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On the design of educational digital stories: the Ed-W model

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Abstract

This paper focuses on the presentation of an educational, modeling methodology (the Ed-W methodology) that is appropriate for the design of storyboards for educational digital stories. This methodology is based on the creation of the following three models: (a) the model of the subject matter; including all aspects of the learning subject in question, (b) the learners' model; including learners' non scientific conceptions about the aforementioned learning subject, and (c) the Ed-W learning model; consisting of a 5-step digital story boarding strategy for the learning of the subject in question, while at the same time acknowledging the students' non scientific conceptions. The aforementioned 5 steps are: (a) the hero faces a problematic situation where she/he needs to use the knowledge of the subject matter in question, (b) the situation is worsened, due to actions which are based on the hero's non scientific conceptions described in the learners' model, (c) the situation is improved due to external, uncontrollable factors, (d) the situation becomes terrible because the hero continues to act in the previously mentioned way, and (e) the hero is forced to reflect on her/his thoughts and practices, and makes appropriate corrections. Then, all problems are finally resolved. To illustrate the aforementioned design methodology, an example of the design of a concrete digital story will be also demonstrated. © 2013 Published by Elsevier Ltd.

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1. Introduction

Storytelling can enhance students learning. In fact storytellers have to organize, communicate, evaluate and transform life experience in their own voices (Liu, Fan-Chiang, Chou, & Chen, 2010; Pirrie, 1999). Storytellers must take an active role in their learning as they try to turn their observations and knowledge into externalized expression, shape their experience and further reflect to construct meaning for themselves (Craig, Hull, Haggart, & Crowder, 2001; Madej, 2003).

There are many different definitions of "Digital Storytelling," but in general, they all revolve around the idea of combining the art of telling stories with a variety of digital multimedia, such as images, audio, and video. There are diverse types of digital stories, which could be categorized into the following three major groups: (a) personal narratives; which are stories that contain some significant incidents in one's life; (b) digital stories that examine

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historical events; which are stories that present dramatic events that could help people understand the past, and (c) stories designed to inform or instruct the viewer on a particular topic.

Digital story telling could be used for learning purposes by both teachers and students. Teachers can create their own digital stories and use them as anticipatory sets or hooks at the beginning of a lesson to capture the attention of their students and increase their interest in exploring new ideas (Burmark, 2004; Ormrod, 2004) and as a bridge between existing knowledge and new material (Ausbel, 1978). By creating digital stories, students can develop various types of literacy such as: information literacy, visual literacy, technology literacy, and media literacy. In fact, by providing students with opportunities to participate in the multiple steps of designing, creating and presenting their own digital stories, they can increase a full complement of literacy skills, including (Robin, 2006): (a) *Research Skills*: Documenting the story, finding and analyzing pertinent information; (b) *Writing Skills*: Formulating a point of view and developing a script; (c) *Organization Skills*: Managing the scope of the project, the materials used and the time it takes to complete the task; (d) *Technology Skills*: learning to use a variety of tools, such as digital cameras, scanners, microphones and multimedia authoring software; (e) *Presentation Skills*: Deciding how to best present the story to an audience; (f) *Interview Skills*: Finding sources to interview and determining questions to ask; (g) *Interpersonal Skills*: Working within a group and determining individual roles for group members; (h) *Problem-Solving Skills*: Learning to make decisions and overcome obstacles at all stages of the project; and (i) *Assessment Skills*: Gaining expertise critiquing their own and others' work. The aforementioned multiple skills that are aligned with technology have been labelled as "Twenty-first Century Literacy," (Brown, Bryan and Brown, 2005).

Students could be also asked to analyze/interpret, theorize, and reflect intellectually and creatively on their digital stories to make some conclusions and reflect on their experience (Benmayor, 2008). In this way, digital storytelling aids theoretical thinking, and theoretical thinking aids creative expression. In conceiving and constructing their stories, students become more cognizant of the contexts and backgrounds that shape their perspectives. This helps to demystify theory and empower students to become theorizers of their own historical and cultural experiences (Benmayor, 2009). Digital storytelling has been also acknowledged as a 'social pedagogy' (Bass and Elmendorf, 2007). This means, a pedagogy that approaches learning as a collaborative process. Just as intellectual theorizing requires situating the individual in a collective referent, the process of creating the digital story needs and creates community in important ways. Without this element of community, the digital stories would not be as deep and powerful as they are.

Story grammars have been used as frameworks to facilitate the creation of stories and link the episodes of the story in a way that can enhance students' meta- knowledge about stories. For those children who are not knowledgeable or have difficulties about the elements of stories, story grammars can enable them to create episodes of a story in a way that experts generally do. In fact, the grammars have to provide children comprehensive and general rules of stories that they can apply. With the support of such storyboards, storytellers can easily manipulate, reflect on, and further revise the meta-structure of stories while they are creating them. A number of story grammars have been reported by the literature (see for example Yazdani, 1989; Center for Digital Storytelling, 2005). Some computerized meta-level storyboards such as Woven Stories (Nuutinen et al., 2010) and StoryMapper (Acosta et al., 2004), which allow storytellers to design and link story episodes, were also developed in a concept map format. In this paper, we propose a modelling methodology –the Ed-W model- for the design of educational digital stories, that is based on of modern constructivist views of learning (Jonassen, 1999; Vygotsky 1974). This methodology focuses on the overcoming of student difficulties –related to the learning concepts in question- through digital storytelling and is presented in the following section of this paper. To clarify this methodology, the storyboard of a digital story for the learning of the concept of distance between the earth and the moon is also presented.

2. A modelling methodology for the design of educational digital stories: the model Ed-W

A modelling methodology –named Ed-W methodology- has been formulated for the design of educational digital stories. Modelling methodologies had already been successfully used in the design of educational software (Kordaki & Potari, 1998; Kordaki, 2010). This methodology has considered the design of three models, namely: (a) the model of the subject matter. This model consists of the basic concepts of the learning subject in question, as well as the basic tasks which are considered appropriate to be carried out by the students in order to grasp these concepts, (b) the learners' model that includes the students' non-scientific conceptions regarding the aforementioned learning concepts. These misconceptions could be investigated through specific empirical studies, as well as from investigations of the literature, and (c) the learning model consisting of an appropriate learning strategy through digital storytelling. In the design of the learning model, various aspects of social and constructivist views of learning (Jonassen, 1999; Vygotsky 1974) were also taken into account, namely, the essential role of: (i) learners' motivation through the use of familiar and interesting digital learning stories, (ii) students' previous knowledge -especially their non scientific conceptions- in the construction of new knowledge, (iii), visual support in the development of mental conceptions by the students, and (iv) scaffolding and appropriate help on learners' actions in order to enable them to progress smoothly in their understanding of the learning concepts in question (Vygotsky, 1974). Based on the above, the Ed-W learning model is constructed. This learning model consists of a 5-step digital story boarding strategy for the learning of the subject in question at the same time acknowledging the students non scientific conceptions. The aforementioned 5 steps are as follows: (a) the hero faces a problematic situation where she/he needs to use the knowledge of the subject matter in question, (b) the situation is worsened, due to actions which are based on the hero's non scientific conceptions described in the learners' model, (c) the situation is improved due to external, uncontrollable factors, (d) the situation becomes terrible because the hero continues to act in the previously mentioned way, and (e) the hero is forced to reflect on her/his thoughts and practices, and makes appropriate corrections. Then, all problems are finally resolved. The Ed-W learning model has been inspired by the idea of the W-model for storyboarding for writers (proposed by Mary Carroll Moore; http://www.youtube.com/watch?v=pMhLvMJ_r0Y&feature=related). However, the Ed-W learning model is dedicated to the design of educational digital stories taking into account modern learning theories with an emphasis in the acknowledgement and exploitation of students' misconceptions as tools for learning, while at the same time utilizing modeling techniques. The 5 steps of Ed-W storyboarding are as follows:

1st edge of W: The story starts with external stimuli that cause serious problems to the heroes of the story. The situation is related to the learning concepts in question and the problems that the heroes of the story face are due to their misconceptions about the aforementioned concepts. (1st top left edge of W)

2nd edge of W: the problems, the dilemmas and the contradictions are deepening for the heroes of the story and gradually worsen with time. The heroes are not aware of the significance of their actions, the situation and the misconceptions they hold about the implied learning concepts in question (1st down left edge of W)

3rd edge of W: Suddenly, the situation accidentally turns better and the heroes seem to feel some release from their problems. However, they have not yet become aware of their misconceptions about the basic concepts related to the problems they are facing. As the story unfolds another challenge appears and the situation escalates (arriving the middle point of W: 2nd edge in the middle of W).

4th edge of W: Due to said challenge and the unsolved heroes' misconceptions the situation keeps worsening, until it reaches a lowest point (2nd right down edge of W).

5th edge of W: At this point, the heroes are forced by the critical condition of the situation at hand to reflect on their experience and try to find some reasons to explain the problems they are facing. They try also to ask for some information and help. As they become aware of their misconceptions and the related appropriate knowledge, they start to face the problems in proper and suitable ways. From this point on, the situation starts to become better and better and the story ends with a happy end and a dialogue indicating that the heroes have finally learned from the problems and their mistakes (3rd top right edge).

Based on the above the Ed-W methodology for the design of educational digital stories is unfolded in the following steps.

Step 1: Definition of both; the subject matter model and the learners' model.

Step 2: Definition of the learning aims of the digital story: The digital story has to emphasize the learning of at least one of the concepts included in the subject matter model and provide students with opportunities to overcome their difficulties related to this concept as emerged from the students' model.

Step 3: Creation of the storyboard using the Ed-W model

3. The Earth – Moon distance: Use of the Ed-W model for the design of a digital educational story

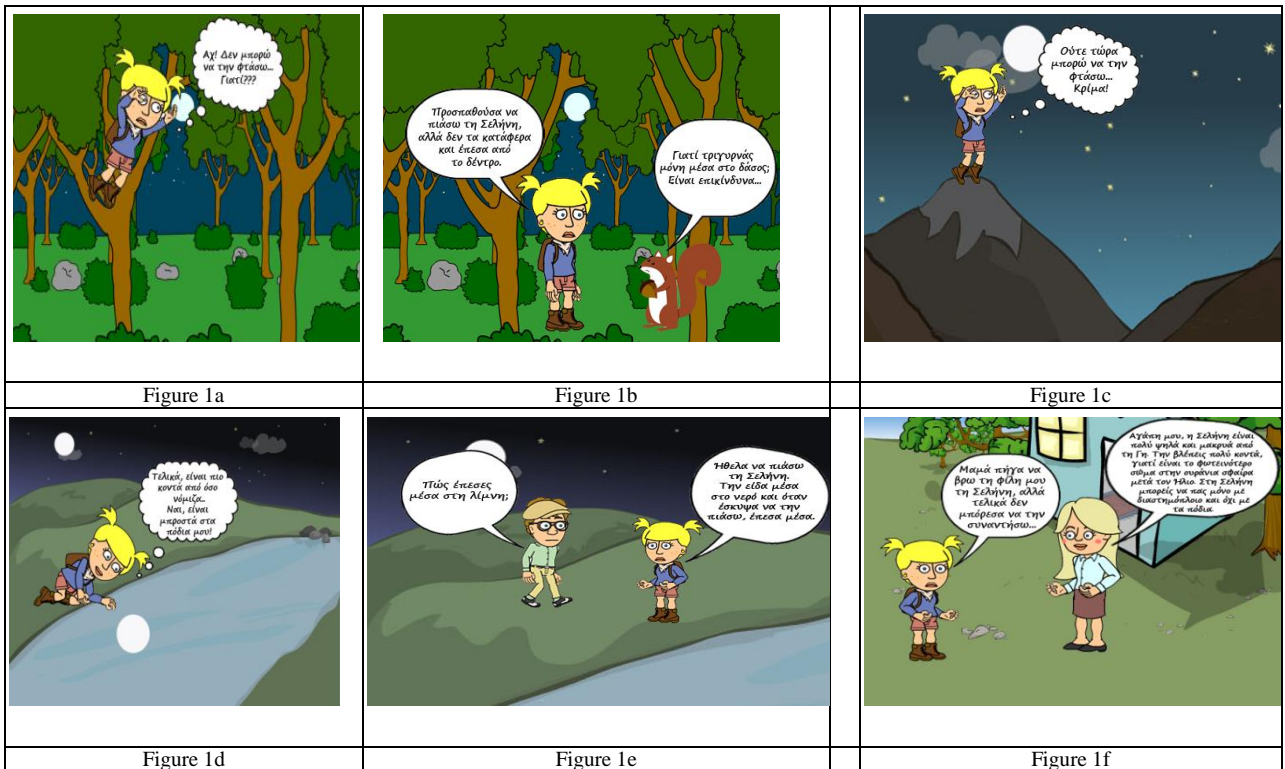


Figure 2. Scenes from the 'moon-girl' digital story

Modeling: The model of the subject matter considers the concept of distance between the Earth and the moon and the position of the moon on the sky. The students' model considers that students reveal difficulties to understand that the moon is not approachable by the highest point of the Earth. In fact, students believe that the moon is very small and it is also near to the Earth, due to the fact that the Earth is lightened by the moon during the night. In addition, when they observe some reflections of the moon on some mirroring surfaces (eg. lakes, and seas) they easily revise their initial opinion that the moon is on the sky with the opinion that the moon is on the Earth; that is based on an illusion. In fact, students believe that 'what is', is 'what they see'.

The learning aims of the Digital story: The aims of the story are to help students understand that: (a) the moon is not approachable by the Earth, even from its highest point, (b) the position of the moon is on the sky.

Implementation of the ED-W model:

1st edge of W: The moon-girl is impressed by the light and the shape of the moon and expresses the will to touch it. The moon-girl thinks that the distance between the Earth and the moon is approachable. Thus, she discusses with her mother her decision to touch the moon with her own hands. She rejects her mother's suggestions to stay home because the moon is far away from the Earth and makes plans and dreams to approach the moon right away.

2nd edge of W: The moon-girl is on her road to the moon: she is looking ecstatically at the moon and tries to climb on a high tree to touch the moon by hand (see, Figure 1a). Unfortunately, she falls down on the ground but does not really understand why.

3rd edge of W: Suddenly, a small squirrel comes to the scene and informs the moon-girl that the moon is far away from this place (see, Figure 1b). However, based on her strong will, she is again on the road to approach the moon. She climbs on a high mountain to be near the moon (see, Figure 1c). Unfortunately, the moon is also far away from the top of this mountain and the moon-girl –disappointed– decides to go back home.

4th edge of W: On her road back home she suddenly sees the moon's reflection on the surface of a lake. Suddenly, the moon-girl thinks that the moon is not on the sky but it is on the Earth in front of her; just on the lake's surface. Happily, the moon-girl tries to touch the moon by hand but unfortunately she falls into the lake (see, Figure 1d).

5th edge of W: Here, the moon-girl seems to be overwhelmed by her setbacks and tries to reflect and revise her opinions about the position of the moon and its distance from the Earth. At this moment a new character comes along and discusses with the moon-girl about the situation (see, Figure 1e). The new character provides appropriate explanations about the phenomenon of the moon reflection on the lake's surface. This is a turning point for the moon-girl. She realizes the mirroring of the moon on the lake is an illusion and the moon is far away from the Earth, not approachable even by its higher mountain. The story ends with the moon-girl returning home and discussing her new experiences and knowledge with her mother (see, Figure 1f).

References

- Acosta, C., Collazos, C., Guerrero, L., Pino, J., Neyem, H., & Moteletm, O. (2004). StoryMapper: A multimedia tool to externalize knowledge. Computer Science Society, 2004. SCCC 2004. In *24th International Conference of the Chilean* (pp. 133–40).
- Ausubel, D. P. (1978). In defense of advance organizers: A reply to the critics. *Review of Educational Research*, 48, 251–257.
- Bass, R. and Elmendorf, H. (2007) 'Social pedagogies framework'. Available at: <http://www.cfkeep.org/html/stitch.php?s=21958734860605&id=81886024569986> (accessed October 2007).
- Benmayor, R. (2008). Digital Storytelling as a Signature Pedagogy for the New Humanities. *Arts and Humanities in Higher Education*, 7, pp. 188–204.
- Benmayor, R. (2009) 'Theorizing through Digital Stories: The Art of Writing Back and Writing For', in R. Bass and B. Eynon (eds) *The Difference that Inquiry Makes: The Impact of Learning on Teaching and Innovation in Higher Education*, pp.1–25.
- Brown, J., Bryan, J., & Brown, T. (2005). Twenty-first century literacy and technology in K-8 classrooms. *Innovate*, 1(3). <http://www.innovateonline.info/index.php?view=article&id=17> (Retrieved October 13, 2005).
- Burmark, L. (2004, May/June). Visual presentations that prompt, flash & transform. *Media and Methods*, 40, (6).
- Center for Digital Storytelling. (2005). <http://www.storycenter.org/history.html>
- Craig, S., Hull, K., Haggart, A. G., & Crowder, E. (2001). Storytelling: addressing the literacy needs of diverse learners. *Teaching Exceptional Children*, 33(5), 46–51.
- Jonassen, D. H. (1999). Designing constructivist learning environments. *Instructional design theories and models*, 2, 215–239.
- Kordaki, M. (2010). A drawing and multi-representational computer environment for beginners' learning of programming using C: Design and pilot formative evaluation. *Computers and Education*, 54(1), 69–87.
- Kordaki, M., and Potari, D. (1998). A Learning Environment for the Conservation of Area and its Measurement: a computer microworld. *Computers & Education*, 31, 405–422.
- Liu, C. C., Fan-Chiang, S. H., Chou, C. Y., & Chen, Y. S. (2010). Knowledge exploration with concept association techniques. *Online Information Review*, 34(5), 786–805.
- Madej, K. (2003). Towards digital narrative for children: from education to entertainment, a historical perspective. *Computers in Entertainment (CIE)*, 1(1), 12..
- Nuutinen, J., Sutinen, E., Botha, A., & Kommers, P. (2010). From mindtools to social mindtools: Collaborative writing with woven stories. *British Journal of Educational Technology*, 41(5), 753–775.
- Ormrod, J. E. (2004). *Human learning* (4th ed.). Upper Saddle River, NJ: Pearson Educational, Inc.
- Pirrie, A. (1999). Supposing: reading between the lines: an allegorical account of contemporary debates on literacy acquisition. *British Journal of Educational Studies*, 47(4), 348–363.
- Yazdani, M. (1989). Computational story writing. In N. Williams, & P. Holt (Eds.), *Computers and writing: Models and tools*. New Jersey: Alex Publishing.
- Vygotsky, L. (1974). *Mind in society*. Cambridge, MA: Harvard University Press.