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## CMC environments supporting self-regulated learning

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This paper focuses on the relationship between online collaborative environments and the development of Self-Regulated Learning (SRL) abilities. To investigate the support provided to SRL by Technology Enhanced Learning Environments (TELE), the TELEPEERS European Project has developed an evaluation tool whose structure derives from previous research on SRL. This tool was employed to analyse an online course for trainee teachers based on a configuration of a commercial Computer Mediated Communication (CMC) system. From this experience, some general conclusions are drawn concerning how Computer Supported Collaborative Learning can favour the development of SRL abilities.

**Keywords** Self-Regulated Learning, Computer Supported Collaborative Learning, Computer-Mediated Communication, Technology Enhanced Learning Environments

Developing students' self-regulatory skills in addition to teaching them content knowledge is currently considered one of the major goals of education. The reason for this is that Self-Regulation skills support lifelong learning by making people independent learners and by favouring the transfer of knowledge and methods to different learning situations.

Self-Regulated Learning (SRL) can be described as a goal-oriented process of active knowledge construction, involving the interaction of an individual's cognitive, motivational, emotional, social and volitional resources. According to Zimmerman [10], the self regulation process develops during three phases that take place repeatedly during learning, i.e., forethought or planning, performance or execution, and evaluation.

Developing SRL abilities is a complex task, which depends on many factors. The literature underlines the importance of creating and structuring favourable learning environments which offer opportunities to control the essential dimensions of learning [7], as well as opportunities for feedback [5], reflection and revision [9].

Several studies argue that self-regulating strategies are linked to positive emotions and have a self-maintenance function. Negative emotions, such as anxiety, fear, irritation, shame and guilt, on the other hand, hinder learning, because they temporarily narrow the scope of attention, cognition and action. Negative emotions are associated with self-control, rather than self-regulation [2].

Research also indicates that students who lack self-regulation skills often achieve insufficient academic results, and may also have behavioural problems and difficulties in social relations, both in expressing their thoughts and feelings and in attempting to understand those of others [8].

Among others, Boekaerts et al. [1] argue that a lack of social learning experiences is the first important source of self-regulatory dysfunction. Hence, it seems important that students experience collaborative learning, and that this explicitly aims to develop SRL abilities. As a consequence, online courses based on collaborative learning should be designed with an eye on the development of self-regulation abilities which are peculiar to this approach.

This paper focuses on the relationship between online collaborative environments and the development of SRL abilities. In particular, this study is based on work carried out by the authors in the TELEPEERS European project, where an evaluation tool, called Peer Review Evaluation

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Tool (PRET), has been developed to analyse the support to SRL provided by different kinds of Technology Enhanced Learning Environments (TELEs) [4]. Within TELEPEERS, a series of TELEs were analyzed and peer reviewed by experts to assess how far those environments could support cognitive, social, emotional and motivational aspects of SRL. In particular, the PRET was used to analyse an online course based on a special configuration of a commercial Computer Mediated Communication (CMC) platform. Based on this work, we identify and discuss the features of CMC-based learning environments that support the development of SRL abilities.

## 2. Analysing the SRL potentialities of a CMC environment

### 2.1 The evaluation tool

The PRET is an evaluation tool, in form of questionnaire, developed to help teachers and trainers investigate *a priori* (i.e. before use) the potential of a Technology-Enhanced Learning Environment to support students in SRL.

By the term TELE we mean any learning environment that makes use of ICT tools, along with other components, whose presence and form depend on the teaching methodology and learning situation at hand. Hence, a TELE may consist in a stand-alone multimedia system, used by a student for self-instruction, or in a course (be it online or not), including the whole learning environment needed to run it. In addition to these two extremes, the term TELE includes any other possibility between them.

The PRET<sup>2</sup> was developed through an extensive bibliographical research on SRL and its structure reflects a widely acknowledged model [10] that distinguishes among the main components of the learning process, that is planning, execution and monitoring, and evaluation, and the relevant aspects of SRL: cognitive, emotional, motivational and social aspects. The PRET does not include volition, mentioned in the literature as a relevant aspect of SRL [3], because this aspect seems to be exclusively personal aspect. Emotion and motivation, on the other hand, are addressed in separate sections since, though they may appear similar, they have distinctive features: motivation is related to student's objectives, while emotion is related to non-rational reactions to events. The evaluation tool was conceived as a general purpose one, that is, it is suitable for analysing any kind of TELE. To this end, it contains items related to a variety of aspects that contribute to the TELE learning impact, such as general layout and materials presentation; functional architecture; kind of activities and communication allowed; presence of feedback and assessment tools; etc. When applying it, the user is requested to: fill in general information on the considered TELE; rate on a six-point scale to what extent the TELE supports the abilities described in 43 statements (e.g. "The TELE records a history of activities"); summarize the evaluation scores for the different SRL aspects and learning phases considered.

### 2.2 A case-study

The TELE analysed is TD-SSIS, an online course for trainee teachers based on an ad-hoc configuration of Centrinity First Class<sup>3</sup>, a commercial CMC system. TD-SSIS is part of the Specialisation School for Secondary Teaching of the University of Genoa (Italy) and it deals with basic concepts of Educational Technology. Its main objectives include the development of instructional design competence, with focus on evaluation and selection of learning strategies and

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<sup>2</sup> It can be downloaded for free, for study and research purpose, from the web site <http://www.lmi.ub.es/taconet/>

<sup>3</sup> <http://www.firstclass.com/>

techniques. Through an experiential approach, trainee teachers are lead to become aware of potential and pitfalls of educational technology implementation in the school setting.

The approach adopted in the course is inspired by socio-constructivist theories of learning and is therefore heavily based on collaborative learning activities. This theoretical framework obviously influenced the choice of both the software platform used and the configuration worked out. The course included discussion and collaboration among peers to develop shared understanding and meanings. Some of the activities were purely reflective, others aimed to produce artefacts such as small project works. The course was not designed bearing in mind the development of SRL abilities; nevertheless, course tutors tried to foster meta-reflection and method appropriation.

The results of the evaluation of TD-SSIS through the PRET suggest that the course supports self-regulated learning to a medium-to-high degree, offering its best on the social level, showing its weakest aspect on the cognitive level, and leaving the cognitive and emotional levels heavily depend on the use made by the agents involved into the learning process (teacher, tutors and students). The explicitness of SRL support resulted to be just average.

This evaluation experience turned out to be very interesting, since it made us gain new insight on the development of SRL within CMC environments, calling our attention on some elements that we had under-evaluated before. Such deep analysis led us to work out some general considerations on the support of SRL of CMC environments, that we describe below, in the hope that they can turn out useful to educators and researches working in this field.

### **3. Considerations on the support to SRL of CMC environments**

The analysis carried out and our experience with CMC environments suggest that most of the environment's features that determined the evaluation results are not peculiarities of the particular software platform used but they are common to most CMC environments. The choice of one or the other platform may, hence, be performed by teachers interested in making an experience with SRL similar to our on the basis of exceptions and specificities related with their course requirements, simply by paying attention to the general considerations presented below.

In our opinion, SRL potentialities should be studied at two different levels, that is, the platform level and the whole environment provided by course designers (including both the configuration prepared and its use in the course). It might seem that the platform itself, being a container to be filled by course designers and teachers, is rather neutral as concerns support to SRL. This is not the case, since the fact of using a platform partially influences the course design, by determining what kind of materials can be made available and providing a way to organize and present it.

#### **3.1 Support to SRL of CMC platforms**

CMC platforms usually provide collaborative tools only, and hence they seem to support the social aspects of SRL only. The support to the cognitive, motivational and emotional aspects, in our opinion, should not be considered lacking but rather indirect, since these platforms provide the possibility to work out configurations able to support SRL also in these respects. It is therefore important that course designers and tutors become aware of such potentialities, in order not to miss the opportunity to exploit them while creating their configurations.

In particular, in order to offer SRL potential, CMC platforms should provide the following features:

- Presence of an easy and intuitive interface, so as to avoid the cognitive overload for the students to spend more attention on the use of the software than on concentrating on learning itself.

- Possibility to control and personalize the environment's organization, so as to help the users to avoid confusion and to become more aware of their own thoughts, learning style and current needs. This may ease the phase of cognitive planning.
- Possibility to partially personalize also the content of the working space, by adding comments and evaluations to the materials posted by tutors and peers, as well as annotations on the calendar and files with personal notes. This may have a positive influence both on the cognitive and at the motivational level.
- Possibility to set up both public and private communication streams, so as to foster the development of personal initiative. Apart from the obvious advantage on the social level, allowing the communication and collaboration among peers, this facility can also have a positive influence on the emotional level.
- Availability of a history function (tracking all events related to a specific file or message, such as date of origin and author, readers, etc), which support evaluation and self-evaluation;
- Availability of materials and tools for self- and peer- assessment; this may have a positive influence on the monitoring and evaluation phases of learning.
- Possibility of exchanging multi-media material, not only texts, with obvious influence on the cognitive level.
- Availability of document sharing tools, so as to improve the possibility to take advantage of group work.
- Availability of a methodological help, so as to make the support to SRL more explicit, in particular as concerns the meta-cognitive aspects.
- Availability of automatic functions, reminding students to undertake appropriate actions when necessary (such as answering a personal mail, participating in discussions, etc). Such automatic reminder should be possibly switched on or off by the students, as they wish.

### 3.2 Support to SRL of CMC configurations

The *ad hoc* configuration of learning environments usually increases to the support provided by the platform, by adding the potentialities that can derive from the presence of a learning material and of activities on it. To this end, however, it is necessary that materials and activities are cognitively well structured, fully exploiting the potentialities of the platform. If the configuration is not worked out carefully, it may happen that some aspects of the support to SRL actually decrease instead of increasing; this is the case, for instance, of a platform allowing the sharing of multimedia files which is used within a configuration that offers only textual materials. Analogously, tutors should explicitly invite their students to exploit the potentialities of platforms which are directly at their disposal, like, for instance, making use of the calendar for planning their personal activity, along with the shared use for the classroom deadlines.

It should be noted that exploiting the virtual presence of peers and tutors may compensate for the cognitive, motivational and emotional aspects that the platform alone supports potentially but not directly.

A configuration may more or less succeed in exploiting the SRL potential of a CMC platform, depending mainly on three factors:

- the didactical project and instructional design;
- the type and amount of scaffolding given by tutors;
- the context of use (which includes both tutors and peers).

The context of use appears particularly delicate, since it depends not only on course designers and tutors, but also on all students, and this aspect is obviously difficult to control. On the other

hand, this aspect is extremely important, since the emotional and motivational components of SRL depend heavily on it.

In our opinion, a good way to sensitize tutors and students on the importance of all aspect of SRL would be to explicitly include SRL abilities among institutional aims, along with the learning of content knowledge. It would also be important to make the students aware that: 1) SRL is a very important ability for them to acquire; 2) SRL acquisition requires awareness and commitment on their part, not only on the cognitive and social level, but also on the emotional and motivational one. In this respect, we could perhaps introduce the terms meta-emotional and meta-motivational abilities, by analogy with the well known meta-cognitive one.

In conclusion, fostering SRL within a CMC environment requires competence in a variety of aspects, as well as an explicit commitment on the part of all subjects involved. Without such competence and commitment, SRL development would take place in a marginal fashion, and, what's more, it would be very likelihood that only those students who already have SRL abilities would be in a condition to learn effectively in such an environment.

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