

Hands-on Science in Romania, Act II

Dan Sporea

National Institute for Lasers, Plasma and Radiation Physics

409 Atomistilor St., Magurele, RO-76900, Romania

E-mail: sporea@ifin.nipne.ro

Abstract. *The paper describes our results obtained during the last year as we coordinated the “Hands-on Science” network in Romania. A diversity of activities will be addressed: the promotion of the use of virtual instrumentation experiments; the set-up of a science club in Bucharest; the implementation at national level of a science fair; a web-based research on science literacy; the promotion of experiments based on training kits available on the market, as well as the experimental set-ups built by students; the start of a activity related to a “mobile” science demo laboratory.*

Keywords. Experimental mock-up, science club, science fair, science literacy, virtual instrumentation.

1. Introduction

During the second year from the starting of “Hands-on Science” project we focused on the development of the Romanian network, on the diversification of the activities run under the project umbrella, and on the improving the visibility of the project achievements. New associate members joined the team, and meanwhile the groups involved into science teaching small projects spread across the country. The paper exemplifies the main results, underline the experience gained in this period and points out to the plans we have for the next year. For some specific results see the papers of some Romanian teachers contributing to this volume.

2. Activities and outcomes

Considering the success of the previous year as it concerns the use of the graphical programming environment LabVIEW in building real and virtual experiments for physics teaching we continued our efforts in spreading this

practice. The new schools were enrolled into this programme, and, apart of the teachers who take master courses and have the possibility to study the programming, we encourage teachers from other towns to start a self study campaign and we are offering consultancy when needed. Additional results in using virtual instrumentation in classrooms are also reported at this Conference (e.g. Mrs. Garabet and Mrs. Ruset reports). Our pragmatic approach in using this software tool was to complement the programming facilities with training kits and dedicated sensors, to assist teachers in building real experiments. Following this line, training aids for mechanics and electricity were purchased in the project frame and were offered to partner schools (Fig. 1).



Figure 1. Training kits and special sensors offered by the project to the “Grigore Moisil” Theoretical High School in Bucharest

A team of two high school teachers, leaders in using LabVIEW for both real and virtual experiments, made two trips in less developed area in Romania (Valea Jiului county where, after mines closing, a high unemployment rate is registered, and Ramnicu Valcea county in a rural region) in order to introduce the philosophy of the “Hands-on Science” project to interested school teachers. In the mean time, they presented the results they have using virtual instrumentation and PC-base data acquisition.

The most remarkable fact concerning this initiative was their demo visit to a village with a dominant rromani population (Fig. 2). The interest of the audience was astonishing. We expect to be able to promote more such exchange visits in the near future.



Figure 2. Demonstrating hand-on experiments at a rromani school in Ramnicu Valcea County

The interest towards the project is demonstrated also by the organization of science contest for secondary school students in the Slatina town, where young people participated with great enthusiasm in building their own small experiments (see Mrs. Vladescu' paper). The contest focused the interest of a great number of very young and innovative students, and their work was rewarded both at the national science fair organized in Bucharest (Fig. 3), and at the local level as they were invited to "perform" during the celebration of the Europe' Day on May 9.



Figure 3. Innovation and technical skills proved by secondary school student from Slatina

In order to make as accessible as possible the demonstration of advantages of the PC-controlled experiments, we started to build a small portable demo laboratory based on a National Instruments data acquisition board, operating over the USB connection. This approach coupled with a set of sensors can be used for on site training sessions. We have to thank to National Instruments Company for its generous support of this endeavor. The team from "Grigore Moisil" Theoretical High School demonstrated also this teaching aid to a teacher's conference in May 2005.

The same dedicated team organized by the end of April a science fair at national level. More than 160 students participated at both secondary degree and high school level from almost all regions of Romania. Microsoft Romania generously sponsored the travel of students and teachers in Bucharest and offered awards. The science fair "Hands-on science@moisil.ro" included the developments of real and virtual experiments, design of web pages with science related content, experimental mock-ups, live demonstrations. In Fig. 4 is presented the experiment developed by a group of high school students, set-up used for the investigation of microscopic objects by coupling a CCD camera to a PC. Very simple but educationally efficient mock-ups were presented by school children having a great interest in science. In Fig. 5 a simple electrical motor built with trivial materials was demonstrated. The study of hydrostatic pressure was demonstrated by a team from Slatina town (Fig. 6), while their older colleagues report an investigation of the drinking water quality in various wards of Bucharest (Fig. 7).



Figure 4. Investigation of an insect morphology with a PC-controlled microscope



Figure 5. A simple and efficient electrical motor



Figure 6. Demonstrating pressure in liquids using trivial components



Figure 7. Young chemists answering questions on the drinking water quality in Bucharest

During the last year, most of the activities carried out in Bucharest were centered on the newly created science club. The Club gathers several high schools having different structures (i.e. theoretical high schools, vocational training centers) and focuses (natural sciences, economics, etc.). The Club was initiated by the

Tudor Vladimirescu High School, but soon other educational units joined the stream (Fig. 8). In this way, as the participation grown up, we are organizing almost every month a meeting, having different hosts and centered on specific subjects. More information can be found in Mrs. Pausan's paper. What is very interesting is the fact that each participant brings his experience and "culture" and various means of expression are encouraged. So, a complex, very non-formal interaction is established between teachers and students. The way they approach science teaching is extremely complex starting from reports on a selected theme, experiments, debates, poster sessions (Fig. 9), exhibitions, and finishing with small peaces of poetry on science written by students or even short plays with scientific message. The most exciting think was that some of the performances were played in foreign languages.



Figure 8. The open of the "Science Fun Club" at Tudor Vladimirescu High School in Bucharest



Figure 9. Participants to the poster contest having as subject the "life and activity of Albert Einstein"

An interesting experience was delivered by the club activities at the High School “Kiritescu” in Bucharest where the central theme of the activities run was consumer protection. Within this frame, groups of school students demonstrated chemical tests used for the quality certification of food stuff (Fig. 9). A second subject was pollution of the environment. We have to highly appreciate such an approach as it proved very pragmatic and from the educational point of view oriented towards community needs.



Figure 9. Students from a high school on economics concerned about consumer protection by scientific evaluation

In some cases live experiments were carried out targeting basic phenomena. In Fig. 10 the line forces of the magnetic field are beautifully materialized.

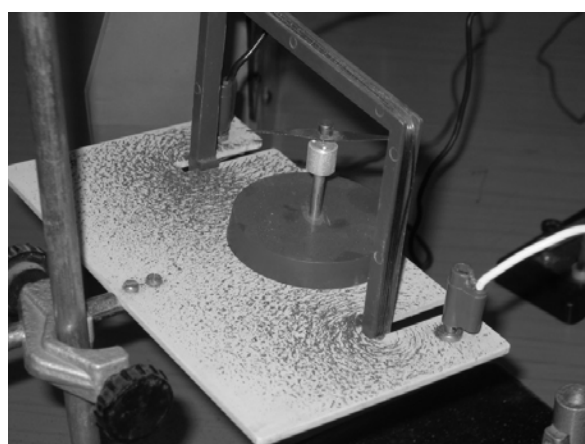


Figure 10. Visualization of the magnetic field through a classical experiment

As the experimental kits available to an average ranked high school are quite in a short supply in Romania we took the opportunity to

organize in the frame of some science club sessions some demo exhibition with classical experiments (Fig. 11). In this way, students from different high schools had the possibility to access some experiments not available in their respective schools.



Figure 11. Exhibition of laboratory experimental kits

The operational capabilities of the Romanian network were strengthened by a generous donation received from EXFO, Canada, a manufacturer of testing equipment for the optical communication industry. The instrumentation received includes both emitters and powermeters, operating at two wavelengths which will be used to diversify the activities of the “mobile” demo laboratory, by including training sessions on optical fiber communications principles and the most important tests carried out for such systems. We expect that in the next year more on site training sessions will be performed in different parts of Romania, mainly in regions with economic problems, to give a chance to a pool of less privileged students.

During the last year we tried to encourage also the production of written training aids both in a print form (Mihaela Garabet and Ion Neacsu – “Experiments in the Physics Laboratory”, printed in Romanian) and in electronic format (“Papers of the First National Science Fair”, also in Romanian). Both materials were distributed for free to schools or during conference presentations.

As our efforts were also directed towards the dissemination of the project results we deliver a talk at an international conference on education held in Romania, and which was published in the conference proceedings [1]. On the same line, an interview with the Hands-on Science network

Professor Manuel Costa was published in a well known Romanian magazine dedicated to science issues – “Stiinta si Tehnica”.

Our interaction with media diversified as D. Sporea delivered a presentation on the project at a local TV station in Bucharest. The training sessions run by Mihaela Garabet and Ion Neacsu in schools from the Jalea Viului Country were also extensively covered by the local television.

Our policy included also the development of local and regional links on science teaching. Within this frame, we participated with a paper to a NATO/UNESCO sponsored Advanced Research Workshop held in Hungary [2]. Following this meeting our Institute, which is coordinating the network activities in Romania, applied and became a member of the Network of Youth Excellence - NYEX. In the same context the author took part to the “Science in Society Forum 2005”, organized by the European Commission in March 2005, where new contacts were established. In June 2005 the author was also invited to attend an international workshop on science education in primary schools in Serbia. On this occasion a review of the Romanian achievements in teaching science in schools is planned. This meeting also will be an opportunity to establish regional links and start some forms of cooperation.

Another direction of our work is related to an extended web-based research we carried out concerning the “meanings” and “the ways of implementation” of science literacy. The paper was presented at the workshop organized by the “Hands-on Science” network in Malta, in January 2005 [3].

In order to support the network efforts and to promote its results a proposal was sent in May 2005 to the European Commission asking for approval of an exhibition booth at the November 2005 Conference on communicating European Science. According to our strategy the booth will include presentation of the network

achievements in various forms (posters, multimedia presentations, mock-up, printed material and e-materials as training aids, short films, etc.).

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4. References

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