Supporting Teachers’ SRL in a Collaborative Environment for Sharing Learning Objects

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Abstract This paper analyses the potential to support the development of self-regulated learning (SRL) abilities offered by a collaborative environment for teachers sharing learning objects (LOs). SRL consists in a set of cross-curricular abilities which allow learners to make the most of their learning by controlling the aspects involved in it. The collaborative environment considered is based on our pedagogical conception of LOs, which includes teachers’ methodology and experience, so as to model the evolving nature of educational materials and turn the re-use of LOs into a learning occasion for teachers. Within such a view, supporting SRL becomes an essential feature for our collaborative environment. This analysis allowed us to spot strengths and weaknesses of the environment as concerns SRL, and to devise some changes that could improve teachers’ learning experiences within it.

1 Introduction

Learning Objects (LOs) are chunks of self-consistent educational materials viewed as instructional components apt to be used in a variety of contexts [11]. They have been receiving increasing attention in education in the past several years; much effort has been devoted to define standards for constructing, organizing and cataloguing them as concerns content, educational objectives, technical features, etc. [1, 9]. Repositories of LOs constitute specialised digital libraries where high quality re-usable materials can be found. They are considered valid tools to exploit the potentialities of Internet for education and training, since they allow teachers to share materials and experiences on a wide basis [1].

In order for repositories to be used as tools to diffuse innovation, however, they need to be conceived as learning environments for teachers, where valuable pedagogical ideas are produced during re-use, as a result of the experience gained by the community of teachers (both producers and users) who deal with it. To this aim, we considered the concept of Learning Object from the point of view of teachers, highlighting the differences with respect to a technological approach [5], as explained in the next section. We also designed and implemented a prototype of collaborative environment explicitly addressed to teachers willing to share their didactical materials...
as well as their methodology and experience of use, so as to build together a wider competence on educational processes.

An environment of this kind gives rise to a community of peers learning autonomously from each other and with each other, and hence should support the development of abilities of Self-Regulated Learning (SRL) in order to result actually fruitful. SRL [12] consists in a set of cross-curricular abilities, skills and attitudes which allow people to take most advantage from their learning activities and helps enhancing and facilitating future learning in different fields.

To this end, we analysed the prototype of our environment by means of an evaluation tool for TELEs (Technology Enhanced Learning Environments) developed within a European project. This lead us to spot strengths and weaknesses of our environment as concerns SRL and to plan for some changes aiming to make learning experiences with it more likely effective for its users. This paper describes the main characteristics of the mentioned LO-oriented collaboration environment and the outcomes of this evaluation, as well as the understanding that we gained from it.

2...An educational view of re-use

The idea of ‘re-use’ is not new in education, where its conception is rather different than the technological meaning of this term. From a technological point of view, the term “re-use” indicates a uni-directional process, implicitly assuming a static view of the object to be re-used, and referring to it as a final product. By such a view, re-use does not result into a learning experience for a teacher. From an educational point of view, on the other hand, re-use refers not only to material to be employed in the classroom or to indications on the activities necessary to reach some learning objective. It involves also, and mainly, the experience gained by the teacher-producer who uses some material over the time. Focusing on experience of use gives the educational material a dynamic nature, viewing it as something constantly in evolution. This evolution actually constitutes for the teachers a further learning object.

Fruitful re-use of some material, moreover, often leads to the re-elaboration of the initial view of the material itself, due to the interaction between the user and the material. Thus, reusing constitutes a transfer process, to which both user and producer should take part actively.

The above considerations lead us to see the re-use process as a constructive activity, able to induce teachers’ learning [5]. For this sake, we worked out a view of how learning objects should be conceived in order to support pedagogical innovation.

Different kinds of pedagogical knowledge are involved in the re-use process:
1. The initial intentions, which led the producer to developing some educational material, together with hints to guide prospective users in practical applications. This knowledge should be organised so as to lead the user to reflect on their own educational view, to make comparisons, to find analogies and differences.
2. The producer’s experience with the material, which includes the intention of the proposer and the motivation for possible modifications of the initial proposal.
3. The experience deriving from the re-use of the product by other teachers. It includes the pedagogical intentions in the re-use and, if available, information
about possible new material derived from the initial one. Such new material constitutes a pedagogical version of the initial proposal defined by a re-user. This educational conception of re-use is summarized in Fig. 1. With this approach, the different views of an object which emerge from its re-use form a new learning object and constitute a learning occasion for the teachers.

![Figure 1. The re-use process from the teacher's point of view](image)

Thus, we think that two different types of learning materials should be considered:

- The first one includes the materials initially posted by the producers in the repository, and a number of ‘pedagogical versions’ of them, produced by the community of teachers as a result of the re-use process.
- The second one includes the comments created by the community of teachers during re-use. These comments can include a description of the use outcomes, give indications for its application or modification, and so on.

In order to put teachers in condition to exploit the synergy of working on the same educational material with colleagues having different points of view, relations among objects and comments should made explicit and highlighted. The association between an object and its comments constitutes a new, abstract learning object.

### 3. A collaborative environment oriented to Learning Objects

LODE (Learning Object Development Environment) is a platform to support the work on LOs of a community of teachers addressing the task of sharing and re-using educational materials as a formative experience and as an occasion of professional growth. LODE is designed based on our conceptual approach to the re-use of LOs described in the previous section. It is currently under implementation by suitably adapting the Open Source web-based Learning Content Management System (LCMS) Atutor (http://www.atutor.ca/). The platform is available in Italian and in English.

LODE’s main characteristics, with respect to the various platforms currently in use for collaborative work, is that it is specifically oriented to working with LOs. Hence,
not only does it offer the possibility of communicating in various ways and sharing files, but also it allows the users to define pedagogical connections among objects, enriching them with the knowledge deriving from users’ experience and reflection on possible different transformations and applications of an initial proposal.

In particular, users are allowed to include comments to the LOs recorded in the environment, such as outcomes of experimenting them, proposals for pedagogical changes, and so on. Moreover, they can define pedagogical connections among objects (see Figure 2). Different types of connections among objects can be specified. At present, we include four pedagogical categories:

- **derives from**, which means that the object, possibly apparently different from the linked one, was built by including some aspects of it, transformed by the adoption of a different pedagogical approach;
- **substitutes**, which means that the object was built, by a different author, starting from a previous one, by taking into account different pedagogical needs determined by a different context of application (as for example the age of the students or their level of knowledge and cognitive development) which required changes in the way to present the material;
- **includes**, which means that the object at hand partly captures the included one, filtered by the point of view of a different author;
- **complementary to**, which means that the new object produced avails itself of the complemented one, for example by referring to it for further deepening, or by offering a deepening view of some aspects of the initial one.

Based on the outcomes of a preliminary study of teachers’ conceptions on learning objects we carried out with 120 pre-service teachers [4], we think that this set of relation between LOs is minimal, but meaningful and sufficient to express the kinds of relations that teachers are more inclined to exploit in their work.

Thanks to the comments and connections, teachers accessing an object can easily access also the experience of the peers who have worked with that object.

Fig.2. The initial page of a LO in LODE. The lines under the title shows the connections with other LOs; the menu on the left lists the available comments on this LO.
4. Evaluating the support to Self-Regulated Learning

4.1 What is self-regulated learning

Self-regulated learning is being considered with increasing attention in the literature because of its positive impact not only on school results, but also on social behaviour and on the ability to tackle autonomously different application contexts [3, 12]. Among the many authors working on this topic, there is general agreement that it depends on a compound set of aspects, including not only cognition (what school systems are currently mostly focused on), but also social behaviour, motivation, emotions [14]. According to Zimmerman [13], self regulation involves three phases (forethought, performance, and evaluation) that take place repeatedly during learning. In order to support SRL development, the literature underlines the importance of creating and structuring favourable learning environments offering opportunities for feedback, reflection and revision.

4.2 The evaluation tool

In order to analyse the SRL potential of the considered TELE, we used as evaluation tool the PRET, a kind of questionnaire developed within the European project TELEPEERS, aiming to evaluate the support to SRL granted by Technology-Enhanced Learning Environments (TELEs).

This evaluation tool turns out most useful if applied a priori in that it helps one to analyse the potentialities of a TELE before its use, so as to highlight what is the potential support to SRL of a chosen software tool together with its planned configuration and use. This allows one to possibly decide to use a different platform or to make some adjustment to the configuration and methodology of use, if the results of the analysis are not satisfactory, so to increase the possibility of success of the planned learning experience. It does not interfere in any way with a TELE’s content, and only aims to guide the evaluator to focus more precisely on the aspects of a TELE that can favour of hinder the development of SRL abilities; it can help teachers, hence, to build an overall idea of the "learnability" of environments.

The PRET was developed through an extensive bibliographical research on SRL. It includes: general information on the TELE; a set of 43 statements on features or possibilities of use of the TELE; a section of summarizing questions. For each statement, the user must select a number between 0 and 5, expressing how much the described property is present in the considered TELE. The 43 statements include items related to a variety of aspects that contribute to the impact of the TELE, such as: general layout and materials presentation; functional architecture; kind of activities and communication allowed; presence of feedback and assessment tools; etc. As an example, the first statements are shown in Fig. 3.

The statements are organized so as to reflect the widely accepted theoretical model of SRL [13] that distinguishes among the main components of the learning process, that is, planning, execution+monitoring, and evaluation. Within each of the mentioned learning phases, the relevant aspects of SRL are highlighted, that is, cognitive, emotional, motivational and social aspects.
Planning

Cognitive aspects

This question refers to the possibility for the student to easily get an overall idea of the content of the TELE.

1. **The TELE helps the learner to structure the learning content.**
   - Not supported 0 1 2 3 4 5 well supported

2. **The TELE has an easy and intuitive interface.**
   - Not supported 0 1 2 3 4 5 well supported

A history shows information such as who has created or edited a file or feature, who has read or used it, etc.

3. **The TELE records a history of learner activities.**
   - Not supported 0 1 2 3 4 5 well supported

**Fig. 3.** A small portion of the evaluation questionnaire

This evaluation tool is general-purpose, hence suitable for any kind of TELE. It may happen, though, that some statements are not applicable to some TELEs or need to be interpreted in the context at hand. In the considered case, for instance, since the users of the considered TELE are all peers, the statements making reference to the teacher are not applicable or must be interpreted in terms of “manager of the environment” or “initial LO producer”.

This evaluation tool can be downloaded for free, for study and research purpose, from the web site [http://www.lmi.ub.es/taconet/](http://www.lmi.ub.es/taconet/). As far as we know, this is currently the only available tool to evaluate SRL support within TELEs.

5. **Outcome of the evaluation**

We analysed from the point of view of SRL a prototype implementation of LODE, as being used by a learning community of teachers, all actively contributing to the construction of a repository of educational material. In this case, the learning consists in teacher’s becoming able to effectively share educational materials and experiences of use, so as to support each other’s professional growth. The detailed analysis is described in an internal report [8].

From the performed analysis, our TELE resulted to support SRL to a medium degree, offering its best on the planning phase of learning, showing its weakest side on the evaluation phase and remaining on an average level in the execution and monitoring phase.

As concerns the different aspects that contribute to SRL, the maximum support was found on the social one; this was quite expectable since the TELE is addressed to a learning community. Motivational aspects appeared to be well supported as well, due to the clear and straightforward organization of the software platform, and the
facilities to give and receive feedback and help from the members of the learning community.

The cognitive aspects resulted just average; these are supported by the freedom of movement the user has in this environment, as well as by the articulated interconnections among the materials; the weakness of this aspect is determined by the lack of explicit tools to support self-reflection, self-monitoring and self-evaluation. Such activities, though, are not completely missing, but are indirectly supported by the fact that comments do include, and stimulate, reflections; also the need to suitably formulate one’s comments on peer materials obviously leads contributors to reflect on their own work, as well as to give feedback to the work of others.

The emotional aspects resulted the weakest ones since the environment did not include explicit mechanisms to help the users cope with the challenges of the task, nor provides feedback to the work done leading to appropriate self-efficacy beliefs [2]. This aspect did not result completely missing, however, but again indirect and implicit, since it relies mostly on the possibility of interaction with peer users through the fora and personal communication.

It is evident from the above observations that the main limitations to the support to SRL granted by our environment derives from several aspects being covered only implicitly. This has led us to design some improvements of the facilities of LODE, in order to offer explicit tools to support reflection and feedback and make them less dependent on the initiative of the single users. In particular, we decided to add: more search facilities, so as to visualize more easily, in different ways, one’s own production and that of selected colleagues; possibility to search on the comments by keywords, not only on the LOs; links to the comments also from the LOs’ directory; a section of FAQ; a methodological help, aiming, among other, to remind teachers that developing SRL abilities is a great help for them to carry out successfully this kind or learning experience, but requires on their part awareness and commitment; several fora devoted to requests of help of different kinds, from simple information to searching collaborators interested in re-elaborating some LOs based on precise objectives.

This analysis from the point of view of SRL of the environment based on the LODE prototype has globally resulted rather stimulating and fruitful, since it actually lead us to improve the realization of our collaborative environment, beyond what had already been done by means of a careful conceptual design as well as on our experience on LOs [4-7] and education.

The LODE environment is currently being refined following the suggestions emerged by this study. We are planning to experiment it in a teacher training course during the next academic year.

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