to take into account for a strategy/tool to be adopted.
- Design a more systematic and effective monitoring and evaluation approach, guided by semi-automated tools, that gives the instructor the ability to define flexible and efficient methods to monitor, support and assess collaborative work and learning, and gives the students the opportunity to regulate their learning and participation in their group without any additional overhead (Persico, Pozzi, & Sarti, 2009).

CONCLUSION

This chapter provides a framework for structuring collaborative learning opportunities and selecting technologies to enhance learning outcomes in a blended learning environment. We presented the design and implementation of a new collaborative learning practice for incorporating cutting edge pedagogy into traditional curricula and classrooms. In particular, we proposed a novel methodological approach that fosters online collaborative study and writing. We innovated by encouraging and inspiring leaning groups to design themselves a new collaboration strategy that springs out of existing collaboration strategies, which fits better the idiosyncrasy and dynamics of the group, and use it to define, structure and carry out their collaboration in the best possible way.

Doing so, students assume a more responsible role for their actions, develop an active participation behavior, provide better and well-balanced contributions, and increase their involvement and commitment toward collaboration, joint learning and accomplishment of the common goal. In addition, the adoption and correct implementation of their new collaboration strategy allows them, on the one hand, to organize their groups and define their collaborative tasks and activities (such as discussions) in a more systematic, efficient and reliable way; and, on the other hand, to decide better about the way to employ the available tools.

After the end of the experience, students were asked, through a questionnaire and personal interviews, about their satisfaction with respect to both the group learning process and the acquisition of new knowledge and skills that may be used for teamwork in the real world. Students were generally satisfied for both criteria. Furthermore, when the practice has been completely assessed by the instructor, all of this work was put together, and a shared repository of information emerged; this brings a possibility that students might start building on one another's work.

Another achievement of our approach is *student reflection*. In particular, students managed to enrich their learning by engaging each other on the topic they found interesting or useful by drawing upon previous course work, opinion or life experience. Using the collaborative BSCW platform, students posted materials they thought would be of interest to one another. These materials grew over the course of the term as students provided new materials from which to learn. Many students really tried to find the most diverse information sources. Sometimes it was a group summary of a reading, sometimes notes from a lecture, sometimes a reaction to something in the popular press. When this happened, dialog emerged in the group and most members usually addressed the matter. Pedagogically, this was

exciting because students posted things to learn from, and they learned about what they thought from responding to each other. The emphasis on writing and discussing forced all students to think and reflect on the topic and how it relates to both the course and what is going on in the research field. Finally, writing a report about group work and functioning every three weeks, allowed them to enter another reflexive process.

All in all, the experience proved to be positive and interesting for all participants. The issues referred above can certainly improve and make it more effective, producing more advantages and less overhead. More experimentation will show more interesting results, since we surely need more meaningful and effective collaborative learning experiences.

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KEY TERMS AND DEFINITIONS

Activity Awareness: In Computer-Supported Collaborative Learning (CSCL), activity awareness gives learners indications of what is happening and what has happened recently in collaborative activities in their group. It enables learners to be aware of the latest information created their peers and of the progress made as regards the tasks they share in their group space. In general, we define activity awareness to be the awareness of long term joint efforts directed at specific goals and objectives that promotes informed action and reaction. This extends most prior work in awareness that has focused on social (who is present?) or action (what is happening?) awareness. Instead, activity awareness focuses on the "why?" aspect to awareness. Important issues include awareness of the overall situation, social expectations and dependencies within a group, and shared task goals and status. Technology plays a vital role in the process of awareness creation, however one has to clarify in what ways communication technology affects awareness creation.

Blended Learning (Course): Blended Learning refers to a mixing of different learning environments. It can combine face-to-face instruction with computer-mediated instruction. It also applies science or IT activities with the assistance of educational technologies using computer, cellular or iPhones, Satellite television channels, videoconferencing and other emerging electronic media. Learners and teachers work together to improve the quality of learning and teaching, the ultimate aim of blended learning being to provide realistic practical opportunities for learners and teachers to make learning independent, useful, sustainable and ever growing. In a blended course scenario, the teacher will have to decide which parts are online, which parts are offline. A basic example of this is a course of English as a second language where the instructor reaches the conclusion that all audio-based activities (listening comprehension, oral expression) will take place in the classroom where all text-based activities will take place online (reading comprehension, essays writing).

Collaboration Strategies/Methods: Collaborative strategies/methods are processes, behaviors and conversations that relate to collaboration between individuals. These methods specifically aim to increase the success of teams as they engage in collaborative problem solving. Many of the strategies involve assigning roles within each small group (such as recorder, participation encourager, summarizer) to ensure the positive interdependence of group participants and to enable students to practice different teamwork skills. Other strategies develop problem-solving abilities, understanding of complex relationships, and decision making in the face of uncertainty. These terms usually do not refer to loosely structured group work in which students are told simply to "work together" on a problem of assignment. Collaboration strategies are content-free, and thus can be used in a variety of contexts. Studies have shown that in well structured collaborative groups, students consistently learn many different subjects better, whereby they are able to organize their thoughts in a less threatening context than whole-class discussions, and then share their thoughts with the class.

Collaborative Learning Scenario: A collaborative learning scenario refers to methodologies and environments in which learners engage in a common task where each individual depends on and is accountable to each other. Often, such a scenario uses a variety of approaches in education that involve joint intellectual effort by students or students and teachers. It is commonly illustrated when groups of students work together to search for understanding, meaning, or solutions or to create an artifact or product of their learning. Collaborative learning activities can include collaborative writing, group projects, joint problem solving, debates, study teams and other activities. Finally, a collaborative learning scenario may include scripts that structure collaborative learning

by creating roles and mediating interactions while allowing for flexibility in dialogue and activities.

Collaborative Educational Systems: A Collaborative Educational System is a specific environment that supports learners in both their individual and collaborative learning, thus giving birth to a new class of learners, e-learners, who can work and learn together irrespective of their geographical location. Such systems provide the capabilities to share information and exchange views in order to reach a common understanding. In general, in this context, collaborative learning refers to a collection of tools which learners can use to assist, or be assisted by others. Such tools include Virtual Classrooms (i.e. geographically distributed classrooms linked by audio-visual network connections), chat, discussion threads, application sharing (e.g. a colleague projects spreadsheet on another colleague's screen across a network link for the purpose of collaboration), among many others.

Computer-Supported Collaborative Learning (CSCL): Computer-supported collaborative learning (CSCL) is a method of supporting collaborative learning using computers and the Internet. It is related to Computer Supported Cooperative Work (CSCW) and cuts across research in psychology, computer science, and education. The technology allows individuals who are far apart to collaborate on-line. The use of these tools is increasing, however many teachers are still new to what tools are available on the Internet and how to use them effectively. CSCL is a method for bringing the benefits of collaborative learning and cooperative learning to users of distance or co-locative learning via networked computers, such as the courses offered via the Internet or in a digital classroom. The purpose of CSCL is to scaffold or support students in learning together effectively. CSCL supports the communication of ideas and information among learners, collaborative accessing of information and documents, and instructor and peer feedback on learning activities. CSCL also supports and facilitates group processes and group dynamics in ways that are not achievable by face-to-face communication (such as having learners label aspects of their communication).CSCL is a way of integrated teaching.

Educational Scenario: An educational scenario describes an educational activity, where the focus and starting point is a real life situation and not a theory. It refers to learning goals within a topic, and more specifically suggests learning activities, use of resources, and may also discuss the role of participating actors. For instance, in a scenario you first learn about water by visiting a river, not by reading a book. The scenario may be an idea that has already been developed and evaluated and found to be successful or a new idea that is being formed and prepared for implementation.

Group Dynamics: Group dynamics is the study of groups, and also a general term for group processes. Relevant to the fields of psychology, sociology, and communication studies, a group is two or more individuals who are connected to each other by social relationships. Because they interact and influence each other, groups develop a number of dynamic processes that separate them from a random collection of individuals. These processes include norms, roles, relations, development, need to belong, social influence, and effects on behaviour. The field of group dynamics is primarily concerned with small group behaviour. This term also refers to the understanding of the behaviour of people in groups, such as task groups, that are trying to solve a problem or make a decision. An individual with expertise in 'group process', such as a trained facilitator, can assist a group in accomplishing its objective by diagnosing how well the group is functioning as a problem-solving or decision-making entity and intervening to alter the group's operating behaviour.

Monitoring: Monitoring in CSCL means to observe the behaviour, communications, activities, or other changing information of individuals or groups. Monitoring may refer to several aspects, such as 'monitoring competence' or 'self-monitoring' can be described as awareness of what one

knows. A high level of monitoring competence means one can make accurate assessments of one's skill or knowledge, while a low level means the opposite. Specific software can be used to track every student as they progress through a qualification, specifically checking behaviour and progress, quickly flagging up problematic issues such as low participation or a swift decline in progress, and thus enable a coordinator to intervene accordingly.