8ο Πανελλήνιο Συνέδριο ΕΤΠΕ «Οι ΤΠΕ στην Εκπαίδευση»

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΝΩΣΗ
ΤΕΧΝΟΛΟΓΙΩΝ ΠΛΗΡΟΦΟΡΙΑΣ
& ΕΠΙΚΟΙΝΩΝΙΩΝ ΣΤΗΝ ΕΚΠΑΙΔΕΥΣΗ

Βόλος

27 - 30 Σεπτεμβρίου 2012

ISSN: 2529-0916

STRUCTURAL LEARNING THROUGH DIGITAL STORYTELLING FOR PEOPLE WITH AUTISM

K. Chatzara , C. Karagiannidis , D. Stamatis

STRUCTURAL LEARNING THROUGH DIGITAL STORYTELLING FOR PEOPLE WITH AUTISM

K. Chatzara[1,2], C. Karagiannidis[2] and D. Stamatis[1]
chatzara@sed.uth.gr, karagian@uth.gr, demos@it.teithe.gr
[1] *Department of Information Technology, Alexander TEI of Thessaloniki, Greece*
[2] Department of Special Education University of Thessaly, Greece

Abstract

In this paper the use of digital storytelling is examined for teaching social skills to people with autism. A review on previous attempts that were using storytelling and a description of the impact of storytelling in education through e-learning are presented. The focus lies on issues referring to difficulties that arise from the different way autistic people communicate. The characteristics of people with Autism Spectrum Disorders are recorded that make this method appropriate for teaching this special learning group.
An operational model is presented that is describing the system created that accommodates the presentation and creation of stories that describe different social skills. The system caters for different levels of autism and evaluates user performance towards the learning outcome.

Keywords: digital storytelling, autism, artificial intelligence, adaptive interfaces

Introduction

The storytelling is a well known established educational method, especially for young children (Yuksel et al, 2011; Robin, 2006; Valkanova & Watts, 2007) and is referring to a linear narration of a story which has a starting point, a middle point (climax) and an ending point. Storytelling provides several benefits to the educational process in several domains and to different learning groups (More, 2008) and includes text, as well as other forms of media such as images, sounds, animation and videos. Digital storytelling is based on digital images, videos, text and sounds to form a genre in order to convey or communicate a story to readers, viewers and listeners. When these are presented via a computer system we are referring to digital storytelling.

The present paper is referring to software systems of digital storytelling for special learning needs. The software created is called DiSSA which consists of the acronyms of Digital Structural Storytelling for Autism. The system is aiming to help people with autism learn social skills through storytelling with the use of images, as text is, often, not appropriate in their way of communication. It evaluates user's performance and presents information on user's improvement or failures. It is designed in a structured way which is appropriate for this learning group (Mesibov, 2005) to make sure that users are in control of the learning experience. People with autism need to know the rational of all their actions and they need direct explanations of why something needs to be done, how it will be done, when is going to finish and the sequence of events that are included in the learning task. In cases that this order is distracted, they get confused and cannot operate tasks they previously did without problem. DiSSA accommodates the above and users always know where they are in the application, what is the purpose of their actions and the desired outcome that they are expected to fulfill.

Related work

Barry & Burlew (2004) support the view that social stories can accommodate different learners with different needs by combining visual cues with verbal cues. The Kullo - Abbott & Polman (2008) indicate that a digital storytelling program can help students improve their writing skills. This is due to the fact that in order to create a story, learners need to organize and create a sequence of images that correspond to their ideas. They also concluded that storytelling makes students more engaged, inspires them to expand their creativity and to discover different ways to express their ideas. Other researchers, such as Valkanova & Watts (2007), asked children to make sound "voice over" in a narrative form for their own videos. They reported that this procedure is enabling children to express themselves verbally and visually in an artistic, productive and inspiring way that helps them express themselves.

The same conclusion was reached by Burgess (2006) whose research was on the use of digital storytelling that increases creativity. Sadik (2008) tried digital storytelling in typical education and concluded that increases students' understanding in the learning tasks.

Meadows (2003) observed that when students use multimedia software they are more active and engaged with the subject matter. He focused on ways to involve students in activities that makes them visualize their thoughts and through this create a new experience for themselves and the viewers of their creations. Li (2007) focused his research in the integration of multimedia technologies into higher education. He concluded that through digital storytelling students improved their learning skills.

In 2004, Sansosti, Powell-Smith, and Kincaid conducted a research on children with autism by using social stories. The authors claim that the method showed positive intervention effects and they propose further research on the use of digital storytelling operated via a computer for effective learning. Heo's (2009) research indicated that digital storytelling increases children's involvement in the learning subject matter.

Most researchers agree that the creation of a story though digital media attract children's interest and makes children more creative and involved in the teaching subject matter. Their use, though, in special learning groups, is not thoroughly examined.

Autism and Education

Autism is a neuro developmental disorder characterized by impaired social interaction and communication and by restricted and repetitive behavior (Laushey & Heflin, 2000). Autism is included in Pervasive Developmental Disorders, including Asperger's Syndrome, Syndrome Rett, the disruptive disorder and the typical Pervasive Developmental Disorder.

Today autism is recognized as a pervasive development disorder with biological background and disturbances in communication and social interaction skills. Learners with autism end up doing solitary activities and often they do not respond when asked to communicate. Usually they do not interact with their peers, not because they don't want to but because they don't understand how to communicate with neurotypical people (Welton et al, 2004).

Autism is not treated and accompanies the person throughout his life, affecting perception, thinking and behavior. It affects people with varying degrees of severity and therefore we use the term "autistic spectrum disorders" (ASD). The mental capacity varies from person to person and can coexist with prompt and severe learning difficulties.

Children with autism learn differently than their neurotypical peers. They are acquiring social skills by learning them and not by simply observing them. They need a more intensive intervention to be successful in the social environment. Social stories have several strengths as interventions since the stories can be individualized and they can be tailored to meet the needs and personality of each learner (More, 2008; Gray, C. A., & Garand, J. D., 1993).

People with ASD seem to have a profound desire to use computers and they usually use it as a tool of entertainment and education (Heo, 2009). The computer offers the possibility to the learner with autism to work in a controlled environment that is predictable and does not contain social stimuli. In this way, the computer helps the student to maintain attention and concentration in an activity. The structured teaching helps children with autism have a more organized behavior and act with greater success and autonomy (Mesibov, 2005).

The characteristics of people with ASD that are related with learning might be summarized below: a) they have a different way of communication. b.) they like a stable environment, they don't like surprises. c.) They need to be informed of why and what we are doing in a learning task. Other ways, they cannot understand what is happening and they are losing their interest. d.) they don't like emotional cues, they don't understand them, when are communicated in the usual way neurotypical peers communicate. e.) in general, they prefer images to text. f.) they work much better in structured environment and structured educational sets. g.) repetition of learning tasks helps them learn them. h.) they need breaks when learning. i.) they enjoy using computers.

The advantages of computers that are related with the special characteristics of autistic people can be summarized as follows:

- They are predictable and thus they are controllable devices. Computers are stable in their "behavior".
- They don't have emotional behavior that often disturbs people with autism.
- They enable non-verbal or verbal expression
- A child feels less threatened when corrected by the computer, than from the teacher or parent.
- Programs can be used multiple times. It can accommodate repetition and reinforcement of prior learning.
- Most children find it relatively easy to handle computers, just given the basic assistance. The same goes for children with special needs.
- The computers and programs can be tailored to individual needs and difficulties of each child. Special hardware solutions have been invented in order to help people with special needs. Software can be adaptive and adaptable to user's needs and special characteristics.

Digital Storytelling

Children begin to write their stories through images symbolically representative. They use pictures to create a sequence (beginning, middle and end) that has a plot and tells a story (Gershon & Page, 2001). The stories last a few minutes and have different purposes; the telling of a personal tale, the recounting of a historical event, or a presentation that is aiming to inform or to instruct on a particular topic of interest (Robin, 2006).

Storytelling is an old concept that has been widely used (Lathem, 2005). Nowadays it has found a different form of presentation and creation with the use of digital media. As pedagogy develops over time, new didactic methods are developed to enhance the learning experience. Known concepts are reused, adjusted in new pedagogical settings that are enhanced with the use of technology (Levin, 2003).

Digital storytelling allows learners to develop a narrative story, to portray their knowledge in a structured way and give meaning to a sequence of images that describe a story. Software systems that accommodate the above, have been presented in various forms. These systems support the execution (performance) and the creation of digital storytelling. Digital storytelling supports technology to help learners convey their thoughts and empower themselves (Valkanova & Watts, 2007). Lathem (2005) defined the domain as the combination of traditional oral storytelling with multimedia. The many different means of communication that can be used in digital storytelling (writing, voice, image and sound) encourages innovative ways of presentations that accommodates user interaction.

System overview- DISSA

The system designed (DiSSA) has five main axis; adaptation, presentation, creation, evaluation, conceptualization.

Users (special education teachers, parents or the students themselves in some cases) choose a social skill to learn. The relevant story is picked up from the stories pool. The story is adapted to suit user's special characteristics and needs (use of text or not, movements, sound or text messages and other adaptive elements). The system dynamically decides how information is presented to users (adaptive approach) with respect to the adaptivity dimensions user and content (figure 1).
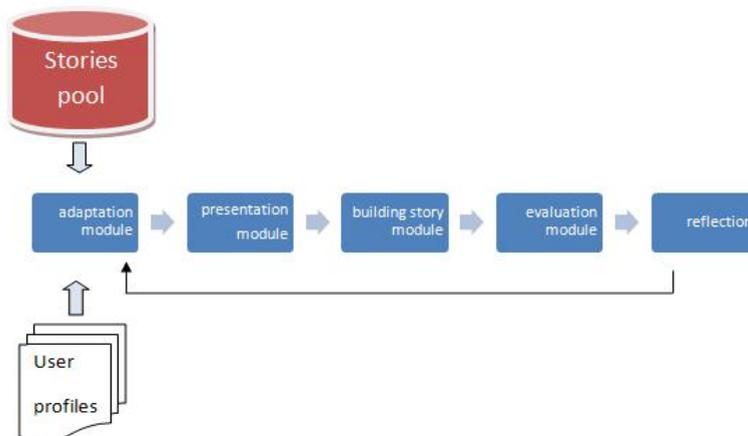

Figure 1. System's overview

A sequence of images is presented which tells a story (figure 2a). After the presentation, the images are placed randomly in the screen (figure 2b). Users have to place the pictures in a sequence to create a story (In figure 2, the story presented is about "opening a present").

The images used are realistic. The user is asked to interact with the system to place the images in the right order.
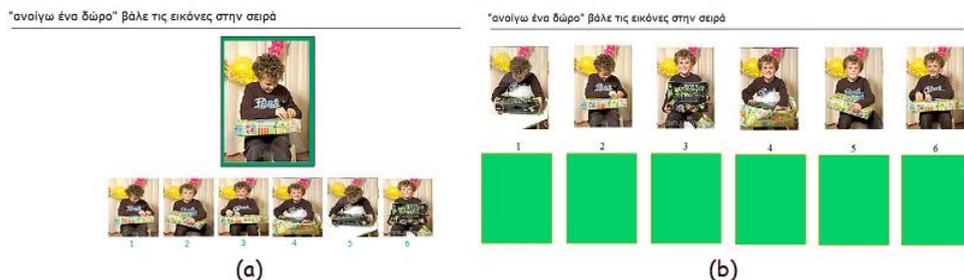

Figure 2. The user views the sequence and then interacts to place images correctly.

Relevant sound messages are presented reflecting user's actions. The messages "drive" users to the right direction in order to make the correct decision. The system tells the users what they have to do and what the outcome will be at all stage of performance.

The system provides sound messages. Text messages are presented too, in order to build a relationship between images and words. In evaluation module, user's performance is recorded, stored and compared with previous user's attempts in the same story. Depending on results, in reflection module the system picks up the same subject matter for example "how to open a present" with different images. This is needed due to the need of abstract conceptualization of the social skill presented. Therefore another story is presented to make sure the learner understands the particular skill independently of the particular sequence.

A "present" is given every time user puts an image in the correct place. People with ASD are very fond of animals, thus the present is an animated animal that places itself in a different space in the screen than user's working space in order to prevent disturbances in the main working area that could confuse and annoy the autistic student (figure 3).
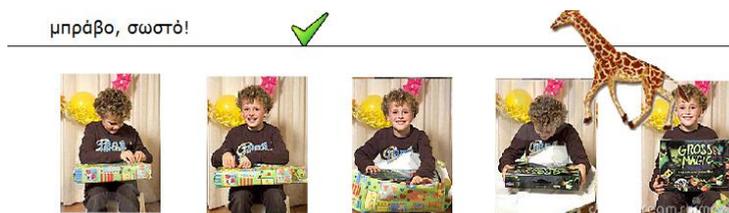

Figure 3. A "present" is given every time user puts an image in the correct place.

Conclusions

The form of the narrative storytelling has changed over the years, without changes in its purpose. The digital storytelling is serving the same purposes with the inclusion of new media and its performance through computers. The number of available digital storytelling systems is indicative of their importance in the entertainment and educational process. Their use, for learners in the spectrum of autism, has been introduced in the last decade and

systems appropriate for this special group of learners need to be designed and evaluated. DiSSA, the system presented uses structured learning for teaching social skills to this special learning group and has the appropriate characteristics such as elimination of disturbances in application's working area, visual cues and extensive use of images. The continuous evaluation serves for specialists to define users' competence with the learning task. Application is often essential to be operated by teachers in order to reinforce their pedagogical role and indicate particular learning objectives. The use of digital storytelling promises to make learning more attractive and students active and productive under individual or collaborative and communicative activities. DISSA will be evaluated from students with ASD and pedagogists from special education. Some tests already took place online and first results were promising.

References

Barry L. & Burlew S. (2004). Using Social Stories to Teach Choice and Play Skills to Children With Autism, *Focus Autism Other Dev Disabled*, 2004 vol. 19 no. 1 45-51.

Burgess, Jean E. (2006) Hearing ordinary voices: Cultural studies, vernacular creativity and digital storytelling. Continuum: *Journal of Media and Cultural Studies*, 20(2), pp. 201-214.

Gershon, N. & Page, W. (2001). What Storytelling can do for information visualization. *Communications* of the *ACM* (CACM), 44(8), 31–37.

Gray, C. A., & Garand, J. D. (1993). Social stories: Improving responses of students with autism with accurate social information. *Focus on Autistic Behavior*, 8, 1–10.

Heo, M. (2009). Digital storytelling: An empirical study of the impact of digital storytelling on pre-service teachers' self efficacy and dispositions towards educational technology. *Journal of Educational Multimedia and Hypermedia*, 18(4), 405-428.

Kulla-Abbott, T., & Polman, J. (2008). Engaging student voice and fulfilling curriculum goals with digital stories. *Technology, Humanities, Education & Narrative,* (5), 38-60.

Lathem, S.A. (2005) Learning Communities and Digital Storytelling: New Media for Ancient Tradition. Society for Information Technology and Teacher Education International Conference 2005.

Laushey K. and Heflin L. (2000)., Enhancing Social Skills of Kindergarten Children with Autism Through the Training of Multiple Peers as Tutors, *Journal of autism and developmental disorders,* Volume 30, Number 3, 183-193,Springer.

Levin, B. B. (2003). Case studies of teacher development : An in-depth look at how thinking about pedagogy develops over time. Mahwah, N.J.: L. Erlbaum Associates.

Li, L. (2007). Digital storytelling: Bridging traditional and digital literacies. In T. Bastiaens & S. Carliner (Eds.), Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2007 (pp. 6201-6206). Chesapeake, VA: AACE.

Meadows, D. (2003). Digital storytelling: Research-based practice in new media. *Visual Communication*, (2), 189-193.

Mesibov, G.B., Shea, V., & Schopler, E. (2005). *The TEACCH approach to autism spectrum disorders*. New York: Kluwer Academic/ Plenum Pubishers.

More C.,(2008). Digital Stories Targeting Social Skills for Children With Disabilities Multidimensional Learning, *Intervention in School and Clinic,* January 2008 vol. 43 no. 3 168-177.

Robin, B. (2006). The educational uses of digital storytelling. In C. Crawford et al. (Eds.), Proceedings of Society for Information Technology and Teacher Education International Conference 2006 (pp. 709-716). Chesapeake, VA: AACE.

Sadik, A., (2008), Educational Technology Research and Development, Volume 56, Number 4, 487-506, Springer.

Sansosti, F. J., Powell-Smith, K. A., & Kincaid, D. (2004). A research synthesis of social story interventions for children with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities,19,* 194–204.

Valkanova Y., & Watts M.(2007): Digital story telling in a science classroom: reflective self-learning (RSL) in action, *Early Child Development and Care*, 177:6-7, 793-807.

Welton, E., Vakil, S., & Carasea, C. (2004). Strategies for increasing positive social interactions in children with autism: a case study. *Teaching Exceptional Children*, 37, 40–46.

Yuksel, P., Robin, B., & McNeil, S. (2011). Educational uses of digital storytelling around the world. In M. Koehler & P. Mishra (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2011 (pp. 1264-1271). Chesapeake, VA: AACE.