PREFACE

This special issue on **Innovations in Education through ICT** is the outcome of work carried out at the Centre of Information Society Technologies and the Department of Information Technologies, Faculty of Mathematics and Informatics, St. Kliment Ohridski University of Sofia. It covers the main results obtained from the implementation of several international scientific projects funded by the European Commission (EC).

The Centre of Information Society Technologies (CIST) was set up in 1999 through the implementation of a research project aimed at establishing a Centre of Excellence in the field of Information Society Technologies. The Centre is a part of the Faculty of Mathematics and Informatics (FMI) at the University of Sofia. Initially, CIST was more focused on information and educational technologies, but during the years its activities expanded and it became an interdisciplinary innovation-oriented research centre. Nowadays, the Centre engages in research activities and provides services in the field of ICT for a wide variety of stakeholders both in public and private sector. The CIST team obtained a reward from the Ministry of Education and Sciences as the best-performing Bulgarian research group in ICT for FP6 and FP7—the main framework research programme of the European Union.

The paper "Design and Development of Metadata Editors: Data-centric and User-centric Approaches" reflects the culmination of the work performed by our team in the H2020-ICT-2014-1-644187-RAGE project: Realising an Applied Gaming Eco-system (2015-2019). RAGE is the flagship project of

the EC in the area of technology-enhanced learning and gamification. The aim of the project is to create a technology and know-how transfer mechanism to accelerate innovation and growth of Applied (Serious) Games studios throughout Europe. In this paper the authors stress on the importance of the metadata standards and models in software development, and how best these processes can be automated.

Another important project in the same domain, funded by the Horizon2020 research programme of the EU, is H2020-ICT-24-2016-731767-SOCIALENERGY project: A Gaming and Social Networking Energy Markets' Operation and Educating Virtual Platform for Evolving Energy Communities (2017–2019). The main goal of this project is to develop a gaming and social network platform for educating energy consumers and virtual energy communities towards evolving EU energy markets' operation. In the paper named "Supporting European Energy Consumers through Gamification and Competence-based Learning" the authors describe the competence framework used for designing and developing the software platform and learning content management system in the project.

Gamification is one of the main topics in this special issue, and one more paper hails from this field: "Towards Automatic Generation of Serious Maze Games for Education". This paper was also inspired by the work done in the RAGE project, but it was later continued in more specific research activities related to the application of serious games in education.

When it comes to educational innovations, it would never do to overlook the role of the main actors—the teachers. The paper "Review of Policy Envisions and Requirements for STEM Teachers in Bulgaria" aims to pave a solid background for the inclusion of one such big innovation as Inquiry Based Science Education into the educational practice of Bulgarian schools. This paper reflects the results achieved under the implementation of 2016-1-E101-KA201-023647-ELITe project: Enhancing Learning In Teaching via e-inquiries (2016-2019), and EU FP7 318499 weSPOT project: Working Environment with Social and Personal Open Tools for inquiry based learning, 2012–2015. Within the weSPOT project the team ran several pilot experiments in schools to implement the project's model and software tools supporting IBSE in STEM subjects in schools. On the basis of all the experience gathered

from these projects, the prerequisites were formulated for the successful implementation of inquiry-based science education (IBSE) in schools adopted in a national research project: change teachers' attitude and provide stronger support to students (at micro level), provide schools management support, form teachers team to share experience and best practices and provide the needed ICT support (at mezzo level) and national curriculum reform, provide constant training for teachers and a rich set of resources based on ICT infrastructure (at macro level).

This special issue concludes with a summary of a PhD thesis called "Semantic-oriented Architectures and Use of Ontology for Organizing Adaptive Search in Digital Libraries". This PhD thesis was based on the results and analysis of one of the most successful research projects: Share.TEC. The main result of the project is the design and implementation of the Share.TEC portal. The portal provides access to more than 100 000 digital resources related to teacher education in Europe. The portal is multilingual and multicultural and provides many advanced features such as adaptability, personalization, recommender system, Web 2.0 support, etc. These features are based on the advanced semantic model developed, including Teacher Education Ontology, Common Metadata Model and Multicultural Metadata model.

Conclusion. The papers in this special issue provide inputs which are very valuable for the research community. They present the state-of-the-art in the fields related to innovations in technology enhanced learning, gamification, inquiry-based science education and competence development. The team presents new and inspiring ideas from several large-scale challenging international research projects, and their great impact on the educational landscape can be seen not only in Europe, but worldwide as well.

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Guest Editor