

**BULGARIAN ACTIVITIES IN THE PROJECT COSMOS:
AN ADVANCED SCIENTIFIC REPOSITORY
FOR SCIENCE TEACHING AND LEARNING**

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Abstract. One of the main purposes of the European educational project COSMOS (co-funded by the European Commission under the program eContentplus), is to create an experimental laboratory for the school of tomorrow in order to improve the education in astronomy by expanding the resources for teaching and learning in schools and universities and by providing more challenging and authentic learning experiences for students. A large educational database was created as a result of the project activities made by 15 partner institutions. The unusual electronic "library" offers to students and teachers unique educational resources: learning scenarios, images, presentations, videos and animations (most of them are impossible to produce in any scientific laboratory). It is freely accessible to anyone, anywhere, anytime. Our poster presents the contribution of the Shumen university (the only partner from Bulgaria) in the project: uploading more than 12000 astronomical images in the COSMOS portal; creation of 45 learning scenarios; holding 5 teaching workshops at different places for more than 100 Bulgarian teachers to use the possibilities of the COSMOS portal (including creation of their own learning scenarios). Our analysis of the questionnaires filled-in by the participating teachers shows the necessity of such projects and workshops.

1. INTRODUCTION

One of the main purposes of the European educational project COSMOS (co-funded by the European Commission under the program eContentplus), is to create an experimental laboratory for the school of tomorrow in order to improve the education in astronomy by expanding the resources for teaching and learning (www.cosmos-project.eu). COSMOS project (eContentplus-2006-410025) is funded under the eContentplus programme, a multiannual Community programme to make digital content in Europe more accessible, usable and exploitable. The main purpose of the COSMOS project is to create an experimental laboratory for students and teachers in order to improve science instruction by expanding the resources for teaching and learning in schools and universities and by providing more challenging and authentic learning experiences for students.

2. COSMOS PROJECT

COSMOS project was built upon the state of the art developments as regards the interoperability architectures and metadata standards and the latest evolutions in learning technologies to perform an extended validation on the effectiveness and the efficiency of the proposed approach in the science teaching and learning.

The COSMOS approach may be implemented at two levels:

- at secondary education: The COSMOS approach made educational materials (educational scenarios, lesson plans, collaborative projects with the associated content) easily accessible for creative, hands-on interactive science lessons to meet the needs of school curricula. These are suitable for small-group collaborations and would include automated image acquisition service and/or observatory control as required to complete the lessons, plus the use of copyright material on our project's portal.
- at university education: The databases of the observatories of the COSMOS network are used to improve the quality of science instruction at the university level, while offering to the students the opportunity to realize their own projects and carrying out independent scientific research. Astronomy (or other closely related fields) students can use our service for teaching practical astronomy laboratory techniques and research astronomy courses.

Two major existing repositories, the Discovery Space Portal and the Educational Repository of the Schools Observatory project were used as sources of science education content (projects, activities, lesson plans, astronomical images and scientific data, videos and simulations of physical phenomena, questionnaires and on-line tests). The main outcomes of this work is the COSMOS Tool-Box and the Roadmap for the implementation of a Pan-European Educational service, which include recommendations for European Quality Certification of science education content.

The main objectives of the COSMOS project were (www.cosmos-project.eu):

- The deployment of a Web Repository of educational content using multilingual vocabularies that will facilitate end-users' search, retrieval, access and use of both scientific and educational resources. This was achieved through the unification of the existing educational tools and on-line materials for science teaching.
- The development of a methodology for designing, expressing and representing educational practices in a commonly understandable way.
- To integrate a complete set of tools, namely the COSMOS Toolbox, supporting all stages of the chain: creation, publication, discovery, acquisition, access, and use of Science Educational Content.
- The development and validation of a series of innovative Educational Scenarios of the use of the digital resources according to the designed organization of the knowledge content.
- The development of a systematic validation methodology in order to identify the impact of the proposed approach in terms of the effectiveness and efficiency of the learning process.

- To contribute to the development of a new generation of citizens who are scientifically literate and thus better prepared to function in a world that is increasingly influenced by science and technology.

3. BULGARIAN ACTIVITIES

The activities carried out by the Bulgarian team within the framework of the COSMOS project are:

1. The Bulgarian team of COSMOS Project translated the questionnaire Co-Design Cosmos into Bulgarian and conducted a preliminary survey of the possible Bulgarian users.
2. The team translated the key words and units of the science domains used in the COSMOS Portal and the materials for Workshop Validation. By the 11.8 % translation of the portal COSMOS Bulgaria is on the first place for this activity.
3. Four workshops on the project were held by the Bulgarian team - in Varna, Shumen, Targovishte and Yambol. The goals, tasks and possibilities of the project have been presented. As a result of the training the teachers acquired knowledge how to prepare materials. They are eager now to use the astronomical images, to participate in activities and initiatives of the project.
4. The project Cosmos was presented at the Bulgarian opening ceremony of the International Year of Astronomy on 23.01.09 in Sofia as well as at the opening ceremony of the International Year of Astronomy on 04.02.09 in the town of Shumen.
5. Presentation of an invited report on the Cosmos project at the Annual National Conference of the Bulgarian Society of the Physicists (02-05.04.2009, Ruse).
6. The Presentation of the Cosmos project at the Balkan Astronomical Conference (29 September 2009, Belgrade) aimed at popularizing the COSMOS project among the astronomers of the Balkan countries that are members of Sub-Regional European Astronomical Committee.
7. The Bulgarian team prepared and uploaded 47 different learning scenarios. Three of the TOP 10 Learning scenarios were prepared by the team of Shumen University. These are: "Observations of the Milky Way - our galaxy Observations of the Moon and exploring the lunar surface or "Guide for lunar travelers", Author: Veselka Radeva and "Newton's mistake or how to calculate the speed of light in water", Author: Aneta Marinova. All of the TOP 10 Scenarios were translated into Bulgarian as well as 5 Learning activities written by Austrian authors.
8. Preparation of more than 12000 astronomical images (images of astronomical objects, presentations, animations and URL addresses).
9. The Bulgarian team published a book (Marchev et al. 2009) on the project in Bulgarian which includes: general information of the COSMOS Project; information on the different types of learning scenarios used in the COSMOS project;

guide for using the COSMOS PORTAL (Registration, COSMOS Repository, PORTAL Tool Box, COSMOS Learning Activities Authoring Tool, COSMOS Metadata Authoring Tool, RELOAD Learning Activities Viewer, Working with the COSMOS Portal Software), information about the Bulgarian activities.

10. Two representatives of our team took part in the 4th COSMOS meeting (March 2009, Helsinki, Finland).
11. Four teachers from Bulgaria were trained to work with the software of the COSMOS Portal during COSMOS Summer School (July 2009, Crete, Greece).
12. Four representatives of our team took part in the 5th COSMOS meeting (July 2009, Rethymno, Greece).
13. The Cosmos project was presented at the 5th National Conference on E-Learning, Sofia on October 22, 2009 as well as at the National Conference on Physics and Astronomy, Smolyan on October 23, 2009.

4. CONCLUSION

The cross-border learning and shared knowledge between the partner teams helped for the unification of the education in astronomy as well as enhancing the communication and collaboration of teachers and scholars from different countries. The joint work within the framework of COSMOS project contributed for the improvement of the intercultural relations between our countries and as a result of that cooperation was created a new digital experimental laboratory for students, teachers and university lecturers based on the best achievements of interoperation architectures and metadata standards.

As a future development of the COSMOS Repository the Bulgarian team will add new observational data obtained by the Bulgarian student observatory (with center Shumen University), which will be created within the framework of the scientific project "Establishment of Network of Small Robotic Telescopes in Bulgaria" (SMARTNET).

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