MUSICAL PEDDY-PAPER: A COLLABORATIVE LEARNING ACTIVITY SUPORTED BY AUGMENTED REALITY

José Duarte Cardoso Gomes, M.C.S. *
*Centro de Investigação em Artes e Comunicação, Universidade Aberta, Universidade do Algarve, Portugal **
*jdgomes65@gmail.com **

Mauro Jorge Guerreiro Figueiredo, Ph.D. *
*Centro de Investigação Marinha e Ambiental, Centro de Investigação em Artes e Comunicação, Instituto Superior de Engenharia, Universidade do Algarve, Portugal **
*mfiguei@ualg.pt **

Lúcia da Graça Cruz Domingues Amante, Ph.D. *
*Laboratório de Educação a Distância e Elearning, Universidade Aberta, Portugal **
*lucia.amante@uab.pt **

Cristina Maria Cardoso Gomes, M.C.S. *
*Centro de Investigação em Artes e Comunicação, Universidade Aberta, Universidade do Algarve, Portugal **
*ccardosogomes@gmail.com **

ABSTRACT

Gaming activities are an integral part of the human learning process, in particular for children. Game-based learning focuses on motivation and children's engagement towards learning. Educational game-based activities are becoming effective strategies to enhance the learning process.
This paper presents an educational activity focusing to merge mobile computing devices and Augmented Reality, as a means to engage student in collaborative learning towards the Aesthetical Periods of Music History. The Musical Peddy - paper proposes student to use their mobile computing devices (smartphones/ tablets) to find eight stations scattered in a set location, and then use their music literacy skills to find the correct answer in each station. Collaborative work is required to find the stations and the answers to the clues.
The musical Peddy-paper was developed mixing Geo-location and Augmented Reality concepts. Geo-location Points of Interest (POI's) where set through Hoppala platform. Augmented Reality browsing and QRCode reading is supported by the LAYAR platform.
In this paper, we introduce the concept of game-based activities as a tool to promote motivation and engagement towards learning, and fully explain the development process of the activity.
We conclude this paper presenting the conclusions contemplating the use of this activity among a group of children from the 2nd Cycle of Basic Education in Basic School Maria Manuela de Sá, Matosinhos – Portugal.

KEYWORDS

Music History, Augmented Reality, Geo-location, Motivation, Engagement, Cooperative learning.

1. INTRODUCTION

Gaming and ludic activities can act as tools to enhance student participation, facilitating cooperative learning. These game-based educational activities can be more effective than the traditional teaching methods and are an effective approach to promote success (Criado, Salgado et al. 2010).

Portuguese public schools, at present, have large, non-homogeneous classes. It's frequent to find non-motivated students towards the learning processes, concerning different areas. Traditional teaching methods sometimes seem to be an ineffective way to promote engagement and motivation to these students. Game-based educational activities supported by mobile computing devices can act as a trigger to added success, collaborative learning and improved learning outcomes. According to Jonassen (2007) students learn to think significantly, with the thought-activated activities that may be provided by computer or teachers. The Musical Peddy-paper intends to act as an extension activity based on innovative non-formal educational approach, promoting fun, experiential, playful and collaborative learning.

This paper introduces the concepts of game-based activities, geographical Points of Interest (POI's), Geo-location and Augmented Reality, mixed and applied in educational context. It fully describes the development process of the Musical Peddy-paper activity focusing to an audience of Music Education fifth grade students. We conclude, presenting the preliminary conclusions from the activity conducted among a sample group of students at EB Maria Manuela de Sá, Matosinhos.

The paper is organized as follows: Section 2 introduces the concepts of game-based activities as tools to engage and motivate students towards learning. Section 3 describes the Musical Peddy-paper activity development with the HOPPALA and LAYAR platforms. Section 4 describes the implementation process in an educational environment. Possible learning outcomes and conclusions are presented in section 5.

2. GAME-BASED ACTIVITIES TO ENHANCE LEARNING

Games have the power to teach, to train, to educate and to bring people together. In *The Republic*, Plato drew the connection between play and education as he recommended the use of games for the education of children. In early learning stages as preschool or kindergarten, games are taught as socializing activities and preparation for further learning (Michael and Chen 2006).

According to Smith (2007) active learning theorists encourage teachers to consider the motivational context for students in their classes. The premise is that students learn best when they feel the need to know. Activities that provide rewards or prizes act as a motivational force. The actual generation of students is characterized as having low-thresholds for boredom and short attention spans. In this context, interaction and group activities are becoming essential pedagogical practices.

These activities are well supported by recent Information and Communication Technologies (ICT), such as Augmented Reality and handheld mobile computing devices as smartphones and tablets. Augmented Reality is getting more important every day, encouraged by the new smartphones and tablet revolution. According to Zarzuela, Pernas et al. (2013) these devices will define a new way of seeing, thinking and understanding reality. Actual students have known digital technology from early ages, and are commonly identified as the "digital native generation" (Vasconcelos and Ribeiro 2013). These students previous knowledge can be harnessed to promote learning, blending technology and curricula in different areas.

This approach is closely related to basic constructivism principles, focusing on activities and environments over learning objects itself. According to Wangpipatwong and Papasratorn (2009) quoting Parker and Becker (2003) and Tynjala (1999), students achieve better results in constructivist environments. In constructivism, knowledge is not external to the individual, so that learning involves the construction of personal knowledge from experience and prior knowledge. It appears that the constructivist learning is an approach that effectively motivates students, allowing a learning process more active, exploratory and interactive. In other words, through the learning process, students construct their own knowledge.

The Musical Peddy-paper aims to promote a constructivist learning environment based on group work methodology by offering a game-based recreational activity. The activity focuses on the role of previous student knowledge (both music and ICT); the role of the context and the experience itself; the interactive and cooperative character of learning; the new roles assumed by students and teachers and the involvement and reflexing of the student on the undertaken task.

The activity focuses on the use of mobile computing devices, Geolocation and Augmented Reality to enhance student engagement and promote learning in the area of music education.

3. ACTIVITY DEVELOPMENT

Peddy-paper is known as a pedestrian orientation proof, designed for teams, consisting of a path to a number of points or stations attached to questions concerning a subject, in this case, Music History related . The Peddy-paper is a playful activity, usually linked to the acquisition of knowledge about a certain topic. The Musical Peddy-paper activity was developed with the HOPPALA and LAYAR platforms and designed to remix concepts of Geolocation, and Augmented Reality as support to find and interact with eight stations, spread within the physical school area. Through AR and the Layar app, students can find the real-world geographic location of an object and interact with it. For the purpose of the activity, QRCodes were used to display web pages containing a music related question and some clues that pointed to the correct answer.

3.1 Hoppala platform

Hoppala[1] Augmented Reality (AR) Content Platform is open to all major mobile ar browsers, such as Layar, Wikitude and Junaio. Hoppala Augmentation provides an easy-to-use graphical web interface to create augmented reality contents. This graphical interface allows users to create and configure Points of Interest (POI's) and export them as API URLs configured to serve as "getPOIs response" in the ar browsers. The interface includes a dashboard to create and name the overlay URL's, featuring title, name and the URLs Overlay address. Each overlay is programed in a simple interface, by adding and configuring the required augments, viewing the geographical location in map or satellite view. The platform allows users to configure each augment by adding titles, up to three levels of description, thumbnails, footnotes and filter values. These configurations export to the chosen augmented reality browser, in this case, Layar.

3.2 Layar platform

Once all required POI's are set in Hoppala, it is required to choose one of the three augmented Reality Browsers, namely, Layar, Wikitude or Junaio. We have chosen Layar, which indexes the Points of Interest with associated information and URLs. These points are picked up by the Layar browser on a mobile device, to create the 3D overlay on reality. Layar doesn't host the files itself, these are hosted by Hoppala that also supports the editing of POIs and metadata. The steps involved in creating an augmentation layer with Hoppala and Layar are as follows:

- Create Hoppala account and the required layer;
- Create a Layar account and create a new Geo Layer;
- Associate the Layar Geo-layer with the Hoppala layer and add extra information.

The Layar interface allows configuring and to add information through a set of menus, such as:

- Overview;
- API;
- Metadata;
- Graphics;
- Settings;
- Permissions.

The Layar web interface also allows edition, testing, consulting errors/ logs and to view usage statistics. The overall process is quite straightforward and allows users to create Geo-location layers without programming knowledge. Final steps include the layer publication.

4. ACTIVITY PREPARATION

For our Peddy-paper activity, eight geographical positions were chosen within the school area, as one of the requirements were to confine the area activity in a secure location. Each of these positions would act as a station. The first seven stations displayed a printed QRCode with one music question and some clues to find

[1] www.hoppala-agency.com

the correct answer. The last station prompted the users to an online form, where they write the answers, the team member names, class, and other questions concerning the Peddy-paper activity itself.
Previously to the activity, students received a simple brochure with clear instructions on how to perform the activity. The requested material was the brochure itself and a pencil. The principal requirement was that one of the team members should have a mobile computing device (smartphone/ tablet) featuring the app Layar and capable of GPS and exterior internet access.
The activity was available in a period of four days and the students had time to organize their teams and prepare their quest.
The activity was proposed in a class of fifth grade students, on EB Maria Manuela de Sá – Matosinhos. Five teams were organized and all accomplished successfully the challenge, overcoming the technology and musical challenges.

5. CONCLUSION

Musical Peddy-paper activity was held during the last week of the school year, so there was little time to implement a thorough case-study analysis and to conduct student interviews. However, relevant data elements were collected from direct observation and from the online forms filled by the students. The five teams were supervised by teachers while conducting the activity. Direct observation revealed high levels of enthusiasm and engagement towards the activity itself as great concern in achieving good time results and accurate answers in each station. In each team students shared their knowledge concerning the specific Music History questions and some even researched their notebooks or textbooks to find relevant information. Data gathered from Google Drive forms filled in the last checkpoint revealed that all the Geo-located stations were found and all the required answers concerning the music questions were also accurate. Regarding the mobile computing devices used, data show that students used five Android based smarthphones. The Aesthetical Periods of Music History are key points to understand music evolution over time and how music integrates itself in different cultural contexts. Activity driven learning outcomes resided mostly on the application of the musical knowledge acquired along the school year in different contexts. Answer accuracy shows that, in each team, students were able to correctly identify twentieth century composers, musical instruments and musical styles, through clues involving sound, image, video and graphics.
These preliminary observations and student feedback, suggest that this kind of game-based activity may contribute to added interest and motivation towards learning and scholarship outcomes, by promoting the use of technology and previous student knowledge to consolidate specific learning objectives.
Further work is required to perceive the impact of these activities in student scholar outcomes, focusing on the potential benefits on their scientific knowledge, motivation and engagement.

REFERENCES

Criado, M. O. d. U., S. M. Salgado and C. d. L. C. Durán (2010). "Herramientas para el aprendizage colaborativa una aplicación prática del juego do rol." Teoria de la Educación: Educación y cultura en la Sociedad de la Información **11**(3): 277-300.

Jonassen, D. H. (2007). Computadores, Ferramentas Cognitivas. Porto, Porto Editora.

Michael, D. and S. Chen (2006). Serious Games: Games That Educate, Train, and Inform. Boston, MA, Thomson Course Technology PTR.

Smith, F. A. (2007). "Games for Teaching Information Literacy Skills." Library Philosophy and Practise **9**(2).

Vasconcelos, J. B. d. and N. Ribeiro (2013). Tecnologias de Programação de Jogos. Lisboa, FCA - Editora de Informática, Lda.

Wangpipatwong, T. and B. Papasratorn (2009). The Influence of Constructivist E-Learning System on Student Learning Outcomes. Information Communication Technologies for Enhanced Education and Learning Advanced Applications and Developments. L. Tomei. New York, Information Science Reference**:** 45-59.

Zarzuela, M. M., F. J. D. Pernas, L. B. Martínez, D. G. Ortega and M. A. Rodriguez (2013). "Mobile serious Game using Augmented Reality for Supporting Children´s Learning about Animals." 2013 International Conference on virtual and Augmented Reality in Education: 375-381.