Science on Stage teacher training course in Slovakia

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Abstract

Science on Stage (SoS) offers European teachers the opportunity to exchange successful and innovative teaching methods and materials. It is directed towards science teachers and students in Europe's primary and secondary schools. The project addresses the content and format of science teaching in European schools, seeking to improve the quality of teaching and to find new ways to stimulate students and children to take an interest in science. The National Steering Committees in the participating countries are responsible for organising national activities; they promote the overall project and are subservient to increase the teachers' interest in educational innovation. One of the way how to promote SoS activities on national level is teacher-training course for physics teachers, which is currently running in Slovakia with group of 30 physics teachers. The contribution presents the curriculum, selected activities and type of materials for teacher training course. They were selected and prepared with regard to the Inquiry-based science education (IBSE) approach by using ideas presented on Science on Stage events as well as own inventions. The strong emphasize was put on the sharing of the best school practices based on active student learning with accordance to the different level of inquiry activities.

Background

Science on Stage (SoS) represents a European project initiated in 1999 with the aim to attract attention to science education problems associated with low scientific literacy as well as to seek solutions to the problems in European context. The project is being implemented by means of international science festivals held every other year in one of the participating countries. The festivals enable teachers, experts in education and science workers to meet in order to share experience in the area of innovative teaching methods, modernizing contents of education, popularizing sciences, and presenting current streams of scientific research, which, if transformed into teaching, should present students with the real picture of contemporary science and increase an interest in sciences among young people. The international festivals could not be held without national events that are held in all participating countries in different forms. Only the most enthusiastic of them usually participate in the festivals. Our aim is to promote the ideas and outputs of Science on stage activities among the widest possible teaching community and thus increase the impact of the events on science education in Slovakia.
As a result we have prepared and been accredited a **teacher training course**, which from the point of view of its content represents the ideas, goals and educational activities carried out within Science on Stage events.

Methods

It is possible to carry out the following kinds of courses within the system of continuous education in Slovakia:

- **updating** (20 - 60 lessons, final presentation and an interview)
- **innovative** (60 - 100 lessons, final presentation and an interview)
- **specialization** (100 - 160 lessons, defence of a thesis and an exam)
- **functional** (160 - 200 lessons, defence of a thesis and an exam)
- **qualification** (200 lessons or more, defence of a thesis and an exam)

SoS teacher training is an innovative education with the extent of 65 lessons (40 present and 25 distant) within which teachers participate at lectures given by specialists, SoS events, they carry out interactive experiment demonstrations and workshops focusing on training teachers´ skills.
The distance part of the course is dedicated to studying information sources, web portals and preparing school research projects. Teachers also attend regional and national events of Science on Stage as well as visit scientific research institutions. At the end of the course teachers present their own school research project. That means that teachers design a set of activities for their students that can involve experiments, measurements, labworks or project-based activities at different level of inquiry. They design their own project and implement and trial it in the class. The most successful participants of the education have a chance to become the members of a national team at the international festival.

Science on stage teacher training course

Continuous education course content
The course syllabus consists of the following topics:

1. Introducing SoS idea – stimuli, key institutions and events, Slovakia participation in the international events.
2. Basic types of educational and popularization events characteristics – presentation in national stalls, workshop, stage presentation, excursion, importance of contact with scientific research workplace, discussion with experts, best stand presentation contest.
3. Selected educational and popularization events analysis – demonstrating a phenomenon by means of simple aids, science and technology around, innovation of learning aids and their use, computer supported measurement, pupil project, observation, measurement, scientific theatre, workshop.
4. Major Slovak scientific research workplaces – the system of scientific research workplaces in Slovakia, major workplaces in selected branches, an excursion at a scientific workplace, preparation, planning and implementation principles, excursion as an educational activity, samples of excursion pedagogical documentation.
5. School research project – aims and principles of implementation, where to look for inspiration, how to complete a project application, implementing a school research project, preparing a regional event presentation.
6. Regional and national Science on Stage Slovakia events – teachers' participation in one of the events, presentation of a school research project, poster or oral presentation.
7. Final project presentation and interview with an interview panel.

Examples of educational activities – stand experiment

Stand experiments that teachers like presenting as demonstration experiments are particularly popular. From among a variety of ideas the following ones were presented: inductive cooker, hot air balloon model by means of a toaster, falling chimney, Archimedes' screw and weighing air.
For each of the experiments there is a short manual for teacher and a physical interpretation of the presented phenomenon. The experiments are recommended to use as interactive demonstrations in the class.

Figure 1: Examples of stall experiments used for teacher education (inductive cooker, Archimedes' screw).

Examples of educational activities – stand experiment

In order to get students involved in learning as much as possible it is necessary to implement inquiry-based activities. Within the course we adopted the hierarchy of inquiry-based activities classified by the Establish project partners, namely interactive demonstration/discussion, guided discovery, guided inquiry, bounded inquiry, open inquiry. We presented examples of activities at different levels of inquiry that teachers carry out within the course, e.g. measurement of liquid refraction index as a guided discovery activity, measurement of solid substances thermal conductivity coefficient as a guided inquiry type. These examples should motivate and inspire teachers to create their own activities to be designed and implemented in the class.

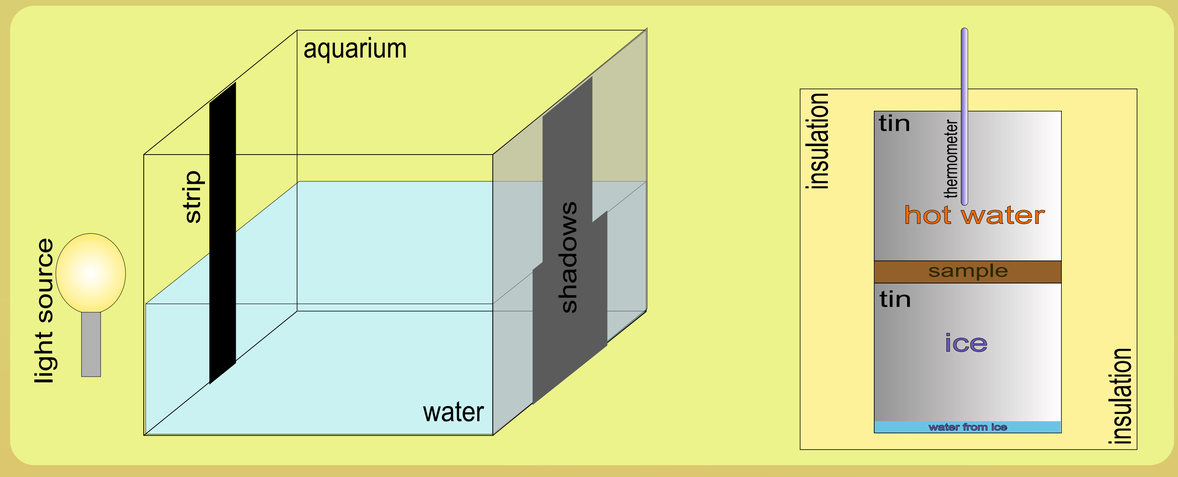
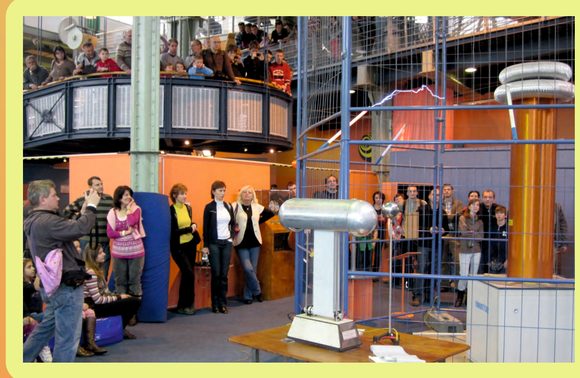


Figure 2: Measurement of liquid refraction index as an example of a guided discovery activity and measurement of substance thermal conductivity as an example of a guided inquiry activity.

Examples of educational activities – excursion

Leading European scientific workers, who by means of presenting the results of their work to teachers try to promote science among young people, take an active part in SoS events. In Slovakia, our effort is to promote science with the help of top scientific teams ranked as Excellence Centres in their research field. Teachers visited Excellence Centre of low temperature physics, become familiar with possibility of observing structure by means of Atomic force microscope and solid state physics research and magnetism. Apart from that, teachers visited science popularization centre The Palace of Miracles in Budapest.



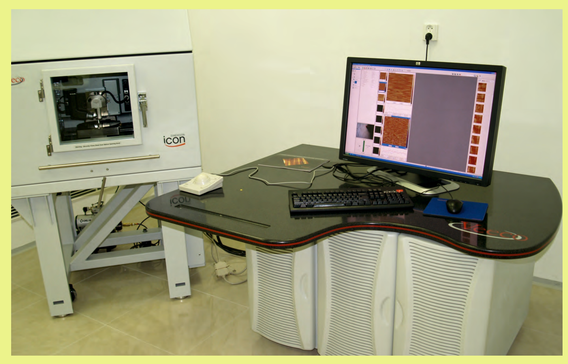


Figure 3: Excursion at the science popularization centre in Budapest (left) and scanning the structure of substances by means of Atomic force microscope (right).

Examples of educational activities – discussion with education experts

Teachers meeting significant personalities involved in science education create a wide space for experience exchange. International dimension of education issues can be a highly motivating element in teachers´ work. Within the course David Featonby from Institute of Physics, England gave a lecture on physics education system and presented a What Happens Next workshop that was highly appreciated by teachers.

Figure 4: Lecture of David Featonby on the school system in England and What Happens Next workshop with examples of attractive physics experiments.

CONCLUSIONS AND IMPLICATIONS

SoS teacher training course covers the characteristics of SoS events and presents a collection of ideas for different types of educational and popularization events. Currently there are 18 and 12 teachers of secondary and basic schools, respectively involved in the course. The meetings take place at the Faculty of Science, P.J. Šafárik University in Košice, the distant learning part is organized under the LMS Moodle system. The financial support of the Slovak research and development agency is used to cover operational costs as well as to equip teachers for implementing school research projects. We are confident that after the course we will be able to find a group of other enthusiastic teachers and eager fans and supporters of SoS events.

References

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Acknowledgement

This work is the result of the national projects Science on Stage Slovakia supported by Slovak research and development agency under the contracts No: LPP-0223-09 as well as the international 7FP project ESTABLISH (European Union´s Seventh Framework Programme FP7/2007-2013 under grant agreement N° 244749).

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