Chapter XIX
Supporting Group and Individual Processes in Web-Based Collaborative Learning Environments

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ABSTRACT

This chapter tackles the issue of how it is possible to integrate individual differences in the learning design of Web-based collaborative learning experiences. In particular, in online collaborative learning environments, it is quite common to adopt techniques to support collaboration and interactions among peers. This contribution proposes to monitor the enactment of the collaborative techniques to make individual and group differences emerge, thus allowing the consequent customization of the learning experience. To this aim, a monitoring model is proposed, whose flexibility allows the tutor to bring different aspects and different levels of the ongoing learning process under control.

INTRODUCTION

One of the main issues in the field of web-based education is how to incorporate individual differences in the learning design (Jonassen & Grabowski, 1993); the problem is currently being addressed from very different perspectives, ranging from the psychological point of view (Anastasi & Foley, 1949; Eysenck & Eysenck, 1985; Merrill, 2001), to more technological perspectives, aimed at finding new technical solutions to meet individual styles and behaviors (ranging from Intelligent Tutoring Systems (ITS) to Adaptive Hypermedia Systems (AHS)) (Brusilovsky, & Peylo, 2003).

The issue of incorporating individual characteristics in the learning design is strictly related to the two concepts of individualization and personalization, the former being more focused on the ability of a learning environment to offer an
ad hoc learning path to a certain student according to her/his individual characteristics; the latter being devoted to the possibility of the student to personally choose a certain path (Clarke, 2003). Going beyond the differences between the two concepts, there is a common idea underpinning them, that is that web-based education should not coincide with fixed, pre-determined contents to be equally distributed to all learners independently of their individual characteristics, but rather that contents (and the way they are presented) should evolve during the learning experience, on the basis of the learner’s styles, attitudes and behaviors (O’Connor, 1999; Henze et al., 2004; Lee, 2004). Even the most common specification in the field of learning design, namely IMS-LD\(^1\), recognizes personalization as a necessary aspect to be addressed (Koper & Olivier, 2004).

But what does this mean in collaborative learning environments? To what extent are individualization and personalization possible in contexts that are primarily based on discussion and negotiation among peers as the way to construct knowledge?

Brusilovsky and Peylo (2003) state that “Intelligent collaborative learning is an interesting group of technologies developed at the crossroads of two fields originally quite distant from each other: computer supported collaborative learning (CSCL) and ITS. The recent stream of work on using AI techniques to support collaborative learning has resulted in an increasing level of interaction between these fields. [...] Currently we can list at least three distinct technologies within the intelligent collaborative learning group: adaptive group formation and peer help, adaptive collaboration support, and virtual students” (p. 161).

This chapter aims to provide a more methodological contribution to the discussion in this field, by focusing on monitoring as a practice able to provide the tutor of an online collaborative learning experience with a run time picture of the participative, the social, the cognitive and the teaching dimensions, as they are developed by students performing activities, in such a way s/he can individualize the learning path according to the emerging individual and group characteristics. In other words, in this contribution monitoring is considered a valuable, methodological solution to address individualization in web-based collaborative learning processes.

**BACKGROUND**

In the last decade constructivist approaches have been increasingly appreciated, ranging from “radical constructivism”, which states that there is no reality, but only individual speculations and interpretations are possible (Suchman, 1987), to the “situated constructivism” point of view, which assumes that it is by using social patterns that we conceptually interpret events, objects, and perspectives and thus construct knowledge (Jonassen, 1991). According to the mentioned approaches, educational experience has to be as authentic and genuine as possible, so that learners can observe and critically reflect on real situations (Bendar et al., 1992). These methods lead far away from traditional, transmissive paradigms of learning and encourage the adoption of more modern, participative approaches. Partially inspired by these approaches, “social constructivists” definitively stress the importance of the social dimension in the process of developing new knowledge and state that learners develop understanding using language in discussion, collaboration and debate. Language therefore becomes the basic element of an educational experience (Vygotsky, 1962). In other terms, during a learning experience “the process of negotiation is how we construct knowledge and, if the process of negotiation results in agreement, the agreement is reality” (Kanuka & Anderson, 1999).

On this line, *Computer Supported Collaborative Learning* (CSCL) is the research area that focuses on debate-based learning and peer negotiation in online learning environments.
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(Feenberg, 1989; Harasim, 1989; Kaye, 1991; The Cognition and Technology Group at Vanderbilt, 1991; Rowntree, 1995; Scardamalia & Bereiter, 1994; Berge, 1995; Dillenbourg, 1999; Kanuka & Anderson, 1999). In these contexts, students work online and are subdivided in groups; each group is usually engaged in tasks (discussing a topic, solving a problem, studying a case, etc.) with concrete outputs to produce, which act as catalysts of interaction and collaboration among peers.

In order to facilitate and encourage collaborative dynamics, it is quite common to adopt “techniques” or “strategies” with the aim of providing a structure to activities, so as to foster collaboration and exchange among peers (Kanuka & Anderson, 1999; Dillenbourg 2002; Hernández-Leo et al., 2005; Persico & Sarti, 2005; Jaques & Salmon, 2007; Pozzi, 2007; Persico et al., 2008). Techniques are content-independent procedures, which serve as scaffolds to activities (which on the other hand are content-dependent). Techniques are typically selected by the designer prior to the educational pathway, taking into consideration different variables, such as course objectives and contents, characteristics of target population and – more in general - context constraints. Examples of techniques are: Discussion, Peer Review, Role Play, Jigsaw, Case Study, etc. In particular, a “collaborative technique” is aimed at specifying:

- The phase repartition and timing of a learning activity: most of the collaborative techniques adopt a two (or even more)-step model, that is to say that different stages are envisaged in the activity, so that participants contribute at different levels and possibly play different roles. Time availability is an important factor to be considered: some techniques are particularly time consuming; others are less structured and thus require less time.
- The nature of the task to be performed and the work distribution: most collaborative techniques engage learners in concrete tasks, often with very tangible pragmatic outcomes, that can be either the solution to a problem, or the production of an artefact (a document, a concept map, a schema, a hypertext, etc.); this fosters the reciprocal interdependence of participants thus enhancing collaboration.
- The social structure of the group(s) (in terms of size, composition, etc.): the numerosness of learners may influence the choice of a collaborative technique (Caspi et al., 2003). Some techniques are more flexible as far as the social structure is concerned and thus they may be applied irrespective of the number of students; on the contrary, other techniques depend very strongly on social organization and thus can be applied only with small or large groups. As already mentioned, very often techniques are carried out into two steps, where one stage may be carried out by small groups (2-6 participants), while the other stage may involve larger groups (typically 20-25 people).
- The mode of interaction among participants and groups. In order to carry out collaborative activities, learners usually interact through Computer Mediated Communication systems (CMC), which allow both synchronous and asynchronous textual communication. Such systems can be configured in conferences, forums and/or thread, so as to support different groups working in parallel and/or in sequence. Each technique is characterized by specific mechanisms of interaction, which may entail one-to-one communication, one-to-many communication or many-to-many communication. The CMC system usually provides group formation tools, so that different levels of permissions allow an easy management of different groups/roles performing different tasks (Dimitracopoulou & Petrou, 2005).
COLLABORATIVE TECHNIQUES AND STUDENT PROFILES

In the following three examples of collaborative techniques are briefly described, together with the features, which make each of them more or less “theoretically” adequate to certain initial students’ characteristics and group profiles.

Discussion

During a Discussion, students are subdivided in groups. The technique usually envisages two phases: during the first phase the task consists of individual study of some learning materials. During this phase, the CMC system, which is typically configured in conferences to allow groups to work separately, is used exclusively for asking questions and for expressing personal doubts, ideas or comments to the tutor or to the other members of the group.

The second phase of the technique is much more collaborative, because students are explicitly asked to interact with the peers of their own group to carry out a collaborative task, on the basis of what they have learned from individual study of the first phase. The task at hand may range from information gathering, list-making or problem solving.

As far as the social structure is concerned, since participants have to collaboratively produce an artefact, the technique is most suitable in case of small groups (2-6 people), otherwise interactions may become dispersive.

The choice of Discussion as a collaborative technique within a course should be determined, among the other constraints, by certain students’ characteristics. In particular, since Discussion provides an opportunity for learners to share their knowledge, beliefs, values and experiences, it is a proper technique to be adopted when students are characterized by heterogeneity in competences, so that diversity may be exploited at its best.

Moreover, Discussion, by providing a “weak” structure to the learning activity and leaving the interaction process relatively free, will very likely make students with social attitudes (social-oriented leaders), as well as task-oriented leaders emerge. Moreover, by looking at students while interacting, it will be possible to note those students who tend more to individual reasoning, as opposed for example to those with more group-oriented cognitive styles, or even those with reflective attitudes.

This makes this technique particularly indicated in those contexts where the students’ profiles are not yet clear; for example, at the beginning of a course, it is very likely that information of this kind is not available to the tutor and this technique may be a good tool to break the ice and allow students to show their natural attitudes and skills at the same time.

Peer Review

Another interesting technique which may turn out to be very useful in online collaborative contexts, is Peer Review. The technique is usually structured in two phases: during the first phase students individually analyse some learning materials and are asked to report their impressions or points of view about what they have read. During the second phase, each student is typically assigned a peer and is required to read his/her analysis, in order to provide comments and/or suggestions. This way, each student receives feedback on the work done in the previous phase.

Structured like this, a Peer Review may be adopted even in the context of large groups (20-25 participants) and this is not particularly disturbing, due to the fact that during the first phase each student simply delivers her/his document, while in the second phase communication occurs mainly in couples.

As a matter of fact, Peer Review is not - per se - associated with a specific social structure and thus it could also be organized in such a way that the reciprocal feedback is provided not only from
one individual to another, but from one pair to another, or even between groups. This feature makes the technique suitable also in contexts with large numbers, where the ratio tutor/students is particularly low.

During the Peer Review, a reciprocal teaching approach is stressed, where one’s own interpretation of reality is to be faced and compared with those of others (Pozzi & Sugliano, 2006; Pozzi, 2007). In order to exploit the possibility of such reciprocal teaching, this technique is appropriate in those contexts where students have similar competences; another important requirement that students should have in order to effectively adopt this technique, is that they have already developed the ability to receive criticism positively, as well as a strong reciprocal commitment, otherwise they can fail to provide significant suggestions to their colleagues.

Moreover, the adoption of this technique requires a certain knowledge by the designer of the target population, so perhaps Peer Review should not be used at the beginning of a course, but rather as a mid-or late activity, when students’ attitudes and groups’ behaviours have already emerged. In particular, if groups have already experienced internal conflicts in previous activities, Peer Review should be avoided, due to the risk of flaming. If, on the contrary, students seem to lack the ability to consider others’ perspectives and/or comment on them, Peer Review may help.

As far as pair composition is concerned, the tutor should devote special attention to the analysis of students’ individual behaviours, in terms of their level of participation on previous activities (for example, very active participants versus lurkers), cognitive styles (for example students who tend to develop individual reasoning, as opposed to those who prefer a group knowledge construction), social behaviors (more open and friendly students, as opposed to shy ones) and teaching attitudes (students who take the responsibility of the learning process more, versus those who simply carry out the task). If on one hand, a certain heterogeneity of behaviors within a pair may turn out to be fruitful (the student with the more positive attitude may influence the other), on the other hand, the tutor should avoid the opposition of extremely different behaviors: for example pairs composed of students who have shown very different levels of participation, may generate frustration in the more active student, who does not receive any feedback from his/her peer.

Role Play

An interesting technique that can be fruitfully adopted in online collaborative contexts is Role Play. Usually at the beginning of the activity students, subdivided in groups, choose (or are assigned) roles and are asked to individually read some learning materials.

During the second phase of the activity, students are asked to pretend a certain situation and to collaboratively carry out a task (solve a problem, elaborate a shared document, etc.), by playing the assigned roles, in such a way that discussion and negotiation is made richer by the fact that students argument their positions according to their roles.

The adoption of the Role Play technique may be supported in online environments by the fact that in CMC systems it is often possible to assign “aliases” to users: by using an alias, the learner can act and respond to class mates who will not know her/his “true” identity (Kanuka & Anderson, 1999) and this will make the role play even more “realistic”.

As we will see in the following, monitoring collaborative techniques during their enactment is a key element in keeping their effectiveness under control and - at the same time - for making group processes and individual differences emerge, so that the tutor can tune her/his actions and customize the next interventions accordingly.
MONITORING ONLINE COLLABORATIVE LEARNING PROCESSES

Once a collaborative technique has been selected and the learning activity fully designed, it is proposed to students. During the enactment of the collaborative technique, it is very likely that new characteristics of the target population will emerge.

As a matter of fact, some characteristics of the target population are known a priori, such as, for example, the numerosness of the learning group and the availability of tutors, which determines the ratio tutor/students; thus the designer may take them into due consideration from the very beginning of the learning design. On the contrary, other characteristics may seldom be investigated a priori, and more often emerge in fieri, such as, for example, individual attitudes by students (attitudes towards socialization, learning styles, etc.) and group dynamics. As already mentioned, monitoring can help in capturing the emerging behaviors and attitudes by groups and individual students, so that designers and tutors of the learning experience can customize and tune the subsequent techniques according to individual and group reactions.

As a matter of fact, in order to gain information on the ongoing learning process, CSCL research has been increasingly using interaction analysis techniques, which take advantage of the non-intrusive capability of technology to record events and their effects (from user actions, like logging into the system to the texts of the messages exchanged), therefore replacing or most often complementing more intrusive ways to collect data (questionnaires and interviews with learners and tutors). Interaction analysis techniques may be based on both quantitative and qualitative data, the former being automatically tracked by the CMC system, the latter deriving from content analysis by a human agent of the messages exchanged between participants. In the last few years many approaches have been proposed which rely on both quantitative and qualitative data (Henri, 1992; Hara et al., 2000; Rourke et al., 2001; Lally, 2002; Aviv et al., 2003; Lipponen et al., 2003; Martinez et al., 2003; Daradoumis et al., 2004; Schrire, 2006; Weinberger & Fischer, 2006; ICALTS Kaleidoscope JEIRP).

On this same line, Pozzi et al. (2007) proposed a model for evaluating and monitoring collaborative learning processes, which mainly builds on Henri’s model (1992) and Garrison & Anderson’s Communities of Inquiry (Garrison & Anderson, 2003). The model has been extensively tested and improved (Persico et al., in press) and its final version encompasses four dimensions as those which mainly characterize the learning processes in collaborative learning environments, namely: the participative, the social, the cognitive and the teaching dimensions.

In order to bridge the gap between the four dimensions and their effective manifestation, suitable indicators have been identified, that is quantitative or qualitative elements that allow the analysis of each dimension according to specific objectives.

Figure 1. The four dimensional model for evaluating and monitoring online collaborative learning processes
In particular, the participative dimension expresses the quantity of messages exchanged by students in the CMC system to carry out the assigned task and thus indicators of this dimension include: the number of active actions by members of the learning community (in terms of sent messages, uploaded documents, etc.), the number of reactive actions (e.g. reading messages, downloading documents, etc.), as well as the level of continuity in participation across time. As one may note, the participative dimension is based on indicators and data of a quantitative nature, that is to say that procedures to obtain and analyse data of this dimension can be totally automated.

Unlike the participative dimension, the other three dimensions are based on indicators and data of a qualitative nature, that is to say that the evaluator needs to carry out a content analysis of the messages exchanged by participants.

In particular, the social dimension is defined as “the ability of participants... to project themselves socially and emotionally, as ‘real’ people (i.e., their full personality), through the medium of communication being used” (Garrison et al., 1999); thus indicators of this dimension include clues of affection (which is typically revealed by expressions of emotion or intimacy, humour or irony, presentations of personal anecdotes) and group cohesion (vocatives, expressions revealing group-self efficacy, references to the group using inclusive pronouns, phatics, salutations).

As far as the cognitive dimension is concerned, this is defined in terms of “the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse...” (Garrison et al., 2001); the model makes a distinction between clues of individual and group knowledge building, by assuming that a collaborative activity in these contexts requires typically a personal re-elicitation of contents and the expression of personal points of view, and - at a second stage - discussion and negotiation to collaboratively construct common interpretations of reality. Moreover, according to the model, the cognitive dimension also encompasses meta-reflection, that is to say that monitoring and/or evaluating the process by students is considered an important component of the cognitive process itself.

Lastly, the teaching dimension is defined as “the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes” (Anderson et al., 2001). Thus indicators of the teaching dimension include organizational aspects, facilitating discourse and direct instruction.

Table 1 summarizes the main indicators of the four dimensions.

The innovativeness of this model with respect to the others cited here (see references above) lays in its flexibility, i.e. the fact that its dimensions (both quantitative and qualitative) and the related indicators can be instantiated according to the aim and time of the analysis and the type of the learning experience, in such a way that one can choose on what dimension(s) and indicator(s) to focus, on the basis of the real needs and requirements of the analysis itself. Thus the model can be considered a general framework, able to provide guidance for any analysis, but allowing the evaluator to choose what element to address (e.g. group dynamics, individual behaviors, level and intensity of interactions) and at what level of detail. This makes the model particularly indicated as a means to keep the various aspects of the ongoing learning process under control and consequently to customize the activities according to students’ and groups’ reactions.

As we will see in the following, in these contexts the model confirmed to be flexible enough to capture and describe the processes deriving from the application of the various techniques by
keeping the participative, the social, the cognitive and the teaching dimensions continuously monitored during the enactment of the activities themselves. Moreover, the flexibility of the model allowed the tutor to capture the performances and behaviors both at group and individual levels, so that s/he could consequently take the most suitable measures to support students, thus guiding them towards the achievement of the learning objectives.

**MONITORING GROUPS: CASE STUDIES**

In the following, a number of case studies are presented deriving from real experiences, with the aim of demonstrating how the model can be used and what kind of results one may obtain by its application for monitoring groups and single students.

The examples cited derive from the application of the model in the “SSIS”, the Italian teacher training institution. In recent years the Istituto Tecnologie Didattiche (ITD) – CNR has designed and run several blended courses for the SSIS of two Italian regions (Liguria and Veneto) on the topic “Educational Technology” (hereinafter these courses will be referred to as “TD-SSIS”). Although each TD-SSIS course has its own specificities (in terms of learning objectives, contents, activities, schedule, etc.), all of them use a CSCL approach and share a basic aim, namely promoting the development of instructional design competence, with special focus on the evaluation and selection of learning strategies, techniques and tools and on the implementation of educational technology in the school context (Delfino & Persico, 2007). These courses always envisage an alternation between face-to-face lectures and online activities through the use of a CMC system.

In particular, face-to-face sessions are devoted to lay the bases for both a better understanding of the subject and an effective participation in online activity, whilst online work is mainly collaborative and asynchronous and is based on techniques such as Discussion, Peer Review and Role Play.

The students of the courses are post-graduate adults with very diversified backgrounds, interests and expectations. Since the size of the audience is usually notable (around one hundred students per year), the students are divided into virtual workgroups each supported and coordinated by a tutor.

The method used to gather data is mixed: as far as the quantitative dimension is concerned (namely...
the participative one), data were automatically tracked by the CMC system\(^5\). On the contrary, as already mentioned, information concerning the social, the cognitive and the teaching dimensions relied on data deriving from the content analysis of the messages exchanged among students. This implied one coder to systematically identify significant properties of textual information. The most commonly used property is the frequency of given keywords or patterns or even expressions that are believed to reveal a feature of the communication act. For example, frequent use of emoticons, expressions like “dear X” or informal greetings are regarded as clues of social presence (Delfino & Manca, 2007). The unit of analysis chosen was the “unit of meaning”, i.e. each message was split into semantic units\(^6\) and each unit was assigned one indicator.

The coding procedure was carried out by two independent coders, who worked separately after a 40-hour period of training. In order to calculate the inter-rater reliability between the two coders (i.e. the agreement between the two), a sample of messages was selected and coded, corresponding to 10% of the total number of messages in each activity. The selected messages were distributed in time (namely, at the beginning, in the middle and at the end of each activity). The inter-rater reliability was calculated using the Holsti coefficient and considering the agreement on each unit of meaning. This was 0.90 (percent agreement 0.84), which is usually considered a good result. Disagreements were solved through discussion.

As we will see in the following, group behaviors resulting from the monitoring process, guided the tutor’s actions and allowed a more customized approach towards groups.

**Case Study 1**

Figure 2 shows an example of the cognitive dimension as developed by a group of 21 students, during a Discussion (course TD-SSIS Liguria 2007). The technique was chosen a priori by the designers of the course mainly because the students were heterogeneous in competences and this was considered in principle a good factor in view of exchange and sharing of diverse experiences and ideas.

The topic addressed by the activity was the use of blogs in educational contexts. In line with the design principles behind the Discussion, the activity was not particularly structured; nonetheless, two phases were envisaged so to give a pace to the work; besides, an artefact was required from students as output of the whole activity.

In particular, during the first phase of the activity students were required to individually read some materials, navigate a certain number of educational blogs and try to implement a draft of a personal blog. During this phase forums were used exclusively for asking questions and for expressing personal doubts, ideas or comments if any. On the contrary, the second phase of the activity was much more collaborative, because students were in charge of discussing to conceive a common design of an educational blog.

The figure shows the results obtained from the analysis of phase 2 of the Discussion, where there is evidence of a certain richness of indicators, which include: explaining personal points of view (C1.3), agreement (C2.2), suggestions to others (C2.3), offering knowledge to others (C2.4), integrating ideas (C2.5), creation of new meanings (C2.6).

In this case the monitoring model helped in confirming the tutor that the reaction of the group to the proposed activity was positive and that the group composition was satisfying, in that members showed a certain ability to exchange and collaborate, thus leading the group to a positive performance. At the same time, the tutor could observe that the tendency to disagreement (C2.1) and individual reasoning in general (C1) was not so high, so she was able to tune her action accordingly within this group, by fostering individual reflections and expression of personal ideas and by pointing out points of divergence.
Case Study 2

The second case refers to the results obtained by monitoring a group performing a Peer Review (within TD-SSIS Liguria 2005).

The object of the learning activity was the use of online resources for teaching and learning and the activity was structured in two phases: during the first phase students of the same subject matter individually analysed online resources and were asked to fill in a template with their impressions about the websites they had visited. During the second phase, each student was assigned a peer and was required to read his/her analysis in order to provide comments and/or suggestions. This way each student received feedback on the work done in the previous phase. During the Peer Review interactions occurred among 19 people at a time. Nonetheless, this was not particularly disturbing, due to the fact that during the first phase each
student simply delivered her/his document, while in the second phase communication occurred mainly in couples.

Figure 3 shows that during phase 2 of the activity the group under study is developing a cognitive dimension which is much more characterized by Individual reasoning (C1), rather than Group knowledge building (C2). In this case the model helped in pointing out that the students preferred to state their personal points of view, instead of addressing directly their peers by disagreeing or providing suggestions to them.

The overall low level of exchange and interactions among participants within this group during the Peer Review, was also confirmed by the participative dimension: indicators of Active participation (P1) and Reactive participation (P2) are not so high, as shown in the Table 2.

Of course, when students receive very poor feedback, or even no feedback at all, the quality of subsequent work is at risk; when the tutor realized this, she started encouraging collaborative and generative feedback, by identifying areas
of agreement/disagreement, so as to move the process of knowledge construction forward.

Moreover, by isolating data per couple of students, she could even customize her feedback according to the nature of interactions that occurred within each couple.

**Case Study 3**

Another interesting case emerged from monitoring a Role Play (TD-SSIS Veneto 2007), the topic of which was “Webquests”. During this activity, 24 students, organized in 4 sub-groups, were asked to pretend to be groups of teachers in charge of a common analysis and a shared evaluation of a certain number of webquests. The analysis of the webquests was to be carried out from a very particular perspective, i.e. by playing a specific role within the group. At the beginning of the activity, students chose their role, from a list of characters, including the “director” and the “rapperteur” of the group, both in charge
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During the first phase of the activity each student chose a role, while in the second phase s/he was asked to discuss a number of webquests, argument his/her position according to the role and negotiate a common evaluation with others. By monitoring this activity through the model (results are shown in Figure 4), it emerged that during the Role Play the level of teaching dimension increased and that students were able to take responsibility for the learning process, so that the tutor could react accordingly and limit her action to a few support interventions. At the same time, thanks to the assigned roles, students experimented argumentation and divergence at cognitive level, thus coming out with a very positive performance.

As we have already mentioned, the model also allows one to focus on single students and to understand their personal attitudes, behaviors and weaknesses, by looking at dimensions and indicators each learner develops through time.

For example, looking at the participative dimension of each student, may help the tutor in detecting very active students, lurkers (i.e. people who read messages exchanged by others but rarely participate), or those who are later in accomplishing an activity and need to be reminded of deadlines.

Similarly, by looking at the social dimension each student is developing, the model may help in detecting and bringing to light social-oriented leaders. In Figure 5 the social dimension is described, as developed by a group of 7 students performing the second phase of a Discussion.
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(TD-SSIS Liguria 2005); values on the bottom represent the social dimension developed by the whole group, excluding that developed by a particular student, whose name is L. (represented at the top of the columns).

In this case the model allowed the tutor to focus on a single student and highlighted that she was particularly active from the social point of view, in that she often told personal anecdotes (S1.3), expressed her feelings (S1.1), used self-irony (S1.2) and this encouraged the others to do the same and contributed to the creation of a friendly climate. Moreover, L. often referred to the group as a whole (S2.1) and used expressions of group self-efficacy (S2.2) thus enhancing group cohesion.

These aspects are determinant for the tutor, whose actions cannot leave these kinds of data out of consideration: starting from them, the tutor increases students’ personal involvement, help those who are more peripheral or hard to reach, and thus is able to individualize the proposed activities more, according to students’ personal results.

Furthermore, when looking at a single student, especially if s/he is performing a technique that is not particularly pre-structured, the model may highlight his/her cognitive styles, by making reflective attitudes emerge (high levels of Meta-reflection (C3)), or a tendency to Individual reasoning (C1), or a Group oriented attitude (C2).

In the same way, by looking at the indicators of the teaching dimension developed by a student, one may note task-oriented leadership attitudes, such as:

- Organizing the group and coordinating the work, which can make you think of an organizer (T1).
- Asking others for contributions, stimulating the group and fostering discussion, which may reflect an opinion seeker or an energizer (T2).
- Giving additional information which can make you think of an elaborator (T3) (Benne & Sheats, 1948).

Such use of the model to capture students’ behaviours, may help the tutor to learn more about her/his students, so that s/he can become - on one hand - of more individualized interventions, and - on the other hand - of better exploiting personal students’ attitudes to improve group performances.

**DISCUSSION AND CONCLUSION**

In this contribution we have focused on online collaborative learning environments and have tackled the issue of how it is possible to make this kind of environment flexible and adaptive to the learners’ needs and profiles.

This can be done by monitoring the learning process, so as to keep group and individual reactions to the proposed activities under control; in particular, starting from the collaborative techniques used to enhance collaboration and interactions among students, it is advisable to monitor the participative, the social, the cognitive and the teaching dimensions, as they are developed by single students and groups, so as to take adequate measures when the techniques do not convey the expected results and in order to individualize the next actions.

This chapter mainly assumes a methodological perspective and provides examples of how these dimensions (and the related indicators, as they have been defined in the proposed model) can be used, with the final aim of better customizing the collaborative activities on the basis of what emerges from the enactment of the techniques.

Nonetheless, overall there is a lack of research effort devoted to the integration of individual differences in the learning design of online collaborative learning experiences and further work should be done to bridge this gap. Even the model proposed here suffers from a number of shortcomings, mainly due to the fact that gathering data is not always so easy.
For example, as far as the quantitative data are concerned, it is true that the most recent CMC systems provide functionalities aimed at tracking the learning process and in some cases - where adequately configured – systems can elaborate data and alert tutors and/or students when the actual performance does not match with the expected one. Nonetheless, the possibility to automatically gather and elaborate quantitative data from CMC systems, should not be taken for granted, due to the fact that at the moment there are no standards for these kinds of systems and this causes differences in the kind of data available. Besides, if some sort of automation is possible for quantitative data, it is evident that, as for the content analysis of messages, this cannot be done automatically (at least not completely) and this makes the overall monitoring process strictly dependent on human intervention.

Despite these weaknesses which certainly call for further investigations in the field, the affordances opened by monitoring a web-based collaborative learning process through a mixed and flexible approach and the consequent possibility to adapt at run time the learning process itself according to the emerging individual differences, are worth studying.

Moreover, while in this contribution we have mainly mentioned the affordances provided to the tutor, who may tune her/his actions according to the monitoring results (i.e. in an effort to individualize his/her interventions and the following activities), we should not forget the possibilities opened by presenting the same results directly to learners, who may thus increase the level of awareness of their performance, thus improving their ability of self-managing and self-regulating the learning process. This last consideration poses further challenges to the researchers in the field, by highlighting the possibility of bridging the gap between the two fields of personalization and CSCL, which still seems to be so distant.

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Current developments in technology-assisted education 1 (pp. 703-709). FORMATEX.


http://gsic.tel.uva.es/~dherleo/cfp/pyramid-en/

ICALTS (Interaction and Collaboration AnaLysis supporting Teachers and Students Self-regulation) is a Jointly Executed Integrated Research Project of the Kaleidoscope Network of Excellence, website at http://www.rhodes.aegean.gr/ltee/kaleidoscope-icalts/

In 2005 the system used was FirstClass™ Centrinity, while in 2007 Moodle was adopted.

It is worthwhile noting that there are differences as far as the kind of data concerning reactive participation and continuity made available by the two CMC systems (namely First Class and Moodle).

For an exhaustive debate on the unit of analysis see (De Wever et al., 2006). “One of the issues under discussion is the choice of the unit of analysis to perform content analysis. Researchers can consider each individual sentence as a single unit of analysis (Fahy et al., 2001). A second option is to identify a consistent “theme” or “idea” (unit of meaning) in a message and to approach this as the unit of analysis (Henri, 1992). A third option is to take the complete message a student posts at a certain moment in the discussion as the unit of analysis (Gunawardena et al., 1997; Rourke et al., 2001)” (De Wever et al., 2006, p. 9).

Occurrences are calculated on the basis of the “units of meanings” attributed by the coder to the corresponding indicator. Each unit of meaning could be assigned one indicator only.

ENDNOTES

1 http://www.imsglobal.org/learningdesign/
2 This collaborative technique in literature is also referred to as Pyramid (see for example
3 ICALTS (Interaction and Collaboration AnaLysis supporting Teachers and Students Self-regulation) is a Jointly Executed Integrated Research Project of the Kaleidoscope Network of Excellence, website at http://www.rhodes.aegean.gr/ltee/kaleidoscope-icalts/
4 In 2005 the system used was FirstClass™ Centrinity, while in 2007 Moodle was adopted.
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6 For an exhaustive debate on the unit of analysis see (De Wever et al., 2006). “One of the issues under discussion is the choice of the unit of analysis to perform content analysis. Researchers can consider each individual sentence as a single unit of analysis (Fahy et al., 2001). A second option is to identify a consistent “theme” or “idea” (unit of meaning) in a message and to approach this as the unit of analysis (Henri, 1992). A third option is to take the complete message a student posts at a certain moment in the discussion as the unit of analysis (Gunawardena et al., 1997; Rourke et al., 2001)” (De Wever et al., 2006, p. 9).
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