An analysis of the SRL potential of a Technology Enhanced Learning Environment based on the collaborative environment LODE (Learning Objects Discussion Environment)

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The evaluation tool is freely downloadable from the web site http://www.lmi.ub.es/taconet/.

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Introduction

LODE (Learning Object Development Environment) is a platform to support the work on Learning Objects (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 a conceptual approach\(^1\) to the re-use of LOs which includes into repositories not only educational material but also teachers’ methodology and experiences, so as to turn the re-use of LOs into a moment of learning and professional growth for teachers.

LODE 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 below). Different types of connections among objects can be specified. At present, we include four pedagogical categories:

1) *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;  
2) *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;  
3) *includes*, which means that the object at hand partly captures the included one, filtered by the point of view of a different author;  
4) *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, we think that this set of relations 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.

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In order to analyse the SRL potential of the considered NLE, we used as evaluation tool a questionnaire developed within the European project TELEPEERS, aiming to evaluate, a priori, the support to SRL granted by Technology-Enhanced Learning Environments (TELEs). This evaluation tool is freely downloadable from the web site http://www.lmi.ub.es/taconet/.

This study represents one of the transfer case-studies carried out by ITD-CNR, to analyse if the considered evaluation tool, which was initially developed within the context of education at university level could result a valid evaluation tool also within other educational contexts. The interest of this transfer case study consists in being focused on a learning community completely formed by peers, without a presence that could be assimilated to a tutor or teacher. The results of this analysis turned out to be very satisfactory, both as concerns the support given to SRL development by the considered TELE, and as concerns the possibility to fruitfully applying the considered evaluation tool to a case of a community of learning of working professionals.

The outcomes of this evaluation have been presented in the paper “Supporting Teachers’ SRL in a Collaborative Environment for Sharing Learning Objects”, by G. Dettori, P. Forcheri and T. Giannetti, accepted at the Workshop on “eLearning and Human-Computer Interaction: Exploring the Design Synergies for more Effective Learning Experiences” within the Tenth IFIP TC13 International Conference on Human-Computer Interaction – INTERACT 2005 (Rome, Italy, September 2005). This report contains the details of the evaluation made, together with some final considerations on what are, in out opinion, strengths and weaknesses of the considered TELE as concerns the development of SRL abilities.
Part A: Technical description of TELE

| Name and short description of TELE | Collaborative software platform LODE (Learning Object Discussion Environment), analysed 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. |
| Institution where it is in use | It will be in use in the Course Multimedia for education of the Teacher Training School of Genoa University |
| Objective of TELE | Promote sharing and development of pedagogical ideas and educational materials by means of collaborative reflection on existing materials and on their possible interactions and experimentation for the sake of learning. |
| Educational model | Community of practice |
| Mode of delivery | On-line |
| Platform | | (please mark with X the appropriate item) |
| | No platform used |
| | Commercial platform used |
| | Proprietary platform used |
| | Open source platform X (ad hoc implementation based on an open-source platform) |
| Places of learning | Anywhere a computer with internet connection is available |
| Context | Teacher community |
| Level of interactivity | | (please mark with X the appropriate item) |
| | No interactivity |
| | Interactivity with TELE X |
| | Interactivity with tutor |
| | Interactivity with peers X |
| Technical requirements | Operating system (server/client) server: windows/unix; client: any |
| | Hard disk space required: standard |
| | Display resolution, colour depth: standard |
| | Hard ware components (working memory, processor, sound card, graphics card): standard |
| | External devices: none |
| | Connectivity (e.g. type of browser, band width) standard |
| Importance of technology for TELE | (please mark with X the appropriate level) |
| | Low importance 0 1 2 3 4 5 High importance |
## Accompanying documentation

*(please mark with X the appropriate item)*

- User’s handbook (printed or in electronic form) for teachers
- User’s handbook (printed or in electronic form) for students
- Tutorial Guidelines
- **Help function X**

## Transferability (Portability)

- **Costs** - *No Cost*
- **Language**  *English/Italian*
- **Legal aspects**  *Licence Open Source*
- Technical aspects (see technical requirements)
- Limitations in using TELE

## Name and institution of person who filled in the PRET

*(Please write your name or initials, and a short sentence which characterizes you, e.g. “High-school Teacher in mathematics, Italy)*

PF, IMATI CNR (Italy), researcher in Applied Mathematics and Information Technology, with wide experience in teacher education; designer of LODE, in collaboration with GD and TG, researchers in Educational Technologies
Part B: Detailed evaluation of support for self-regulated learning

(1) Planning

Cognitive aspects

1. The TELE helps the learner to structure the learning content.
   Not supported 0 1 2 3 4 5 well supported
   A positive aspect is the visualization in the same page of objective content, subjective opinions, subjective links, and possibility to make searches based on different points of view. It is necessary to improve the presentation of the links among objects.

2. The TELE has an easy and intuitive interface.
   Not supported 0 1 2 3 4 5 well supported
   The functions and kinds of content are easy to be detected. It is easy to put into relation the different kinds of content.

3. The TELE records a history of learner activities.
   Not supported 0 1 2 3 4 5 well supported
   Only some information is available (it is possible to see who has posted a document and when, but there is no information on who read it); it is necessary to add a history of the activity of each single user, accessible just to the user him/herself.

4. The TELE allows the student to plan her/his learning with the help of activity plans, personal development plans, progress reports etc.
   Not supported 0 1 2 3 4 5 well supported
   This is supported indirectly, by allowing one to make articulated queries on personal work.

5. The TELE provides the student with the opportunity to choose between different modules.
   Not supported 0 1 2 3 4 5 well supported
   The user is completely free to proceed as he/she prefers

6. The TELE provides the student with the opportunity to choose between different learning paths.
   Not supported 0 1 2 3 4 5 well supported
   The user is completely free to proceed as he/she prefers

7. The TELE provides the student with the opportunity to choose between different modes of delivery.
   Not supported 0 1 2 3 4 5 well supported Not applicable

Motivational aspects

8. The TELE is likely to arouse the learner’s interest.
   Not supported 0 1 2 3 4 5 well supported
The interest for the platform content is increased by giving the user a concrete possibility to interact with the content and to reflect on how the other users proceed in this task.

9  The TELE allows each student to partially personalize the interface used in the environment.
Not supported 0 1 2 3 4 5 well supported

It is possible to display directories by author, or by date, or by subject

10  The TELE eases the student’s becoming aware of personal learning goals.
Not supported 0 1 2 3 4 5 well supported

This is done by means of queries on metadata

11  The TELE helps the learner plan her/his activities by pointing out to her/him external resources (websites, help options) available.
Not supported 0 1 2 3 4 5 well supported

External resources may be mentioned in the comments.

12  The TELE reminds the learner of her/his own knowledge and skills relevant to the task at hand.
Not supported 0 1 2 3 4 5 well supported

The TELE allows the user to visualize all work he/she has done (indirect help)

13  The TELE sensitises the learner with respect to how problems might be solved.
Not supported 0 1 2 3 4 5 well supported
By showing the work done by others.

This is done by showing the work done by others

14  There are explicit mechanisms in the TELE to encourage the learner to tackle tasks.
Not supported 0 1 2 3 4 5 well supported

Authors are notified of new comments on their work; notifications are sent also to the authors of other comments on the same object.

15  There are implicit mechanisms in the TELE to encourage the learner to tackle tasks.
Not supported 0 1 2 3 4 5 well supported

Discussion lists may work in this sense.

Emotional aspects

16  The TELE helps the learner to cope with the challenges of the task.
Not supported 0 1 2 3 4 5 well supported

This is due to the possibility to exchange messages with the other users.

17  The TELE may be adapted to reach a congruence between the learner’s level of competence and the level of difficulty of the task.
The number of comments associated to each LO in the directories allows the user to chose a LO more or less worked out by colleagues, according to his/her competence.

18  The TELE is organised in such a way that the learner is likely to enjoy working in it.
Not supported 0 1 2 3 4 5 well supported

Comments can be of different kinds (texts but also movies and pictures) or lengths; there are different kinds of fora, including also the possibility to search for collaborators on particular tasks (posting board).

Social aspects

19  The TELE offers the possibility to set up both public and private communication.
Not supported 0 1 2 3 4 5 well supported

Yes

20  The TELE provides the learner with the opportunity to negotiate with her/his tutor/instructor how to organise her/his work.
Not supported 0 1 2 3 4 5 well supported not applicable

21  The TELE allows the learner to work together / communicate with her/his peers.
Not supported 0 1 2 3 4 5 well supported

Yes.

(2) Executing and monitoring

Cognitive aspects

22  The TELE allows the user to make decisions on how to proceed.
Not supported 0 1 2 3 4 5 well supported

There is no predefined way to work, the user must always make decisions on how to pro

23  The TELE leads the learner to reflect on her/his own problem solving activities.
Not supported 0 1 2 3 4 5 well supported

There are no explicit support for personal reflection, if not through discussion with peers in the forums. Indirect support is provided by means of reviews, comments, links and search functions.

24  The TELE provides the user with the possibility to find out to what extent she/he is achieving her/his learning goals.
Not supported 0 1 2 3 4 5 well supported

There are no explicit evaluation tools. Indirect support is given by the comments of others and by the possibility to find all one’s work.
The TELE allows the learner to switch to another learning strategy if necessary.

The learner is free to proceed as s/he desires, reading, commenting, modifying or communicating through the forums.

**Motivational aspects**

The TELE helps the learner to maintain her/his motivation.

The user can receive feedback from the peers and ask for help; the system’s organization is very clear and straightforward.

The TELE provides help facilities that aim at strengthening the learner’s perseverance in case of failure.

There are several fora to ask for help. It would be advisable to organize two different kinds of help, technical and methodological, and to add some FAQs

**Emotional aspects**

The TELE provides the user with formative feedback that facilitates the maintenance of a positive working attitude.

Some feedback can be provided by the other users, but this function is not explicitly provided.

The TELE provides the user with formative feedback that intervenes at critical points in the learning cycle in order to restore a positive working attitude.

Same as above.

**Social aspects**

The TELE allows the user to contact and receive help from her/his tutor/instructor.

The “teacher” in this case should be considered the system manager or the initiator of a LO.

The TELE provides the user with the opportunity to communicate with her/his peers in order to exchange ideas or to ask for help.

Yes.

The TELE provides the user with possibilities to collaborate with her/his peers.

Yes.
(3) Evaluation

### Cognitive aspects

33. *The TELE helps the user to reflect on her/his learning progress.*
   - Not supported: 0, 1, 2, 3, 4, 5
   - Well supported
   - Only indirectly, by comparing one’s work with that of the peers.

34. *The TELE encourages the learner to compare her/his present state with the state she/he wanted to be in.*
   - Not supported: 0, 1, 2, 3, 4, 5
   - Well supported
   - Not included.

35. *The TELE provides the learner with the means to assess her/his own achievements.*
   - Not supported: 0, 1, 2, 3, 4, 5
   - Well supported
   - This is done by means of the list of activities done by the user (LOs, comments, participation to fora), and by comparison with the comments of the other users.

36. *The TELE allows the student to select the achievements to be assessed.*
   - Not supported: 0, 1, 2, 3, 4, 5
   - Well supported
   - Indirectly, through the interaction with peers; this question is only marginally applicable

37. *The TELE allows the student to select the competencies to be assessed.*
   - Not supported: 0, 1, 2, 3, 4, 5
   - Well supported
   - As above

### Motivational aspects

38. *The TELE provides the learner with feed-back that leads to appropriate self-efficacy beliefs.*
   - Not supported: 0, 1, 2, 3, 4, 5
   - Well supported
   - This can arise from seeing one’s productions in comparison with those of others, and from the interaction with the peers (though the impression coming from other human beings can not always be considered appropriate).

### Emotional aspects

39. *The TELE provides the learner with appropriate feedback on her/his achievements and on the amount of work done.*
   - Not supported: 0, 1, 2, 3, 4, 5
   - Well supported
   - This is supported by the list of own’s work and comments of peers

### Social aspects

40. *The TELE provides the learner with the opportunity to compare her/his results with that of a tutor/instructor.*
   - Not supported: 0, 1, 2, 3, 4, 5
   - Well supported: Not applicable
The TELE allows the learner to discuss her/his results with her/his tutor/instructor.
Not supported 0 1 2 3 4 5 well supported not applicable

The TELE provides the learner with the opportunity to compare her/his results with those of her/his peers.
Not supported 0 1 2 3 4 5 well supported

Yes.

The TELE allows the learner to discuss his/her results with her/his peers.
Not supported 0 1 2 3 4 5 well supported

Yes.

General impressions on the TELE obtained from compilation of part B

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.
Part C: Global evaluation of support for self-regulated learning

### (1) Planning

**Cognitive aspects**
Not supported 0 1 2 3 4 5 well supported

**Motivational aspects**
Not supported 0 1 2 3 4 5 well supported

**Emotional aspects**
Not supported 0 1 2 3 4 5 well supported

**Social aspects**
Not supported 0 1 2 3 4 5 well supported

### (2) Execution and monitoring

**Cognitive aspects**
Not supported 0 1 2 3 4 5 well supported

**Motivational aspects**
Not supported 0 1 2 3 4 5 well supported

**Emotional aspects**
Not supported 0 1 2 3 4 5 well supported

**Social aspects**
Not supported 0 1 2 3 4 5 well supported

### (3) Evaluation

**Cognitive aspects**
Not supported 0 1 2 3 4 5 well supported

**Motivational aspects**
Not supported 0 1 2 3 4 5 well supported

**Emotional aspects**
Not supported 0 1 2 3 4 5 well supported

**Social aspects**
Not supported 0 1 2 3 4 5 well supported

### Thematic summaries:

<table>
<thead>
<tr>
<th>Planning</th>
<th>poorly supported 0 1 2 3 4 5 well supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execution and monitoring</td>
<td>poorly supported 0 1 2 3 4 5 well supported</td>
</tr>
<tr>
<td>Evaluation</td>
<td>poorly supported 0 1 2 3 4 5 well supported</td>
</tr>
</tbody>
</table>

| Cognitive aspects             | Not supported 0 1 2 3 4 5 well supported |
| Motivational aspects          | Not supported 0 1 2 3 4 5 well supported  |
| Emotional aspects             | Not supported 0 1 2 3 4 5 well supported  |
| Social aspects                | Not supported 0 1 2 3 4 5 well supported  |
SRL evaluation of the collaborative environment LODE

<table>
<thead>
<tr>
<th>Social aspects</th>
<th>Not supported</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>well supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall evaluation of</td>
<td>Low support</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>High support</td>
</tr>
<tr>
<td>support for SRL</td>
<td>Support implicit</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>Support explicit</td>
</tr>
</tbody>
</table>

Factors that contribute to the strength of the TELE

1) Articulated collaboration platform, with possibility for the users to get involved and interact in different ways;
2) clear and straightforward organization of the software platform,
3) facilities to give and receive feedback and help from the members of the learning community;
4) the user has freedom of movement
5) the materials have the articulated interconnections with each other;
6) comments 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.

Factors that represent weaknesses of the TELE

1) Lack of explicit tools to support self-reflection, self-monitoring and self-evaluation;
2) no explicit mechanisms to help the users cope with the challenges of the task,
3) no explicit provides feedback to the work done leading to appropriate self-efficacy beliefs

Suggestions for improving the TELE

Since the main limitations to the support to SRL derive from several aspects being covered only implicitly, some improvements of the facilities of LODE have been designed, 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:
1) more search facilities, so as to visualize more easily, in different ways, one's own production and that of selected colleagues;
2) possibility to search on the comments, not only on the LOs, by keywords;
3) links to the comments also from the LOs' directory;
4) a section of FAQ;
5) 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 of learning experience, but requires on their part awareness and commitment;
6) 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.