An analysis of the SRL potential of a Technology Enhanced Learning Environment based on the narrative software tool Story Maker 2

Giuliana Dettori, Tania Giannetti

An analysis of the SRL potential
of a Technology Enhanced Learning Environment
based on the narrative software tool
Story Maker 2

Giuliana Dettori and Tania Giannetti

Introduction

SRL is mostly addressed in the literature in relation with adult or young adult learners, probably because it involves a good amount of meta-cognition, which adults seem to grasp easier than younger people. There is no evidence, however, that children are not able to start self-regulating or to reason at meta-cognitive level. We think that it would be important to introduce elements of SRL from primary school, since the development of these abilities appears to be an incremental process, that develops faster and faster after the initial steps.

Focusing on children's education, it is widely recognized that narrative is a privileged way for organizing knowledge and helping develop cognitive abilities. Stories are familiar to children from early age[1], and hence a way of learning that results particularly natural for most primary school pupils. For these reasons, we thought it would be interesting to analyse the potentialities to support SRL offered by an increasingly widespread way of working with narrative, that is, Narrative Learning Environments (NLEs), so to pinpoint strengths and weaknesses of these tools, as well as to discuss what improvements could grant a better support to SRL.

For this analysis, we selected as NLE a well known commercial software environment, rich of features and suitable for various age levels. We made this choice since this program is simple and has many affordances as concerns narrative creation by children. Analysing a more complex program would introduce variables not strictly related with the core concept of narrative, and thus make it more difficult to highlight the very relation between NLEs and SRL. Our study, on the other hand, can constitute a basis to analyse more complex software tools, which very likely include all the basic functions of the considered one. With our work, we aimed to spot *categories* of functions useful to support SRL in NLEs, rather than particular implementations of such categories.

The software environment considered, StoryMaker2[2], is a Narrative Learning Environment which allows the users to create multimedia stories. It has a rich menu of backgrounds, characters, props, sound effects, mostly thematically organised (for instance, it is possible to choose plants and flowers from a group "garden", as well as gardeners, garden furniture, etc.). All elements can be combined in different ways as basic components of each scene. It is suitable for children of very different levels of cognitive development, allowing the production of narratives of various degrees of complexity, from simple, linear ones made of a sequence of pages up to hyper-textual narratives with animations.

It can be a valid tool from the point of view of children's learning, since it is suitable for a wide range of applications in the first years of primary school and it can support the development of a variety of cognitive abilities. Just to mention a few of them, it can help develop competencies on narrative itself and communication skills, consolidate reading and writing in one's own mother tongue. It also can be used to develop initial linguistic abilities in a foreign language, since the program includes language features for English and French, and several other languages (German, Spanish, Italian, etc.) are available on separate CDs.

A TELE is not composed only by a software tool, but includes also configuration and mode of use set up by the instructor. Due to the wide range of possible applications of the considered program, it was important firstly to decide clearly what aspects should be considered as part of the TELE, in order to avoid mixing the potentialities of different modes of use, which would all together correspond to no actual application. Since our aim was to focus on narrative learning environments, we limited the TELE examined as much as possible to the mere program, in order not to detect strengths and weaknesses that could be rather ascribed to a particular way of using it, instead of to the characteristics of the program itself. Hence, we supposed a situation where a child is working on his/her own on a precise assignment (the creation of a narrative with some data given but free plot), with an educator around just for quick instructional support. The learning task, in this case, is learning to develop a narrative with some constraints.

---

[1] Bruner J (1990) *Acts of meaning*. Harvard University Press

[2] Published by SPA Software, 2003, http://www.spasoft.co.uk/

An example of a scene worked out with StoryMaker2. This scene can be constructed either as a static scene, as presented here, or as an animation where the standing characters enter the scene one after the other and speak aloud. Both possibilities (as well as the many intermediate ones) are acceptable narratives and suitable goals for children of different age and abilities.

In order to analyse the SRL potential of the considered NLE, we used as evaluation tool a questionnaire developed within the European project TELEPEERS[3], aiming to evaluate 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 applying the mentioned evaluation tool to a school level very different from that originally considered during the questionnaire development. The results of this analysis turned out to be very satisfactory, both as concerns the possibility to profitably use the questionnaire within a variety of contexts, and as concerns the possibility to foster the development of SRL abilities within narrative learning environments for primary school children.

The outcomes of this evaluation have been presented in the paper "Developing Self-Regulated Learning in ICT-based Narrative Environments", by G. Dettori and T. Giannetti, accepted at the Workshop on Narrative Learning Environments within the International Conference AIED (Amsterdam, July 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.

The last section of this document reports some consuderations on the use of the evaluation tool by the person who filled in it.

---

[3] "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/

Part A: Technical 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 considered TELE is formed by the software tool Story Maker 2, used by a single child (early elementary school) working individually, with a teacher around at disposal only for quick technical assistance. The task at hand is to create a story with free plot and characters but with some constraints.**
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	**Teaching a child in the first year of Elementary school to construct a narrative, by using a narrative environment which allows the creation of stories as sequences of one or more scenes, including dialogues and animations**.
Educational model	**Individual work**
Mode of delivery	**Presence education**
Platform	(please mark with **X** the appropriate item) *No platform used* Commercial platform used **X** Proprietary platform used Open source platform
Places of learning	**Anywhere a PC is available**
Context	**Primary school education**
Level of interactivity	*(please mark with **X** the appropriate item)* No interactivity Interactivity with TELE **X** Interactivity with tutor Interactivity with peers
Technical requirements	Operating system (server/client) **Windows, with the usual PS equipment** Hard disk space required Display resolution, colour depth Hard ware components (working memory, processor, sound card, graphics card) External devices Connectivity (e.g. type of browser, band width)
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 **X** User's handbook (printed or in electronic form) for students Tutorial Guidelines Help function **X (only technical)**
Transferability (Portability)	Costs **average** Language **English and French, plus dictionary available for several other languages** Legal aspects **Commercial software** Technical aspects **No special requirements; a PC with the usual equipment is sufficient** 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)* **GD + TG, researchers in Educational technologies, 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

> The available characters and features are grouped into menus, thematically organized

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

> The software tool embodied in this TELE is rather simple and intuitive to use at elementary level; the highest functions, though, are difficult to find and to use without consulting the user manual.

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

> There is no direct mechanism for this sake; the user, though, can exploit the possibility of the operating system to save successive versions of a file, so to keep a record of the incremental steps of a story's creation.

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

> There are no explicit development plans; the user, though, can make a plan by crating all the (empty) scenes he/she is planning to use before proceedings with creating the story in all details.

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 very free to choose among a variety of possible background, characters, actions, 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

> The user is free to proceed as he/she prefers in the creation of a narrative, eg by working out completely each scene, or by deciding all scenes at the beginning and working them out later in parallel.

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 user is completely free to chose between static scenes and animations, written or spoken dialogues.

Motivational aspects

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

The richness of the menus available, and the possibility to import backgrounds and scenes from other applications makes the program certainly interesting to use, especially for primary school children.

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

The user has great freedom of movement within the environment. Also the button menu on the upper bar can be set at two different levels of detail.

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

The only support to reflection is the possibility to go back and see the work done. No explicit reflection tool is provided.

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

Features can be imported by other applications.

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

A library of examples is available, where the user can get ideas of what he/she can do.

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

The examples in the archive can be seen both play mode and in constructions mode, hence giving an idea how to realize animations and other features.

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

We consider as explicit mechanism in this TELE the explicit assignment given by the teacher, and her (non-intrusive) presence.

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

The implicit mechanism is the availability of menus and archives.

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

Seeing examples already realized narratives, sometimes even complex animations, and knowing that he/she can copy the realization mode, can support the user to tackle complex tasks.

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

The user is not compelled to use the most complex functions, if he is not able, yet interesting and complex stories can be created. A congruence with user's abilities is obtained naturally, by simply letting the user make what he/she is able to do.

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

Apart the frustration deriving from possibly not being able to use the most complex functions, the environment is an enjoyable one.

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

No communication functions are provided.

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

No communication functions are provided.

(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

The user is completely free to proceed as he/she prefers in the construction of his/her story.

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

No explicit reflection tools are provided, apart from the possibility to review one's own work.

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

No explicit reflection tools are provided, apart from the possibility to review one's own work.

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

The user is completely free to proceed as he/she prefers in the construction of his/her story.

Motivational aspects

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

> A narrative is created as a sequence of scenes, each of which is a complete product in itself, and the users can proceed in story construction following their own personal style.

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

> The only support in this sense can derive from looking for advice in the archives; the help provided is only technical and suitable more for adults than for children.

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

> No formative feedback is provided.

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

> No formative feedback is provided.

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

> No communication functions are provided.

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

> No communication functions are provided.

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

> No communication functions are provided.

(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

> The only help is the possibility to see one's creation in play and in construction mode, and go back and forth through it as necessary.

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

> Same as above.

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

> It is possible to see one's creation in play and in construction mode, and go back and forth through it as necessary.

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

> The user can check his/her work scene by scene, or character by character, if he/she wishes.

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

> The user can have his/her dialogues checked by the facilities of the software tool.

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

> There is no explicit feedback, apart from seeing one creation in play mode.

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

> There is no explicit feedback, apart from seeing one creation in play mode.

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

A rich archive of other people creations is available, where the teacher can include his/her own models, if he/she wishes.

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

No communication tools are provided.

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

No communication tools are provided. But some example may be present in the archives.

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

No communication tools are provided

Part C

General impressions on the TELE obtained from compilation of part B
This TELE appears to support self-regulated learning to a full medium degree, offering its best on the cognitive aspects, showing its weakest on the emotional aspects, remaining on average level on the motivational aspects, and with the social aspects almost completely undeveloped. As concerns the phases of learning, the TELE gives its best at planning, scores average at execution and monitoring, while results rather low in the evaluation phase, due to the lack of explicit feedback and reflection functions. Also the explicitness of SRL support was evaluated as rather low. **These results appear quite good if we consider that the development of SRL abilities is not among the explicit aims of the software environment on which the considered TELE is based. This confirms our hypothesis that it makes sense to put into relation SRL and NLEs.**

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	not supported 0 1 2 **3 4** 5 well supported
Execution and monitoring	not supported 0 1 **2 3** 4 5 well supported
Evaluation	not 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

It is easy to use (at least at the simplest level). Ease of use can beneficially influence not only the cognitive aspects (favouring the concentration on resources at disposal in relation with the task to be solved, hence facilitating work planning), but also the motivational ones (allowing the user to reach some meaningful results fast) and emotional ones (avoiding frustration and decrease of self-efficacy beliefs).
It offers a rich choice of features for narrative creation. Moreover, it allows the user to enrich the menus by modifying the given features and by importing pictures and sounds from other programs. This influences the cognitive aspects at planning and execution, by giving the user freedom to decide how to proceed in his/her work; it influences also the emotional aspects, since personalization of elements is likely to increase learners' pleasure to create narratives.
It offers a rich variety of possible productions. This influences emotional aspects during the execution phase, since it allows graduation of the complexity of work according to the abilities of each user.
It includes a library of previous productions, which entails the possibility to compare one's own work with the works of others, which thus act as models. This supports the cognitive aspects both in the execution and in the evaluation phases.
The above richness makes the program very likely interesting for young users, hence supporting motivation in all learning phases.
It allows the user to see a same scene in different modes, i.e., playing mode, construction mode with visible elements, construction mode with hidden elements (links, paths and actions). Viewing in different modes the work one is constructing supports cognitive aspects at self-monitoring level. Viewing in different modes the examples in the archives can give suggestions on how to proceed and unblock the learner in possible moments of difficulty, hence influencing both the cognitive and motivational aspects of execution.
It offers the possibility to save one's work, including different versions of a same story corresponding to successive phases of development. This can help one evaluate the amount of work made and the progress attained by comparing successive versions, with obvious influence on the cognitive aspects of the evaluation phase, and possibly also on the motivational ones.

Factors that represent weaknesses of the TELE

Many resources are implicit: if the user does not know the program well it is difficult to guess the existence of some functions.
The feedback is very limited, in particular there is no formative feedback.
Help facilities are only on technical questions, scarcely suggestive and suitable to adults but rather difficult to use for children.
The social aspects are almost completely missing (no tools for communication or collaborative work are included, the only contact with the work of others is realised through the archives).

Suggestions for improving the TELE

Adding the following functions could, in our opinion, improve this TELE:

a. Several help functions, suitable to be used by young children, possibly of different kinds, to answer the different needs a child may have during narrative creation: cognitive-creative ("I need help to invent my story"), emotional-motivational ("I feel discouraged/lost"), methodological ("I don't know how to make what I want to do") and technical ("I don't know how to use a command"). A general help function should co-ordinate the specialized ones, and guide the child to the selection of the necessary help. Providing emotional and motivational help is particularly important in an environment like the considered one, where the child is left more or less on his/her own. In different TELEs, where the child collaborates with peers and receives support and guidance by the teacher, these kinds of help may also be provided by the human component embodied in the environment. This possibility, though, does not decrease the importance of having such a support in the program.

b. Possibility of defining the distinctive features of all characters, to be added to the implicitly predefined features of well-known "types" (e.g., a witch is universally considered wicked, etc.). This could have several influences on the cognitive level. Having at disposal such descriptions as reference while creating the narrative, the child is in a better position to create logically consistent stories and to make inferences on the actions in his/her narration. Detecting inconsistencies between definition and behaviour of a character leads to the introduction of what Bruner calls exceptions, i.e., unexpected behaviours due to some precise reason; guiding the children to reflect on exceptions helps them to gain awareness of, and monitor, the consistence of the narrative under creation. It would be interesting to realize definitions in an articulated way, that is: define characteristics on a continuos scale instead of as discrete values (only seldom people are completely bad or good); allow also definitions of moods, which are local to single scenes and can influence actions.

c. Some kind of support to story general design, to help the child to keep under control the overall development of the plot of a story. This should include two different levels:
    a basic level, consisting in giving some kind of summary, showing the sequence of the scenes already realized or at least initialized ;
    an "intelligent" level, where this function should help the child build an overall idea of his/her plot, with scenes and characters to use in it, similarly to what children do when working collaboratively on the creation of some story.

a. Some kind of support to reflection on the work done, to help the child become aware if the story created is consistent in itself, with the assignment, and with the personal expectations as concerns the story itself..

b. Making some resources more explicit. For instance, it would be useful to have more than two levels for the iconic menu bar, so to include in it all commands, since the presence of buttons calls the attention on the existence of functions that otherwise could ever go neglected. The possibility to have an overall view of the available resources is an important point to support SRL, since it has a positive influence on planning.

Considerations on the evaluation experience made on StoryMaker2, by Giuliana Dettori

I analysed StoryMaker2 firstly because I am interested in the educational use of narrative, especially with primary school children. I wanted to try to understand if an "intelligent" narrative learning environment can really give its users something more than an environment like this one, which is rich of features and possible extensions but nothing more than a graphical-textual editor. Analysing the program again with this SRL-oriented evaluation tool I realised that I had not analysed the program deeply enough and I did not imagine a sufficiently wide number of possible uses of a narrative activity. This evaluation tool has many limits, depending on the ambiguity of many questions and on the difficulty to attribute to the different aspects considered a score that the same person could still find convincing a few weeks later. Nevertheless, I think it could be a valid help for teachers as a tool to guide software analysis: not much to evaluate the educational validity of software programs, but to reason on which ways of use they consider more satisfactory against their own educational methodology, in that it calls attention on aspects that could otherwise go unnoticed.