Production of multimedia textbook: Ionizing radiation and radiation protection

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Summary

In our contribution we want to outline our plan of actions to be carried out for the creation of the first multimedia internet textbook in Slovakia in the field of ionizing radiation and radiation protection. In particular we want to describe first steps that have been performed at its realisation. This textbook would be applicable to the full-time study as well as to distance learning at traditional universities and technical universities. It will also be usable for various forms of in-service training by e-learning.

Introduction

In health service the application of radioisotopes, particle beams, accelerators and ionizing radiation as well as that of the nuclear knowledge has enormously been growing in the last decades, e.g. in radio-diagnostics and radiotherapy, in the new technological processes, at the customs control of product motion, in pharmacology, analytic physics and chemistry etc. Simultaneously the nuclear power-plant engineering, industrial defectoscopy and other traditional applications of nuclear physics continue to develop.

An inseparable part of ionizing radiation application is the radiation protection and the high professional expertise of radiation workers being of the greatest importance. The obligation of the professional preparation and knowledge control of workers is emphasised in all international documents regarding the basic standards of radiation protection. In the Slovak Republic the state of the education and research in the field of radiation protection is for now deeply beneath the level of the international standards of radiation protection.

In order to ensure the sufficient number of qualified workers in all fields of radiation protection, several measures are taken by IAEA and EU to help to develop the effective system of education and in-service training in radiation protection in all EU member states including Slovakia. The creation of the net of national training centres for radiation protection, introduction of innovative training procedures, instructors' qualification development and extension of the educational software is considered to be very important. In the scope of the 6. Framework Programme of EU the projects for the enhancement of educational system of radiation protection are supported. Besides these supporting activities the new project EUTERP (European Radiation Protection Training and Education Platform) focused on teaching-learning of radiation protection was launched in EU.

Several Slovak universities responded to the need of education in radiation protection by an inclusion of such subject into their new study programmes, since in most of the European countries the university education is the necessary condition for the acquisition of RP qualification. Identically within EU the long-term training courses on radiation protection for medical, nuclear and public sector are organized and administrated mostly by universities. The problem is that no academic textbooks of ionizing radiation and radiation protection covering all aspects of radiation problems are available in Slovakia nowadays. This subject matter is included in lectures of various subjects at several faculties of the technology universities as well as research universities. However, in most cases there do not exist any specific textbooks. Therefore the production of the general purpose textbook useable for the university and technical type of higher education as well as for in-service training of staff working with ionizing radiation on the European standard is extremely desirable problem solution.

At present, to the best of our knowledge, there exists neither any computer interactive text nor multimedia teaching software on this subject matter in Slovakia. In the age of modern technologies, which intensively influence the quality of our life, it is quite natural that computer technologies penetrate the university life, technological and production practice. For that account our textbook will be of multimedia character. An observation of the real situations by means of video-clips and their analysis or mediated

image of the real effects by animations and applets helps to the better understanding of the meaning of investigated effects, understanding of the methods of operation, etc.

Contents and processing form

Contents of this internet textbook is supposed to be wide-ranging including physical, chemical, biological and health aspects of radiation problems. Preliminary proposal of the thematic units is:

Bases of nuclear physics.
Physics fundamentals of radiation protection.
Quantities and units in radiation physics and radiation protection.
Sources of radiation: radioisotopic sources, nuclear reactors, accelerators.
Environmental radioactivity.
Radon issues.
Radiation detection and measurement.
Statistics in radiation physics.
Radiation schielding.
Applications of radionuclides and beams in medicine and industry.
Nuclear power-plants and their influence on environment.
Radioactive waste.
Chemical and biological impact of ionizing radiation and its health manifestation.
Basic principles of radiation protection.
Radiation protection in legislation. Radiation dose limits.
Organization and technical ensurance of radiation protection.

The essentials of the textbook will be the proper educational texts with hypertexts to enrich the subject matter. The textbook should meet also the didactic requirements on textbook's production. Therefore every chapter will contain the teaching-learning objectives, background knowledge, control questions with the possibility of self-tests, solved problems and tasks wits answers and links to relevant web-sites.

In terms of the fulfilment of multimedia trait of this textbook we propose to create the set of video-clips recording the events that take place outside the school, e.g in laboratories or in practice - in medical institutions, nuclear power-plants, accelerators and at other workplaces with ionizing radiation. Then it is possible to explain the physical and chemical heart of the investigated effects on the basis of the video-clip analyses. By such approach students will gain a broad view and they can apply the theoretical knowledge in practice. Being familiar with the effect's core, it will be possible to build the knowledge system of radiation protection on the scientific basis.

The animations and interactive applets will be organic parts of the textbook, by means of them it will be possible to model various situations. Students can choose boundary conditions and by an interactive approach they can model a real situation and suggest the adequate measures. The above mentioned procedures, but also the physical analysis of common situations depicted in video-clips, are the new and internationally recognised methods that are being introduced into the educational systems of developed states of Europe.

Realisation

The production of the proposed multimedia textbook of radiation protection is part of the authorized project: "Multimedia programme of education in the field of the ionizing radiation and radiation protection" within the KEGA grant agency of Ministry of Education for years 2005-2007. Research groups reside at: the Department of nuclear physics and biophysics of Faculty of Mathematics, Physics and Informatics of Comenius University and the Department of chemical physics and Department of environment of Faculty of Chemical and Food Technology of Slovak University of Technology in Bratislava. We suppose also the co-operation with researchers and professionals from industry, health service and other universities, as well as the co-operation with computer experts for the preparation of animations and applets.

At present we are selecting particular topics to cover all the mentioned aspects of the subject matter. We are in the phase of the task division, we are preparing the template, drafts of texts in electronic form along with hypertexts and graphics. During the following year we want to shoot sets of video-clips of the observed effects as well as laboratory experiments - predominantly of two kinds. The first group of video-clips will be focused on the demonstration of specific physical or chemical laws or topics. The second group

will concern real-life clips. Simultaneously we plan to suggest the topics to be covered by animations and applets with the possibility to set boundary conditions.

Objectives

Our objective is to create a modern internet textbook in radiation protection, of which production will be co-ordinated with other EU countries. The output of our project - the multimedia textbook - will be available to all students at our university's servers and other users will have CDs at their disposal. We propose the use of this multimedia didactic means also in various forms of the distance e-learning. The main motivation for the implementation of distance courses is the necessity to update knowledge, skills and qualification in our contemporary rapidly developing world. The distance e-learning form of education can solve also the problem with the acquisition of the professional qualifications for the work with ionizing radiation. This is the reason for usage of the mentioned textbook not only as the fundamental and unified textbook for the students of universities, but also as the study material for the civil servants responsible for radiation protection, for in-service workers and providers of the professional training.

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