Project "Models and Applications of Serious Games in Education of Cultural Heritage and National Identity"

Stanislava Slavova-Petkova

Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Sofia, Bulgaria
stanislava_slavova_bg@yahoo.com

Abstract. The current project aims to develop innovative models and technology-based solutions for contextual use of digital cultural resources for educational application through serious educational games. The author plans to implement fundamental and applied research mainly in the field of information and communication technologies (ICT) in order to acquire new knowledge without direct commercial application or use. The project is oriented towards the achievement of scientific results in the field of: technology-enhanced learning/training, serious games, visualization techniques, etc. In order to achieve this goal, the research approaches and methodology in the field of ICT used in the practice of Institute of Mathematics and Informatics, Bulgarian Academy of Sciences will be used. The expected results are creating new models and tools for contextual use of digital cultural resources for educational application through serious educational games.

Keywords: Information and Communication Technologies, Serious/Applied Games, Gamification, Technology-enhanced Training, Cultural Heritage

1   Introduction

Technology-enhanced training (also called technology-assisted training) uses the method of serious games as a research, learning and measuring instrument. This method helps the teacher to stimulate learning, curiosity, creativity and logical thinking in learners, builds up different skills and competences. Serious educational games aim at introducing tools for better understanding, creative thinking, learning-by-doing (creation, authorship), and engaging learners in more active participation in the process of knowledge perception. The main issues raised in the development of serious educational games are: How can the learner be activated and stimulated? What tasks can be interesting and attractive and could stimulate a desire to learn new things? How does the game stimulate motivation, engagement and improvement of learning outcomes? How to improve understanding of the learning content by using inconspicuous and unobtrusive modern methods desired and accepted by the learner? What is the learner's or target audience profile and how does it influence the learning outcomes?

In recent years a team of the Mathematical Linguistics Department of the Institute of Mathematics and Informatics, Bulgarian Academy of Sciences (IMI-BAS) has been working on creating tools for contextual use of digital cultural resources for educational

use through the method of serious educational games. Among other activities, it built models and applications of serious educational games using related multimedia cultural resources to support the display and understanding of cultural heritage in an innovative and interactive way. Together with a team from the Institute of Computer Science and Management at the Hungarian Academy of Sciences, the BOOK @ HAND BIDL application was created, containing several interactive educational games aimed at deepening consumer knowledge of Bulgarian icons (Luchev, et al., 2016) (Draganov, et al., 2015). A serious educational 3D video game was created for an introduction to the Bulgarian Orthodox iconography and in particular a concrete iconographic characters (Bontchev, Paneva-Marinova, & Draganov, 2016) (Bontchev, Paneva-Marinova, & Draganov, 2016), etc.

2   Project Description

The current project aims to develop innovative models and technology-based solutions for contextual use of digital cultural resources for educational application through serious educational games (Slavova-Petkova, Dimova, & Luchev, 2016). The project team is planning to conduct fundamental and applied research mainly in the field of Information and Communication Technology (ICT) and Information Technology to acquire new knowledge without any direct commercial application or use. The project is geared towards seeking new knowledge and achieving scientific results in the field of: Technology-enhanced learning, serious games/gamification, visualization techniques, intelligent management of databases and more .

The project goal is to be achieved upon the completion of the following tasks:

— Exploring the world-wide scientific and research experience in the field of serious educational games and their application in cultural and historical education;
— Study of methodological aspects for application in primary education and the target group of learners;
— Building a model and prototype of a serious educational game using pre-selected multimedia cultural and historical resources for application in primary education; Experimental applications of the developed serious educational game in a real learning environment.

The main hypothesis of the scientific research is that the knowledge acquisition in the field of the national cultural and historical heritage (including the selected sub-areas of it, part of the 3rd and 4th grade curricula) would be more effective and successful with the application of new ICT technologies and modern educational approaches, especially using serious educational games with rich multimedia and semantic content. Current problems to be overcome: lack of unified structures for de-scribing digital cultural and historical materials; insufficient attractiveness of presentation; difficulties in their contextual use in a real learning situation, etc. In addition, technological transfer and the development of technical, humanitarian and social sciences as well as innovation in these fields will be significantly promoted.

In order to achieve the main objective and prove the hypothesis in the project, research and development approaches will be used in the field of ICT, education and the additional related scientific fields (history, cultural and historical heritage and national identity, man and society). The research methodology, adopted and used for many years in IMI-BAS and taking into account good international practices, will also be applied in the current project (Luchev, Pavlov, & Paneva-Marinova, 2015) (Paneva-Marinova, Goynov, & Luchev, 2017). The later also includes:

— Methods and techniques for research studies, collection, selection (synthesis), analysis and summary of scientific information on achievements, good practices, developments related to the purposes of this study;
— Conceptual modeling, methods and techniques for offering and analyzing ideas for the realization of basic technological components and tools;
— Conceptual modeling, methods and techniques for software design of functional components of the proposed technological means, etc., based on the ideas from the previous point;
— Monitoring and control schemes and internal evaluation of the research activities carried out.

Research methods and techniques are based on the standard methodology adopted by computer science and ICT and suggests that the tools created will be reusable, flexible and extensible. The research methods and techniques in the project take into account the exceptional dynamics of the field's development and its interdisciplinarity.

The expected results of the research are building new models and tools for contextual use of digital cultural resources for educational application through serious educational games. In the process of research and acquisition of new knowledge, the following research results would be achieved:

— Demonstrate the basic hypothesis of scientific research;
— Model and development of a serious educational game using multimedia cultural and historical resources;
— Analysis of the current world trends in the field of serious educational games;
— Analysis of methods and tools for creation and modeling of multimedia re-sources from the field of cultural heritage for educational purposes.

Dissemination of results among the Bulgarian and international scientific com-munity:

— Publication of project results in scientific journals, a copy of which will be attached to the report.
— Papers and posters presented at international scientific forums or national ones with international participation, a copy of which is going to be attached to the report. Furthermore, it is planned to participate in IMI-BAS forums: International Conference on Digital Presentation and Protection of Cultural and Scientific Heritage, organized under the aegis of UNESCO, Scientific Conference with International Participation Cultural and Historical Heritage: Preservation, Presentation, Digitization, etc. as well as in relevant inter-national forums such as the European Conference on

Games Learning, eLearning and Software for Education Conference, and the International Workshop on Gaming and Games for Learning.

Contributions to the development of the young scientist: Research - the aim of this project - will inevitably help to increase the qualification of the author (PhD student) through mobility and participation in scientific forums and to establish international contacts with other scientists in the area. The project will provide a field for professional development and advancement in the young researcher's science, development of professional skills, improvement of the conditions for research, etc. It is envisioned that the results of the project will serve as the basis for the dissertation thesis of the doctoral student. The development of the research theme of the project in its modern and innovative form will contribute to the increase of the scientific capacity of IMI-BAS for successful participation in future contests on the subject. Continuation of the studies is foreseen after the completion of the project, incl. participation in other national and international projects.

3 Phases of the Project

3.1 Phase 1 - Design a serious educational game using cultural multimedia resources.

This phase includes activities to study national and worldwide scientific and research experience in the field of serious educational games and their application in cultural and historical education. Methodological aspects for application in primary education and the target group of learners are studied. There is a model of a serious educational game using pre-selected multimedia cultural and historical resources for application in primary education.

3.2 Phase 2 - Design and construction of educational game models and tools using multimedia cultural and historical resources.

During the implementation of the phase activities, a prototype of a serious educational game will be developed, using pre-selected multimedia cultural and historical resources for application in primary education. Experimental applications of the developed serious educational game are planned in a real learning environment.

3.3 Phase 3 - Dissemination and publication of project results.

Scientific and public circles are going to be informed about the project's implementation with reports and publications.

4 Conclusions

The aims of the project are to be made some researches in the field of technologically supported training, serious games / gaming, visualization techniques, etc. Based on these results will be developed serious game which support learning on cultural and historical heritage at school.

Acknowledgements

References

Bontchev, B., Paneva-Marinova, D., & Draganov, L. (2016). An Educational 3D Maze Game for Bulgarian Orthodox Iconography. *Proceedings of the Sixth UNESCO International Conference on Digital Presentation and Preservation of Cultural and Scientific Heritage* (pp. 283-284). Veliko Tarnovo, Bulgaria: Institute of Mathematics and Informatics, Bulgarian Academy of Sciences.

Bontchev, B., Paneva-Marinova, D., & Draganov, L. (2016). Educational video games for Bulgarian Orthodox iconography. In L. G. Chova, A. L. Martínez, & I. C. Torres (Ed.), *ICERI2016 Proceedings 9th Annual International Conference of Education, Research and Innovation* (pp. 1679-1688). Seville, Spain: IATED Academy. doi:10.21125/iceri.2016.1374

CultEcoSys-Project. (2017). *Concepts and models for innovation ecosystems of digital cultural assets, No. DN02/06/15.12.2016 (project web page).* Retrieved March 20, 2017, from http://cultecosys.math.bas.bg

Draganov, L., Paneva-Marinova, D., Pavlova, L., Luchev, D., Márkus, Z., Szántó, G., & Szkaliczki, T. (2015). Technology-enhanced learning for cultural heritage. In R. Pavlov, & P. Stanchev (Ed.), *Proceedings of the 5th International Conference on Digital Presentation and Preservation of Cultural and Scientific Heritage. 5*, pp. 293-301. Veliko Tarnovo, Bulgaria: Institute of Mathematics and Informatics - BAS. Retrieved March 25, 2017, from http://dipp.math.bas.bg

Luchev, D., Paneva-Marinova, D., Pavlov, R., Kaposi, G., Markus, Z., Szanto, G., . . . Veres, M. (2016). Game-based learning of Bulgarian iconographical art on

smart phone application. *Proceedings of the International Conference on e-Learning* (pp. 195-200). Bratislava, Slovakia: University of Ruse, Bulgaria. Retrieved March 20, 2017, from http://elearning-conf.eu/docs/cp16/paper-30.pdf

Luchev, D., Pavlov, R., & Paneva-Marinova, D. (2015). Digitalnata kultura. Problemi i resheniya (Digital Culture. Problems And Solutions; in Bulgarian). *ICT in library and information studies, education and cultural heritage. Conference Proceedings* (pp. 68-87). Sofia: UNIBIT.

Paneva-Marinova, D., Goynov, M., & Luchev, D. (2017). *Multimedia digital library: Constructive block in ecosystems for digital cultural assets. Basic functionality and services.* Berlin, Germany: LAP LAMBERT Academic Publishing.

Slavova-Petkova, S., Dimova, M., & Luchev, D. (2016). Learning scenario for better understanding of fairy tales using role-playing and serious games methods. In R. Pavlov, & P. Stanchev (Ed.), *Proceedings of the 6th UNESCO International Conference on Digital Presentation and Preservation of Cultural and Scientific Heritage. 6*, pp. 241-246. Veliko Tarnovo, Bulgaria: Institute of Mathematics and Informatics - BAS. Retrieved May 10, 2017, from http://dipp.math.bas.bg