

Open Science

Anna MARTINKOVÁ^a

^a*The Academy of Sciences of the Czech Republic*

Abstract. The project Open Science is intended to provide support and further education to secondary school students and their teachers; also it improves public awareness about research.

Keywords. Science, popularization, secondary school students, teachers, further education

Introduction

Recently, a steady decrease of interest in science by young people has been observed. The average age of researchers and scientists at the institutes has been increasing and the age structure reveals a diminishing ration of young generation. Since the level of science and technical development is one of the prerequisites which ensures the advancement of a society and influences its political and economic position among other societies, it is obviously important to reverse this trend. Enhancement of the competitiveness of the Czech economy on the European market is among the key tasks of the Czech Republic.

This effort must be concentrated above all on suitable target groups – on young people just deciding on their future career (i.e., high school students) and on their teachers, who are in close contact with them and have the necessary specialisation. They are in a position to implement the effort of attracting young people to careers in science and in research. The role of the teacher in this process is crucial, because he/she acts as mediator between the student and science, his influence can be either negative or positive. The respective impact depends on a teacher's knowledge and excitement, on his/her training and staying current in science, teaching methods and other professional skills.

1. Open Science to the wider public

1.1. *Basic facts about the project*

Aware of this long-lasting unacceptable situation, the project Open Science¹ has been launched to deal effectively with this problem. The project is being coordinated within the Academy of Sciences of the Czech Republic, which is located in Prague (Czech Republic). It has the approval of the Czech Ministry of Labour and Social Affairs as a part of Single programming document 3 of the region NUTS 3. There are three main sources of funding

¹ www.open-science.cz

of the project Open Science:

- ESF
- State budget
- Budget of the city of Prague

In light of all that, all the activities of the project Open science will encourage young people to consider careers in science, will provide educational resources to their teachers and finally increase knowledge economy of the Czech Republic.

The project has been designed to function for two years and currently has successfully reached first half of its duration. It started on September 1st 2005 and will be concluded on August 31st 2007. Some of the students who joined the project are already continuing their scientific activities at the universities.

1.2. Target groups

There are three main target groups of project Open science; first of all, the project centres all its activities on secondary school students and their teachers, the third, but not less important, secondary target group is the wide public. Nearly all the documents and information about the activities carried out within the project are freely available on the Internet and therefore anyone can make use of them. The information about science and research is presented in a format easily understood.

1.3. Aims

Aims like the target groups can be divided into primary and secondary. The main aim of the project is to **improve knowledge economy** of the Czech Republic and thereby increase its competitiveness. Under this aim the focus is on bright secondary school students. In its intentions, the lecturers from partner Institutes give them support, strive to enhance and broaden their interest in science. Those students, by their own example, can consequently raise their school peers' interest and therefore disseminate the ideas of the project to the wider public.

The next aim is **educational**. This effort is aimed at all the target groups and includes provision of further educational and informational resources. Within these activities, important and successful researchers will convey up-to-date information on current science and research activities that are not yet included in the textbooks.

Promotion of science and research to the wider public is the last but not least aim. One of the most important contributions of the project is that all the materials (collections of lectures, presentations etc.) are also available on the Internet, on the website of the project. To achieve this aim, the contributions will be comprehensible for the target group. Promoting activities are indeed considered as crucial; it is necessary to cooperate with the communications media. Therefore the project has four media partners (Czech radio stations Radiožurnál and Leonardo, the magazine 21. století and the company Kratky Film Praha, a. s.) that inform the public on current activities. Open Science has been presented to the

Czech as well as to the foreign public, i. e., the international conference of the organisation EUSCEA (Iceland, June 2006) or on the science festival Veda v ulicich (Science in the streets), end of June 2006, Prague. Interesting reports about researchers' work and interviews with students have been developed into articles appearing in newspapers. This project was initiated at a press conference where a number of journalists were informed about its aims and planned activities. Unified Internet presentations of the various scientific institutes make also important part of the project.

But teachers need not despair of further assistance when the project comes to an end next August. After the close of the project, all the materials, lectures, presentations as well as the unified Internet presentations of the partner institutes will remain available on the Internet. The institutes will administer their website on their own then.

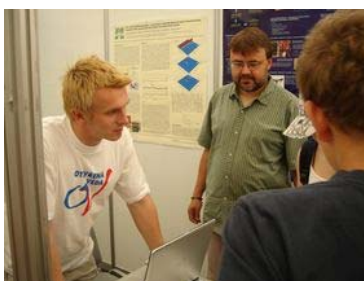


Fig. 1: From the event Science in the Streets (Prague, June 23th-24th 2006)

1.4. Activities

The project team organises various types of activities so as to meet the aims of Open Science. The project would like to interest and assist as many people as possible and therefore the collections of lectures from the conferences and courses are distributed to participants and published afterwards on the website of the project, which enables anybody to make use of them.

The activities can be divided according to the target groups:

- Scholarships for students
- One-week practical training courses for teachers
- Seminars
- Other occasional activities (courses, seminars, lectures)
- Other outcomes (interactive DVDs, unified Internet presentations)



Fig. 2: Practical training courses on biology (Nove Hradý, Czech Republic, summer 2006)

Students can compete for 150 different **scholarships** at the various scientific institutes (including institutes of the ASCR and of partner universities). Led by tutors, important researchers, students either participate in ongoing research projects or carry out their own research activities. The scholarship enables them to get in touch with real research. Although the offer is wide, not all the students can participate, because of some restrictions, i.e., sometimes an age limit of 18 is imposed. In general, students can either choose between interesting topics provided by tutors or even bring their own topic. In all their activities, experienced and skilled scientists assist them and introduce them in that way to the world of science. Some students pursue their studies at a university whilst pursuing their research in the scientific institute.

One-week practical training courses are organised for secondary school teachers, where they can hear lectures and do practical exercises under supervision of the best scientists from the various research institutes or universities. The courses usually take place in summer and are concentrated on three main topics: physics, chemistry and biology. Each participant receives collection of lectures from the course, which is of course then available on the website of the project. That way, the information reaches not only the participant of the course, but also his/her colleagues and via the Internet other people can likewise make use of them. The courses have been accredited by the Ministry of Education, Youth and Sports of the Czech Republic. According to surveys carried out at the end of each course, the participants were satisfied with the content of the course and would participate again in similar courses. This means they are making note of the content of the next course. A large number of them participated already in the last year sessions.

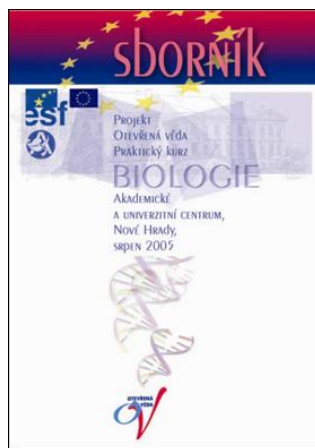


Fig. 3: Collection of lectures on biology from Practical training courses 2005

Multidisciplinary seminar is organised for teachers in autumn.

Some activities have not been planned in the project, yet came out after it started, among them **seminars** on Faculty of Science of Charles University in Prague (Winter practical courses at Vinicna Street), **lectures** on immunology at the Institute of Microbiology of ASCR or the lecture on the biology of the cell by Prof. Arnošt Kotyk, an important Czech scientist, at the Institute of Experimental Medicine.

Students who joined the project could also participate in the **Student Scientific Conference** (September 25th-26th 2006, Prague) where they were able to present their research and reflect on the atmosphere of a scientific conference. The conference simulated a real scientific conference and was open to the wider public. A collection of lectures from the conference was prepared and distributed to the participants. Later it was put on the website of Open Science.²

Apart from the courses and seminars, the outcome that will persist after the project ends are being prepared. Among them, interactive educational DVDs and unified Internet presentations.

The **educational interactive DVDs** on biology, chemistry and physics are intended to provide the teachers with useful up-to-date tailored materials. They are created in cooperation with the target group; thanks to that, the teachers will have the chance to influence their content. And, indeed, teams composed of specialists, university and secondary school teachers have been created for that purpose.

² List of contribution from the Student Scientific conference is in the attachment.



Fig. 4: Educational DVD

Partner institutes were asked to create special websites, linked to the main website of the project Open Science. **Unified Internet presentations** will remain available after the project is over and the Institutes will administer their websites on their own. On the website, the Institutes will introduce themselves, and the scope of their research. Obviously, this will be comprehensive to the wider public, because the project seeks to attract the attention the largest number of people possible apart from the target group. Up to now, most of the scientific informational resources on the Internet are not comprehensible to non-specialists; in fact, they are not intended for them.

2. Conclusion

During its assigned period, we can say, the project has been successful. Through its activities, it effectively reaches its target groups, contributing to the promotion of science to the wider public, helping talented students to perform real research and subsequently enabling them to present their results at the Student Scientific Conference. Secondary school teachers are given an opportunity to meet scientists, to get information regarding up-to-date research, new technologies. They not only get to express their needs regarding educational resources, but also to participate on the creation of those resources (e.g., interactive DVDs). In addition, they are able to upgrade their education and transmit the knowledge to their students.

Although the project closes at the end of August 2007, it will continue, mainly because all the materials will remain available on its website for the wider public; that means anyone interested in science. Through unified Internet presentations, the scientific Institutes will transmit the knowledge in a comprehensible way. It is important that the public is well-informed about science and that talented young people have an opportunity to pursue their interest and eventually establish their life's career in science. They after all represent the future of the nation's continuing development and increase competitiveness of the whole country not only in the important field of science for the 21st century.

3. Attachment

List of contributions from Student Scientific Conference which took place on

September 25th-26th in Prague:

State behaviour of binary liquid mixtures at normal pressure
The potential of betuline for the preparation of anticancer drugs
Species of the Picea genus in the park of the Institute of Botany ASCR in Pruhonice (Czech Republic)
A study of neutron production in fission reactions
Preparation of new materials and polymers based on boron compounds
Plasmochemical purification of water
Tokamak – controlled thermonuclear fusion reactor: Measurement of plasma radiation
Structure evolution of polyaniline films at 80 °C monitored by infrared spectroscopy
Preliminary measurements of Seebeck coefficient and electrical conductivity of Yb_{0.19}Co₄Sb₁₂ as a function of temperature
Detection of genetically modified organisms (GMO) in food and food resources
Applications of nuclear analytical methods
Application of natural fibres in polymer recycling
Visualization of powder particles in thermal plasma flow
Liquid-liquid equilibrium in 1-butyl-3-methylimidazolium hexafluorophosphate and butan-1-ol system
Electrochemical study of intramolecular electronic interactions in nitrocalixarenes
Xenopus as model organism
Mass transfer during thermal treatment of pores in InP
Alloys with shape memory
New biologically active terpenoids prepared by C-C bond synthesis method
The expression of the chemokine CXCR4 receptor in the case of the glioma cell lines A172 and GAMG
Measurement of plasma turbulence in the CASTOR tokamak
Schizophrenic rats
High-resolution microwave molecular spectroscopy
Determination of pressure amplitude of a shock wave by the experimental device SHOW
Indoor environment aerosols
Transgenic plants for phytoremediation of heavy metals: Biotechnology in practice
Anaerobic fungi in ruminant's paunch
Preparation of new esters of betulonic and platanic acids with potential cytotoxic activity
Disorders in development of dentition of mice with tabby syndrome
Scanning probe microscopy: nanoworld imaging method
Gamma-ray spectroscopy
Retroviruses
Electrochemical processes in lyotropic liquid crystals: Preparation of nanostructured metals

A sensor for ERAB enzyme

Liquid flow in a microreactor

Photochemistry in microwave oven

Liquid crystals

Computer modelling in biology: Structure and interactions of intracellular and extracellular proteins