Narrative Learning Environments

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INTRODUCTION

Narrative, in the form of stories and narrations, is a natural mode of communication and expression, familiar to children from a very early age and frequently used also by adults. For this reason, it has often been informally employed, both in and outside school, to facilitate understanding and raise learners' interest, therefore supporting learning in both its cognitive and motivational aspects. For a long time, however, narrative was not an object of interest for the educational research. Its first systematic analyses were worked out within humanities studies, characterizing it in several different ways. Some of such definitions already highlight characteristics that appear crucial for its use in education. Ricoeur (1981), for instance, describes it as a sequence of events connected with each other by cause-effect relations supporting the construction of a meaningful totality out of a set of scattered events.

We owe to Bruner (1986, 1990, 1996) the argument that narrative could be a powerful tool to support learning. Following his studies, the literature in education has witnessed a growing interest in narrative. Several authors have underlined the important roles it can play: external knowledge representation (Porter Abbott, 2002); cognitive process (Luckin, Plowman, Laurillard, Stratford, Taylor, & Corben, 2001; Scalise Sugiyama, 2001); sense-making device through the provision of meaningful contexts (Aylett, 2006); organizational principle (Polkinghorne, 1988); and a way to structure human experience, both individually and collectively (Aylett, 2006). As a consequence of this interest to consciously using narrative in education, many different technology-enhanced learning environments (TELE) have been developed, in which a narrative activity plays a central role to facilitate learning. They are called narrative learning environments (NLEs). Based on the literature and on a qualitative analysis of some well-known examples, this article describes the characterizing features of NLEs, highlighting their relation with the learning afforded.

BACKGROUND

The expression NLE was created over a decade ago within the field of artificial intelligence (AI) to indicate interactive environments basing their learning potential on the use of stories. It is not surprising that the concept of NLE first arose in the AI field since this has a long-time tradition as concerns attention to narrative, from early attempts to make computers understand and generate stories in natural language up to the more recent interest to *interactive storytelling* environments, where the users can actively contribute to the creation of computer-generated stories (Mateas & Senger, 1999).

Due to the increasingly widespread interest for narrative, the concept of NLE has successively widened its boundaries to include learning environments of other kinds, originated from research in education-related fields, such as multimedia and instructional design. Multimedia studies gave rise to editors oriented to the construction of stories, as well as to hypermedia environments where a meaningful background story guides the content fruition. Studies in instructional design, on the other hand, influenced the realization of environments including some relevant narrative activity carried out with the use of general-purpose technological tools. The result of such variety of approaches is that currently a very diverse set of learning environments can go under the name of NLEs. Though differing as concerns appearance and mode of use, all of them share the conceptual similarity to support learning by letting the users engage in some narrative-based activity. This fact allows the definition of a unitary framework to analyze their educational impact, as will be explained in the next sections.

Before proceeding, however, we need to point out that not all learning environments including some story can be considered NLEs. Stories are often used in educational programs to provide an appealing background to some unrelated activity without integrating the proposed tasks and the narrative fruition process (Aylett, 2006). This is the case, for instance, of drill-

and-practice software tools where some assigned problems must be solved in order to progress through a story. The presence of a story in these cases simply aims to give the learners extrinsic motivation to get engaged in some activity they possibly dislike. It does not facilitate the problem solution on the cognitive level nor does it create intrinsic motivation, that is, help the learners perceive the interest or beauty of the considered learning topic.

THREE CATEGORIES OF NLE

Currently available NLEs can be divided into three main groups, based on the fact that they use very specialized technology (like conversational and intelligent agents), or weakly specialized technology (like multimedia) or general purpose technology (like communication functions) to support a narrative activity. They correspond to the origin of NLEs from different education-related research fields, namely artificial intelligence, multimedia, and instructional design. This subdivision corresponds only to the different kinds of technological tools used: in each of the three groups we find environments with various educational aims and pedagogical orientations as well as addressed to users of different ages and with different learning needs.

NLEs Based on very Specialized Technology

Interactive NLEs allow the users to interact in a nontrivial way with the system to generate consistent narrative. In order to actually realize nontrivial interaction, *intelligent agents* and other AI techniques (Paiva, Machado, & Martinho, 1999) or functions to control nonstandard interfaces need to be used. A variety of environments belong to this group, such as virtual drama and storytelling, educational computer games, as well as *augmented reality* environments, where interaction takes place not only by using standard input/output (I/O) devices but also by manipulating real objects or moving in an *ad hoc* equipped, physical space. Implementing environments of this kind entails working out a solution to a number of technological and conceptual issues. A major one regards making computers automatically generate consistent and believable stories. To this end, researchers have been drawing from narrative theories formulated within narratology studies (Cavazza & Pizzi, 2006) in order to select and suitably develop the constituent elements of a story.

Another important issue to tackle when implementing interactive NLEs concerns the realization of real interactivity between human and virtual agents in the joint construction of narrative. This entails balancing user's freedom and system's intended aims, which entails solving a number of complex conceptual and technical problems. Research in this field has originated a number of different approaches (Paiva, 2005), leading to a variety of solutions for the creation of what is called *emergent narrative*, that is, consistent stories collaboratively created by human–computer interaction (Aylett, 1999).

Several interactive environments were developed in the past decade within a number of research projects; unfortunately, most of them remained in the form of prototypes not widely available. In order to guide the reader to deepen knowledge in this respect, we will mention here the main features of some well known examples, referring to the respective Web sites for more complete information. A longer list of examples can be found at http://nle.noe-kaleidoscope.org/resources/studies.html.

1. Carmen's Bright Ideas is a program designed to help mothers of paediatric cancer patients learn to deal with family problems induced by the child's illness. In this environment, a sequence of stories is offered to the user, featuring two characters, Gina, a counselor, and Carmen, the mother of a sick child. Carmen describes a difficult situation she is currently facing due to her child's illness and is helped by Gina's questions to focus crucial points and to become aware of her own reactions. The user can (partially) determine the next story presented by selecting the kind of problem to be discussed in it. The stories are created by autonomous agents, and a new version of them is generated every time, even if the user suggests the same problem twice. The prospective users are adult women. The expected learning is the acquisition of a more conscious attitude in tackling life problems; learning is induced by creating empathy with the story's main character.
2. FearNot! is an application aiming to prevent aggressive behavior in school by inducing children's affective response against bullying situations. Like in the previous case, a story is presented