

INSPIRING SCIENCE EDUCATION CONFERENCE 2016

APRIL 22-24, PALLINI, GREECE

PROCEEDINGS



ELLINOGERMANIKI AGOGI

Published by **Ellinogermaniki Agogi**

Editors:

Dr. Angelos Lazoudis, Dr. Stephanos Cherouvis

Artwork:

Anna Mavroeidi



inspiring
SCIENCE
education

This project has received funding from the European Union's ICT Policy Support Programme as part of the Competitiveness and Innovation Framework Programme (Grant Agreement no. 325123). This publication reflects only the editor's and contributors' views and the European Union is not liable for any use that might be made of information contained therein.

Copyright © 2016 by Ellinogermaniki Agogi

All rights reserved.



This work is licensed under the Creative Commons Attribution-NonCommercial- ShareAlike 4.0 International License. To view a copy of this license, visit <https://creativecommons.org/licenses/by-nc-sa/4.0/>

Printed by **EPINOIA S.A.**

ISBN 978-960-473-775-8

Contents

Enquiring and learning about particles, x-rays and exoplanets 9

Caterina Boccato, *INAF – Osservatorio Astronomico di Padova, vicolo osservatorio 5 35122 Padova (IT)*
caterina.boccato@oapd.inaf.it

Sandro Bardelli, *INAF-Osservatorio Astronomico di Bologna, via Ranzani 1 40127 Bologna (IT)*
sandro.bardelli@oabo.inaf.it

Stefano Sandrelli, *INAF-Osservatorio Astronomico di Brera, via Brera 28, 20121 Milano (IT)*
stefano.sandrelli@brera.inaf.it

CERN, Remote Telescopes, IceCube: The three Major Virtual Visits 17

Chiotelis¹, I., Theodoropoulou², M., and Birbas³, G.

¹*Experimental High School of University of Patras*, ²*General High School of Krestena*,

³*General High School of Pelopio*

johnchiotelis@yahoo.gr, mariatheodoropoulou@ymail.com, georgebirbas@gmail.com

Illustrating problem solving skills in ISE 25

Prof. Dr. Rüdiger Tiemann*, Amany Annagar* & Dr. Jessica Langheinrich[°]

**Humboldt-Universität zu Berlin, Chemistry Department, Chemistry Education, Brook-Taylor St. 2, 12489 Berlin, Germany, ruediger.tiemann@chemie.hu-berlin.de // amany.annagar@chemie.hu-berlin.de*

°Universität Bayreuth, Biology Education, Universitätsst. 30, Building NWI, 95447 Bayreuth, Germany, franz.bogner@uni-bayreuth.de

Connecting Embodied Learning in educational practice to the realisation of science educational scenarios through performing arts 31

Smyrniou Z.¹, Sotiriou M.², Georgakopoulou E.¹, Papadopoulou O.¹

¹*National Kapodistrian University of Athens (NKUA) School of Philosophy, Faculty of Philosophy, Pedagogy and Psychology Department of Pedagogy, University Campus, 15784 Ilissia, Athens, Greece, zsmyrniou@ppp.uoa.gr, elgeorgakop@hotmail.com*, ²*Science View, sotiriou@scienceview.gr*

Highlighting Good Practices in Teaching STEM via Webinars in the Framework of the European Project MARCH 39

Sofia Papadimitriou, *Head of Educational Radio-Television, Ministry of Education, Research and RA, Greece, sofipapadi@minedu.gov.gr*

Anastasia Andritsou, *Head of the Department of Programmes and Partnerships, British Council, Greece, Anastasia.Andritsou@britishcouncil.gr*

The Impact of Scientific School Contests on Students' Attitude towards Science and in following scientific careers 47

Tsourlidaki Eleftheria, *Ellinogermaniki Agogi*, eleftheria@ea.gr

Sofoklis Sotiriou, *Ellinogermaniki Agogi*, sotiriou@ea.gr

Inspiring Teachers for Inspired Children 55

Doran, R., Almeida, M., Costa, A., Cabral, L., Furtado, P.

NUCLIO – Núcleo Interativo de Astronomia, Largo dos Topázios 48 – 3Fte 2785-817 S.D.Rana – Portugal, rosa.doran@nuclio.pt, geral@nuclio.pt

Linking Spatial Thinking and Problem-Solving Skills of Young Children 61

Christos Charcharos, Margarita Kokla and Eleni Tomai

School of Rural and Surveying Engineering, National Technical University of Athens, H. Polytechniou Str. 9, 15780 Zografos Campus, Greece
chchar@central.ntua.gr mkokla@survey.ntua.gr etomai@mail.ntua.gr

Exploring Science via Studying Building and Sharing Models 71

Chiocciariello A., Pastore E., *Consiglio Nazionale delle Ricerche, Istituto per le Tecnologie Didattiche*, augusto@itd.cnr.it, pastore@itd.cnr.it

Following Curiosity on Mars 79

Garabet^{1,2}, M., Baldea¹, A., *SIVECO ROMANIA, Victoria Park, Șoseaua București-Ploiești 73-81, Corpul 4, Sector 1, 013685, Bucharest, Romania, National College “Grigore Moisil”, Bucharest, Timisoara Bd., 33, Bucharest, Romania*, mihaela.garabet@siveco.ro, ana.baldea@siveco.ro

An environmental approach on the importance of Light 85

Eleni Voukloutzi

American Farm School, Thessaloniki, Greece, evoukloutzi@yahoo.com

The steps for elaboration of the “Rosetta stone” demonstrator 91

Radoslav Yoshinov, *Laboratory of Telematics – Bulgarian academy of science, Sofia, Bulgaria*, yoshinov@cc.bas.bg

Monka Kotseva, *Laboratory of Telematics – Bulgarian academy of science, Sofia, Bulgaria*, mkotseva@cc.bas.bg

Fostering connections among Improvisational Art and Science Education.**The implementation of “Meaning Generating Trajectory” 97**

Konstantina Kotsari¹, Zacharoula Smyrniou², *Educational Technology Lab (<http://etl.ppp.uoa.gr/>), National & Kapodistrian University of Athens (<http://en.uoa.gr/>), konkotsari@gmail.com¹, zmyrniou@ppp.uoa.gr²*

Informal astronomy and space education in the constructivist environment 103

Ivo Jokin, *Science teacher in Municipal center for extracurricular activities, municipality Dolna Mitropolia, Bulgaria, e-mail: ivo_jokin@abv.bg*

From the Earth, to the neighbourhood of stars 109

Baboura Anna, *Preschool education, Master of Education – Digital technologies in education anna.baboura@gmail.com*

Inspiring Science Education in Romania 115

Jugureanu¹, R., Baldea¹, A., Garabet^{1,2}, M., *SIVECO ROMANIA, Victoria Park, Șoseaua București-Ploiești 73-81, Corpul 4, Sector 1, 013685, Bucharest, Romania, National College “Grigore Moisil”, Bucharest, Timisoara Bd., 33, Bucharest, Romania, radu.jugureanu@siveco.ro, ana.baldea@siveco.ro, mihaela.garabet@siveco.ro*

Reflection of ISE idea for linking school education and scientific research in the National Strategy for effective implementation of ICT in education and science in the Republic of Bulgaria 123

Radoslav Yoshinov, *Laboratory of Telematics – Bulgarian Academy of Sciences, Sofia, Bulgaria, yoshinov@cc.bas.bg*

Daniela Pavlova, *University for Library Studies and Information Technologies, Sofia, Bulgaria, d.pavlova@unibit.bg*

Orlin Kouzov, *Ministry of Education and Science, Sofia, Bulgaria, okouzov@mon.bg*

Using Astronomical Research in School Education 129

Chris E. North, Haley L. Gomez, Emma Foxell, *School of Physics and Astronomy, Cardiff University, Queen's Buildings, The Parade, Cardiff, CF24 3AA, UK, chris.north@astro.cf.ac.uk, GomezH@cardiff.ac.uk, FoxellE@cardiff.ac.uk*

Edward L. Gomez, Stuart R. Lowe, *Las Cumbres Observatory Global Telescope Network, 6740 Cortona Dr, Suite 102, Goleta, CA9117, United States, egomez@lcogt.net, stuart@strudel.org.uk*

Center for Green Education at Anatolia College 137

E.Kalambokis 1*, L.Antonoglou 2, C.P. Hadjiantoniou-Marouli 2

¹Anatolia College, Pylea, 55510 Thessaloniki, ²Aristotle University of Thessaloniki, 54124, Thessaloniki, ebokis@anatolia.edu.gr

Babies and the Moon 141

Doran, R., Gonçalves, J., *NUCLIO – Núcleo Interativo de Astronomia Largo dos Topázios 48 – 3Fte 2785-817 S.D.Rana – Portugal*, rosa.doran@nuclio.pt, jose.goncalves@nuclio.pt

Gaining Media Literacy by Utilizing Web 2.0 Tools in Primary School IT Education 145

Mirena Maljković, *Primary school “Rapska”, Rapska 3, Zagreb, Croatia*, *Primary school “Jure Kaštelana”, V. Ruždjaka 2a, Zagreb, Croatia*, mirena.maljkovic@skole.hr

Integrating Innovative Practices in Secondary Special Education in Greece 153

Nikolaos Nerantzis,

Physicist in Secondary Special Education (Public Special Junior High School of Thessaloniki)
iSe ambassador for Greek schools (Ellinogermaniki Agogi, Greece), abc57001@gmail.com

Enhancing Reading Comprehension of Students with Reading Difficulties or Dyslexia in the 3rd Year of Primary School, by Implementing Inquiry Based Science Education with Digital Technologies 163

Grigoriou Vasiliki, Zacharoula Smyrniou, *Educational Technology Lab (ETL), National Kapodistrian University of Athens (NKUA) School of Philosophy, Faculty of Philosophy, Pedagogy and Psychology Department of Pedagogy, University Campus, 15784 Ilissia, Athens, Greece*
vgrigoriou1@gmail.com, zsmyrniou@ppp.uoa.gr

The Effect of Vertical Jump Exercise Program in School Setting: A Pilot Study 169

Gortsila, E.¹, Patsiaouras A.²

¹Physical Education Teacher/PhD, Athens, Greece, egortsi@yahoo.gr, ²EUP University of Thessaly/DPESS, Karies Trikala Greece, spat@pe.uth.gr

**The Effect of an Educational Scenario on Throwing Skills Development,
Understanding of Physics Concepts and Initiation into Olympism Values in First
School Age 175**

Roupa Athina, *Ph.D Physical Education Teacher, Ypoloxagou Kapetanaki 47 Agios Dimitrios Athina Attica 17342, e-mail 1) athinaroupa@yahoo.gr 2) aroupa@cgs.edu.gr*

Different Approach for Assessment of Student's Problem Solving Skills 179

Roumen Trifonov, *Technical University of Sofia, 8 st. Kliment Ohridski bul., Sofia 1000, Bulgaria*
r_trifonov@tu-sofia.bg

Galya Pavlova, *Technical University of Sofia, 8 st. Kliment Ohridski bul., Sofia 1000, Bulgaria*
raicheva@tu-sofia.bg

Reflection of ISE idea for linking school education and scientific research in the National Strategy for effective implementation of ICT in education and science in the Republic of Bulgaria

Radoslav Yoshinov,

Laboratory of Telematics – Bulgarian Academy of Sciences, Sofia, Bulgaria

yoshinov@cc.bas.bg

Daniela Pavlova,

University for Library Studies and Information Technologies, Sofia, Bulgaria

d.pavlova@unibit.bg

Orlin Kouzov,

Ministry of Education and Science, Sofia, Bulgaria

okouzov@mon.bg

Abstract

We live in dynamic environment that sets everyday challenges to society and citizens. In order to respond to this dynamics and develop adequate behavior and necessary social, technological, professional and personal skills we need a radically different approach to education. Our children need to be prepared for living in a digital society and be part of the so called knowledge economy. In order to develop innovative products with added value fitted to the information society, students must develop research skills, critical thinking and scientific consciousness from their very early age and developing working synergies between classroom and research centers is a must in the 21st century.

The importance of these processes has been considered quite seriously by the European Union and the European Commission has sup-

ported a series of innovative projects such as Open Discovery Space and Inspiring Science Education that were expected to make the change in the paradigm of the traditional education. The article describes in detail the response of one member state government to the European initiatives and the reflection of the idea for linking school education and scientific research in the National Strategy for effective implementation of ICT in education and science in the Republic of Bulgaria for the period 2014-2020 [1].

The strategy sets its priorities in several directions, including but not limited to:

- Development of unitary modern ICT environment for education, science and innovations;*

- Implementation of integrated digital management in all spheres of education and science and automation of the administrative work of*

university and school teachers and scientists;

- Priority development of generally accessible, universal and compatible (standardized) digital content (including access through mobile devices) as well as significant reduction of paper workflow in education and science;

Keywords

Universal access, technological synergy, fibre backbone, cloud technologies, inspiring science education, ICT strategy, digital society, knowledge economy

1. Introduction

The Strategy for Efficient Implementation of ICT in Education and Science (2014-2020) sets the basic goals, tasks, directions in the informatization of the education and science system in the Republic of Bulgaria up to the year 2020, as well as defines the basic principles, approaches and terms for successful realization of the informatization process. It was adopted in early July 2014 by the Bulgarian Council of Ministers and was widely accepted by the Bulgarian society. One of the reasons for its universal impact not only over academic circles but also over much larger groups of organizations and business companies is its integrated nature combining in unique way the interests of educational and research community as well as that of public institutions. The development of the Strategy was inspired and supported by few major Pan European projects such as Open Discovery Space (ODS) and especially Inspiring Science Education (ISE). These initiatives clearly showed the major trends in developing modern education and science through creating synergy and utilization of common resources such as cloud infrastructure, broadband communications and education platform, concentration of digital resources and successful teaching pedagogical practices.

The Strategy generalizes the expert vision of

ICT implementation in Bulgarian education and specifically:

- Development of unitary modern ICT environment for education, science and innovations;

- Implementation of integrated digital management in all spheres of education and science and automation of the administrative work of university and school teachers and scientists;

- Priority development of generally accessible, universal and compatible (standardized) digital content (including access through mobile devices) as well as significant reduction of paper workflow in education and science;

- Development and adoption of recognized standards and metrics for ICT competency including ICT skills as a component in the career development in education and science;

- Implementation of national external assessment of digital competencies of primary students on graduation and certifying IT skills of students of specialized study course (profiled) and vocational schools;

- Achievement of coordinated planning and realization of ICT projects of the educational and scientific institutions at European, national and regional level – from separate initiatives to realizing long-term and prioritized goals involving maximum stakeholders and achieving economy of scale;

The Strategy outlines how the concentration of resources such as digital fiber backbone and educational and science cloud ICT infrastructure could facilitate the synergy between education and science and also help the automation of the administrative duties of educational practitioners giving them more free time for creative and innovation activities.

2. Implementation activities

Bulgarian educational community embraces

the idea for implementing ICT innovation in everyday work. Throughout the period 2014-2016 more than half of the Bulgarian schools took part in different activities related to implementation implementing ICT innovations in education thus supporting the implementation of ISE project. Some figures that could describe the situation:

From the existing 2556 Bulgarian schools (2015 est.) 1 327 filled e-maturity questionnaire (average score 74/100) and 1 246 prepared an ICT action plan (1 169 did both). Since international cooperation and exchange of good practices is among the primary ISE targets it is useful to mention also that 927 schools translated their plans in English or other EU language, thus showing their interest to collaborate. 871 of these schools chose curriculum areas of interest relevant to science when they filled their action plans thus showing the huge potential for linking educational with science activities nationwide. In these potential BG ISE schools, there are almost 15 000 classes, 19 000 teachers and over 320 000 students.

The ICT Implementation Strategy was written from well-known figures in the Bulgarian education and Science - mainly working in ICT departments of major universities and scientific institutions. Among them there are also people that participate in ISE being part of the local partner institution. This synergy of interest helped the team to promote within the strategy some of the most important aspects of ISE such as cloud technologies based education and science development environment, unified information environment and modernization of education and science infrastructure, development/implementation of digital publically accessible and universal education resources, broadening up digital distance education forms, production and use of information and knowledge etc. The Strategy has three main stages and most of the activities described there fully correlate with ISE development and

penetration concept, thus giving ground to the reasonable assumption that experts just decided to implement what proved to be successful throughout ODS and ISE implementation.

3. ICT in school program

The national program „Information and communication technologies in school“ (ICT in school) of the Ministry of Education and Science donated more than 6 Mln Euros in 2014 and 2015 to approximately 1000 innovative schools based on their ICT preparedness. The experts from the Ministry used e-maturity questionnaires and school ICT action plans developed through ODS and ISE projects in order to rank the schools and give them subsidies for high-speed internet, Wi-Fi access and innovative hardware (more than 20,000 computer terminals, laptops, tablets and other devices were installed in schools in that period).



Fig. 1 Cover page of ICT in school program of Ministry of Education and Science – Republic of Bulgaria (<http://internet.mon.bg/ikt>)

Other important component of the national program ICT in schools was the upgrade of the national educational cloud infrastructure and setting the major fiber lines connecting the 28 regional educational inspectorates which are situated in the regional cities all across the country. A special initiative was started for concentrating all digital school resources countrywide to the educational cloud, as well as starting some strategic talks with major ICT vendors such as Microsoft and Google to facilitate the distance learning activities with their software platforms. The Ministry of Education supported also through one of its establishments the purchase of Adobe Connect platform software which enables few hundred teachers simultaneously to communicate through

5 different virtual rooms thus facilitating international collaboration and massive participation in projects like ISE.

4. Correlation between national innovation initiatives and ISE concept

As we could see, the major Strategy initiatives are quite in line with the overall development of the abovementioned large scale European projects. Some elements of the three stages of the Strategy, that could be considered relevant to ISE concept for example, are as follows:

I stage. Key investments – short-term (2014-15)

- unified backbone network, connecting regional educational inspectorates, universities and science centers;
- national ICT cloud infrastructure for the needs of education and science;
- a backup center for storage, data processing and provision of services;
- national digital education and study content management platform;
- education portal and digital handbooks for all sciences and mathematics subjects.

II stage. Mobility and security – middle-term (2016-17)

- permanent optical or high-speed connection with educational institutions;
- digital platform for video-training, teleconferences and R&D;
- regional resource centers for data and content;

III stage. Universality and sustainability – long-term (2018-20)

- unified education environment for ubiquitous learning (u-learning);
- transition to digital textbooks for all subjects;
- virtual classrooms and laboratories;
- open and universal access to education and science resources.



Fig 2. Implementing the idea for universal backbone and ICT cloud infrastructure [2]

5. Conclusions

As stated by Osborn and Hennessy „While there are changes in the views of the nature of science and the role of science education, the increasing prevalence of Information and Communication Technologies (ICT) also offers a challenge to the teaching and learning of science, and to the models of scientific practice teachers and learners might encounter...” [3]. In this aspect we must confess that modern education sets serious requirements to not only way of teaching and learning but also to the basic understanding of innovation and preparing kids for future life challenges. Projects like Inspiring Science Education are perfect manifestation of that concept and Bulgarian Strategy for effective implementation of ICT in Education and Science and its realization are valid proof that the EU message was heard and well accepted by Member States, encouraging innovation both at national and international levels.

Our expert analysis that was made inside the

Strategy shows potential benefit from its implementation in several directions, related to ISE, such as:

- Sustainable and beneficial environment for provision of quality education and science;
- Strengthening teamwork and international cooperation;
- More prepared school and university students in view of life realities;
- Raise of school and university teachers' and scientists' prestige;
- Free exchange of quality education and science content;
- Strengthening the role of stakeholders in the Pan European education and science space;
- More spare time and personal privacy for teachers and scientists.

Inspiring Science Education project proved to be successful not only through its implementation activities but also with its overall influence on national and international legislation and strategic documents all across Europe and Bulgaria is a perfect success story in that aspect.

6. References

- [1] Стратегия за ефективно прилагане на информационни и комуникационни технологии в образованието и науката на Република България (2014-2020г.) – <http://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=904>
- [2] Кузов, О., Р. Николов, Д. Павлова. Електронното обучение в Стратегията за ефективно прилагане на информационни и комуникационни технологии в образованието и науката на Република България (2014 - 2020) г. В: Сборник с научни доклади и съобщения от Национална научна конференция в чест на 70 години от създаването на ЮНЕСКО и 65-та годишнина на УниБИТ „ИКТ в библиотечно-информационните науки, образованието и културното наследство“, 29 май 2015, София, „За буквите. О Писменехъ“, 2015, с. 14 – 23. [Онлайн издание] http://unesco.unibit.bg/sites/default/files/National_Conference-all-f2.pdf ISBN 978-619-185-164-5
- [3] Jonathon Osborne, Sara Hennessy. Literature Review in Science Education and the Role of ICT: Promise, Problems and Future Directions. A NESTA Futurelab Research report – report 6. 2003. <hal-00190441>