An analysis of the SRL potential of a Technology Enhanced Learning Environment based on the software tool Ecolandia

Giuliana Dettori, Tania Giannetti, Barbara Digitali

An analysis of the SRL potential
of a Technology Enhanced Learning Environment
based on the software tool *Ecolandia*

Giuliana Dettori, Tania Giannetti
ITD CNR

In collaborazione con
Barbara Digitali, studentessa SSIS

Introduction

Ecolandia is a program aiming to teach students of junior high-school to reason consistently on environmental issues.

The program is organized like a game where the student is invited as a consultant to help three neighbour cities in the country of Ecolandia to solve properly the problem of garbage disposal. To accomplish this task the student is required to visit the three cities, in each of which he/she is requested to talk with the public administrators, who illustrate the solution they would like to implement, go to the library, where he/she can find the current laws on the matter as well as information on the environmental situation and constraints of the three cities, and talk with the local people, who present different points of view on the city situation and needs. To work out a reasonable solution for the problem posed, the student is also required to consult three experts (in environmental, economical and legal matters), whose suggestions can help the student to take into account a variety of aspects involved in the considered problem.

The aim of the program is not to convince its users that one of the proposed solutions is preferable to other possibilities, but rather to teach to them to tackle consistently environmental issues, by showing them the need to get information from different sources and to compare different points of view, so to gather a good amount of *pro*s and *contra* on the considered issues, since environmental issues often do not have a unique "right" solution, but several possible ones among which it is necessary to chose based on the constraints of the situation at hand.

The program offers also the possibility to the teacher to define similar situations with different problems, so to allow them a wide range of possible activities with the class.

The program has a nice interface (see figure below) and an organization that can result appealing and effective for high-school students. It is not very recent, though, and does not include some features which are currently increasingly considered as educationally valuable, like facilities to communicate or collaborate on-line. It stimulates the student to reason, rather than to learn specific content knowledge; though it was not developed having in mind the acquisition of self-regulated learning abilities.

The opening page of Ecolandia, showing a map of the region considered, and the next one, where the three cities involved in the situation are presented, each having to face a different environmental situation.

In order to analyse the SRL potential of the environment based on the program, we used as evaluation tool a questionnaire developed within the European project TELEPEERS[1], 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/.

The following analysis 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 applying the mentioned evaluation tool to a school level different from the one originally considered during the questionnaire development. Moreover, since this program aims in particular to make students reason on issues, we thought it was interesting to check to what extent encouraging reflection would contribute to make this learning environment effective from the point of view of self-regulated learning.

The analysis of the program was made by a trainee teacher in Science education for junior high-school. This allowed us to check whether the evaluation tool considered could result interesting and usable also to professionals not yet very expert in this topic. The experience was rather successful, in that the trainee teacher involved (though with many explanations from the researchers) managed to go through the evaluation tool and reach a conclusion on the support to SRL granted by the considered TELE, as well as on the points where teacher support would be necessary to lead the students toward the acquisition of these abilities.

In the last section of this document, some observations on the use of the evaluation tool by the trainee teacher are reported.

---

[1] "Self-regulated Learning in Technology Enhanced Learning Environments at University Level: a Peer Review", Grant agreement 2003-4710-/001-001 EDU-ELEARN, http://www.lmi.ub.es/telepeers/telepeers.php

Part A: Description of TELE

Name and short description of TELE	*(please describe shortly what you consider part of this TELE, i.e. software used, configuration, use made of it, agents involved, etc).* **The software environment Ecolandia, aiming to show junior high-school school students how to reason on environmental issues. In this study, the software tool is supposed to be used in the classroom work in 8th grade, letting the pupils work in pairs on a PC. The role of the teacher is of supervisor.**
Institution where it is in use	**This is an *a priori* study. The program is available at the Italian Library for Educational Software (see http://www.sd2.itd.cnr.it/)**
Objective of TELE	**The TELE aims to show junior high-school students how to reason on environmental issues, by showing them the need to get information from different sources, such as experts in low, economics, etc, and to compare different points of view, so to gather a good amount of *pro*s and *contra*s on the considered issues, since environmental issue often do not have a unique "right" solution, but several possible one among which it is necessary to chose based on the constraints of the situation at hand.**
Educational model	**Learning through problem solving**
Mode of delivery	**Presence education.**
Places of learning	**School laboratory, but equally well at home.**
Context	
Level of interactivity	*(please mark with X the appropriate item)* No interactivity Interactivity with TELE **X** Interactivity with tutor Interactivity with peers
Technological component	(please mark with **X** the appropriate item) Commercial **X** In house built Open source
Technical requirements for technological component	Operating system (server/client) **Windows (not XP)** Hard disk space required **standard** Display resolution, colour depth **standard** Hard ware components (working memory, processor, sound card, graphics card); **graphic card and sound card necessary** External devices **none** Connectivity (e.g. type of browser, band width) **Not necessary**
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 Language Italian Legal aspects 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")* **Barbara Digitali, trainee teacher in Science for junior high-school, Italy**

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

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

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

> I should have actually put two different scores to show what the student can see from what the students can see: 3 would be the right score for the students, since they can see in their diary what they have marked there, and because every time they ask help from the environmental expert the program points out how many of his suggestions have already been used. The score for the teacher should be 5, since I noticed that there is a didactical record, which can be accesses only by the teacher, where the whole path of every single student can be seen. The average I made does not express exactly the situation.

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

5   *The TELE provides the student with the opportunity to choose between different modules.*
Not supported   0   **1**   2   3   4   5   well supported

> There is the possibility (for the teacher), besides solving the posed problem, to create a personal city with a new story or a new problem to be analysed. The city that can be created is in the same style of Ecolandia, with a library, an archive, people to talk with, etc.

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

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

> The video format is missing

Motivational aspects

8   *The TELE is likely to arouse the learner's interest.*
Not supported   0   1   2   3   4   **5**   well supported

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

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

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

There is a help function in the notebook section, but a list of web sites is missing.

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

13   *The TELE sensitises the learner with respect to how problems might be solved.*
Not supported 0 1 2 3 4 **5**   well supported

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

Different people in the environment-city encourage the student-consultant to tackle tasks, namely experts, public administrators, citizens. Only a way to visually sign not-read documents is missing.

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

In the section "experts" a work plan is available so to help students to organize their work.

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

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.*
Not supported **0** 1 2 3 4 5   well supported

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

I did not give the full score since in my opinion the interest progressively decreases, especially when the students go to the library and there are many (technical) things to read.

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

Working in class each student can communicate not only with his/her partner but also with other peers. I did not give the full score because the software component within the environment does not provide specific tools for this purpose.

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

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

(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

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

The student-consultant can access opinions on his own work from the citizens of the cities. Moreover, if a long period of inactivity occurs, an expert intervenes in order to help the student-consultant to proceed.

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

25   *The TELE allows the learner to switch to another learning strategy if necessary.*
Not supported 0 **1** 2 3 4 5 well supported

There is the possibility for the students to choose among different approaches to the task by selecting the activities to carry out and their sequence. However, this is, in my opinion, only a choice of path and not of problem solving strategy.

Motivational aspects

26   *The TELE helps the learner to maintain her/his motivation.*
Not supported 0 1 **2** 3 4 5 well supported

> The TELE does not point out student's good results, but allows the student to access some information only after gathering other. This is, in my opinion, a way to maintain high the level of interest in students.

27   *The TELE provides help facilities that aim at strengthening the learner's perseverance in case of failure.*
Not supported **0** 1 2 3 4 5   well supported

Emotional aspects

28   *The TELE provides the user with formative feedback that facilitates the maintenance of a positive working attitude.*
Not supported **0** 1 2 3 4 5   well supported

29   *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.*
Not supported 0 **1** 2 3 4 5   well supported

> This score is due to the only presence of a bell ringing after a long period of inactivity and the successive intervention of an expert asking the student if there are problems with his/her work.

Social aspects

30   *The TELE allows the user to contact and receive help from her/his tutor/instructor.*
Not supported 0 1 2 3 4 **5**   well supported

> I suppose the software environment being used in school with a careful teacher and working in pair with a class mate..

31   *The TELE provides the user with the opportunity to communicate with her/his peers in order to exchange ideas or to ask for help.*
Not supported 0 1 2 3 **4** 5   well supported

> Same as above. There is no possibility to communicate on-line.

32   *The TELE provides the user with possibilities to collaborate with her/his peers.*
Not supported 0 1 2 3 4 **5**   well supported

(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

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

> The presence of the "to do list" allows the student to compare the state of progress of his/her work with the final state to reach.

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

> There a re no tests to verify the acquired knowledge but it is possible to know the suitability of applying some particular strategies it is necessary to communicate to the expert (inside the program) some of the pieces of information that can be found within the villages. In this way the students can test to have acquired *something*.

36   *The TELE allows the student to select the achievements to be assessed.*
Not supported **0** 1 2 3 4 5   well supported

37   *The TELE allows the student to select the competencies to be assessed.*
Not supported **0** 1 2 3 4 5   well supported

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

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 thanks to the personal diary.

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

41   *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

42   *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

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

General impressions on the TELE obtained from compilation of part B

The TELE appears generally good, but it is lacking as concerns explicit self-evaluation activities by the students.
It is clear that this TELE is not completely apt to support self-regulated learning, but the presence of a teacher is necessary for this sake.

Global evaluation of support for self-regulated learning

Part C:

Evaluation of support of 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:

Planning	poorly supported 0 1 2 3 **4** 5 well supported
Execution and monitoring	poorly supported 0 1 2 **3** 4 5 well supported
Evaluation	poorly supported 0 1 **2** 3 4 5 well supported
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
Overall evaluation of support for SRL	Low support 0 1 2 **3** 4 5 High support
Evaluation of explicitness	Support implicit 0 1 2 **3** 4 5 Support explicit

Factors that contribute to the strength of the TELE

The initial motivational aspect is very good, the students are right away stimulated and made curious to solve a problem, also by means of a clear and amusing interface.

I find very useful the intervention of experts and the personal diary, since these help the students to plan their work.

Factors that represent weaknesses of the TELE

1) There is a lack of self-evaluation tools, for instance, three possible solution are presented, but there is no way help the students evaluate how correct is the solution they work out (which can be different from the three solutions presented)

2) The lack of distance communication tools for the students, whose collaboration is hence constrained to the work in class (oral communication).

3) Though the students can decide how to tackle the learning path, the TELE can not be adapted to different levels of preparation of the students.

Suggestions for improving the TELE

1) It would be necessary, in general, to improve the self-evaluation: introduction of tests to evaluate the acquisition of the presented contents. There should be the possibility for the students to evaluate properly their answer.
2) Add the possibility of a public communication on-line.
3) It would be useful to have a TELE giving different levels of problems to be solved. This could be used for different age ranges, so that all students could feel at ease working with it.

Observations on the evaluation experience, by Barbara Digitali

This activity gave me the possibility to approach a theme that I had never tackled before, self-regulated learning and the TELE as a tool to develop this ability. I would say that this is a very useful way to make students acquire more knowledge (and responsibility) to be protagonists of their own learning, to understand where they are in reaching their objectives and hence to interact at best with the teacher to fully reach these objectives.

It is, hence, fundamental that the teacher be able to choose a TELE suitable to the needs of her/his students, and this activity has been for me very useful in that it allowed me to make practice to this aim.

Filling in the questionnaire, however, has not been trivial. I would say that it is very difficult to fill it in without the assistance of the experts. I met two main difficulties:

1. *Interpreting some questions.*
2. *Assigning a score in Section B: while it is easy to decide the minimum and maximum score, it is not so easy to decide the intermediate score (1,2,3,4), and assigning one of these values is a quite subjective matter.*