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A Novel Educational Digital Storytelling Tool Focusing on Students Misconceptions

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Abstract

This paper describes the design and implementation of a new educational digital storytelling tool for the design and creation of multimedia digital stories to support students in reflecting on and overcoming their learning difficulties. In fact, this new digital story tool can assist students in creating digital stories using the 'Educational W' (Ed-W) story grammar (Kordaki, 2013). The digital storytelling tool enables the learner to design the storyline for every step of the Ed-W story grammar separately, and to combine the multimedia files he has uploaded to his digital library. Then, the system automatically assembles all the parts to create a single concrete educational digital story. An example of the use of our digital storytelling tool will be also demonstrated.

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1. Introduction

Storytelling is the backbone of human communication, the two constituting a natural pair. Complex concepts or information also become well understood through storytelling (Bruner 1990; Chung, 2006) and, throughout the history of mankind, knowledge to do with all subjects has been passed on through its use (Chinen, 1989; Brady, 1997; Abrahamson, 1998; Davidson, 2004). Recently, however, we are witnessing the emergence of a new genre of storytelling - digital storytelling (DS) - which stems from a synergy of technological advances and storytelling itself. In fact, technology facilitates learning according to modern learning theories as well as the reuse of known learning strategies adjusted to a new pedagogical setting (Levin, 2003; Kordaki, 2010). According to Porter (2005), DS

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"takes the ancient art of oral storytelling and engages a palette of technical tools to weave personal tales using images, graphics, music, and sound mixed together with the author's own story voice", while Robin (2008) believes that digital storytelling is a powerful technological tool for the 21st century classroom. Digital storytelling is well-documented as a key factor in education, since it encourages reflection (Benmayor, 2008; Genereux & Thompson, 2008; Malita & Martin, 2010) improves students' critical thinking (Maier & Fisher, 2006; Benmayor, 2008; Malita & Martin, 2010; Borneman & Gibson, 2011) and promotes student engagement (Meandows, 2006; Barrett, 2006; Hofer & Swan, 2006; Robin, 2008; Di Blas & Paolini, 2012). All these attributes are very important when the resolution of students' misconceptions is in question, the term misconception having been introduced when it was realized that students' ideas can be quite different from what they were taught (Fensham, 1972; McCloskey, 1988). Simple explanations given by teachers are usually not enough to resolve misconceptions since they are deeply rooted in students' mental framework (Oliver, 2013) and generally hinder their subsequent learning (de Posada, 1997). The strategies and techniques which are used to modify misconceptions in students' cognitive structure are usually termed conceptual change strategies (Wandersee, Mintzes & Novak, 1994). A well-known conceptual change model has been that of Posner, Strike, Hewson and Gertzog (1982), which describes the conditions of conceptual change in four steps, namely: (i) there must be dissatisfaction with an existing conception, (ii) the new conception should be well understood, (iii) the new conception must be plausible, and (iv) the new conception must be fruitful. Based on the above, a new educational digital storytelling tool has been created, one which focuses on treating students' misconceptions and their conceptual change. To achieve this, the Ed-W educational story grammar model (Kordaki, 2013) has been used for the creation of digital stories. This model takes into account modern learning theories in the design of digital stories and places central focus on the acknowledgement and treatment of students' misconceptions. Each digital story created with this model encompasses 5 steps in its creation, each representing one of the five edges of the letter W, namely: (i) 1st top edge of W: At the beginning of the story, the hero/es face a serious problem related to their misconception(s) in the learning concept in question (1st top left edge of W), (ii) 2nd edge of W: the problems of the hero/es gradually worsen with time. The misconceptions are still present (1st down left edge of W), (iii) 3rd edge of W: In this part of the story, the situation greatly improves and the heroes feel that they are heading in the right direction for the resolution of their misconceptions. Nevertheless, there is still a long road ahead of them before they can manage this (2nd edge in the middle of W), (iv) 4th edge of W: The situation worsens again, until it reaches its lowest point (2nd right down edge of W), and (v) 5th edge of W: At this point, the hero/es, through reflecting on their experience, become more and more aware of their misconceptions and the relative appropriate knowledge. The situation gradually improves until the story reaches a happy end with a dialogue indicating that the hero/es have resolved their misconceptions and thus found a solution to the problem they were facing that was connected to their misconceptions (3rd top right edge). Despite a number of software tools that have been created to exploit the educational power of digital storytelling, [e.g. Toontastic (Russell, 2010), 1001 Stories (Di Blas, 2009), ShadowStory (Lu et al., 2011)], a digital storytelling tool that focuses on the resolution of students misconceptions has not yet been reported. This is the contribution of this paper. The remainder of this paper is organized as follows. Section 2 features an overview of the digital storytelling tool that has been created, while Section 3 features an example of its use. Summary and directions of future work are also presented at the end of the paper.

2. Overview of the educational digital storytelling tool

The educational digital storytelling tool that has been created is comprised of three modes, namely: (i) the 'Digital Library' mode, (ii) the 'Digital Story Creation' mode, and (iii) the 'Digital Player' mode. In the 'Digital Library' mode, (Fig. 1a), the digital story creator (teacher or student) can import into her/his digital library the files [photo(s), sound(s) and video(s)] she/he will use in the creation of a digital story. This can be done either at the beginning or at any time during the creation of the digital story. The files can be added to the digital library either by directly uploading a file or by using the "drag and drop" technique.

The 'Digital Story Creation' mode is comprised of five timelines, each of which corresponds to the five edges of the Educational-W model. After inserting the title and a brief description of the digital story, the available story components should be combined for the creation of each of the five parts of the digital story. There are three types of story components that can be added in every timeline simply by clicking on them, namely: