EVOLUTION OF THE CHERNE NETWORK ACCORDING TO THE NEW ERASMUS+ PROGRAM

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ABSTRACT

During last years, the educational capacity of Higher Education Institutions in Nuclear Sciences has mainly decreased due to financial restriction but also by political reasons. Nevertheless, it is essential to maintain a high level of skills and competences in all fields related to radiation protection, safe use of nuclear installations and waste management. This implies theoretical knowledge but also practical training on real devices and real work conditions. The CHERNE network was created in 2005 to enhance the collaboration between academic institutions for education in Nuclear Engineering. Since 2014, the new Erasmus+ Program linked to the Horizon 2020, allows the possibility to organise a larger consortium including also non-academic institutions as partners: the Strategic Partnership. Eight members of CHERNE, in collaboration with two non-academic institutions (the Greek Atomic Energy Commission and the Radiation Protection Service of the Czech Republic) decided to submit a proposal for a Strategic Partnership mixing virtual (development of e-learning modules) and real mobility (training sessions) in the field of Radiation Protection and Waste Management. The grant obtained for two years will allow the development of distance learning courses and also the mobility of students. After the funded program, sustainability have to be achieved, mainly for real mobility by developing some geographical partnership to decrease the cost for traveling.

1. Introduction

In recent years, the educational capacity of Higher Education Institutions in Nuclear Sciences has mainly decreased due to financial restrictions but also by political reasons. Nevertheless, important issues will occur in a near future. The first will certainly be the implementation of the new European directive, 2013/59/EURATOM [1] which will lead to a harmonization of the regulation related to radiological purposes. Changes will certainly have to be applied to the definition of key-person in radiation protection.

On the other hand, due to the possible development of new reactor technology (Generation IV reactors) [2] and the challenges related to dismantling of old facilities, it is essential to maintain a high level of skills and competencies in all fields related to radiation protection, safe use of nuclear installations and waste management. This implies theoretical knowledge but also practical training on real devices and real work conditions.

2. What is CHERNE

The CHERNE network [3] was created in 2005 to enhance the collaboration between academic institutions for education in Nuclear Engineering. Within the network, the partners have developed different strategies to allow the use of specific devices by a large number of students. Presently, the CHERNE network consists of 21 academic institutions from 10 different countries.

During more than 10 years, CHERNE has organized different learning and teaching activities (mainly in the framework of the Erasmus Life Long Learning Program), seminars, conferences, workshops... bringing together students and academic staff.

Different Intensive Program courses have been organised to allow students to have access to large experimental devices like reactors or accelerators. During these intensive courses, the focus was mainly put on experimental training and real work situations. A large number of courses organised by one partner have also been opened to others, which increases the teaching offer for students. The main problem for real mobility is to obtain grants for travels and stays. Until 2014, the Erasmus Intensive Program has been used to support teacher and student mobility.

3. The strategic partnership

In the year 2014, a new Erasmus program has been settled in the framework of the Horizon 2020. The objectives of this program include the sustainable development of higher education and training. This new Erasmus+ Program [4] offers the possibility to organise larger consortia including also non-academic institutions as partners: the Strategic Partnership.

Strategic Partnerships intend to support the development, transfer and/or implementation of innovative practices at organisational, local, regional, national or European levels with the aim of, for instance:

- enhancing the quality and relevance of the learning offer in education, training and youth work by developing new and innovative approaches and supporting the dissemination of best practices;
- increasing labour market relevance of learning provision and qualifications and reinforcing links between education, training or the youth fields with the world of work;

3.1 The strategic partnership: Blended learning in radiation protection and radioecology

During the year 2015, a consortium of ten partners has been constituted to propose a strategic partnership linked to education and training in the field of radiation protection and radioecology. Eight of them are academic institutions, members of the CHERNE network: University College Paul Henri Spaak (ISIB, Belgium), University of Hasselt (UHasselt, Belgium), University of Coimbra (Portugal), Polytechnic University of Valencia (UPV, Spain), University of Aachen (FHAachen, Germany), Czech Technical University (CTU, Czech Republic), National Technical University of Athens (NTUA, Greece) and University of Bologna (UNIBO, Italy). Two non-academic institutions have joined also the partnership: a research institute, the National Radiation Protection Institute (SURO, Czech Republic) and a

regulatory body, the Greek Atomic Energy Commission (EEAE, Greece). They have been chosen according to their competence in a specific field and their possibilities to promote the program during and after the duration of the European funding of the project.

The objectives of the project were defined as…

- development of a blended learning program in radiation protection and radioecology. Blended means the use of e-learning modules and real "on the field" modules;
- establishment of a continuous education program for people already involved in radiation protection;
- possibility of acquisition of specific competences in the nuclear field for those who were not involved in nuclear and radiological techniques during their studies;
- contribution towards standardization of the knowledge across Europe in radiation protection and safe use of radioactive materials.

By means of this program, an attempt is made to fulfil some European priorities such as the improvement of the quality and relevance of higher education. To get it in each partner country, market needs with regard to specific knowledges and training related to nuclear applications should be identified. As well a contribution to create a European area of skills and qualifications through the blended learning program is necessary. Finally, the standardization of knowledge across Europe in protection and safe use of radioactive materials can be reached by sharing the knowledge in radiation protection and radioecology.

3.2 The development of the program and targeting group

During the two years of the European funding (from September 2015 to June 2017), two kind of teaching modules will be developed: e-learning modules and training modules. Different groups of people are targets of the program. First, students of the academic partners involved in a Master in physics or in nuclear engineering. They can apply for e-learning courses but also for training activities to acquire specific skills to extend their employability. Students involved in another Master could also apply after following some e-learning modules as prerequisite. Secondly, the teaching staff who can take benefit from the experience of foreign colleagues when participating in training sessions. And last, the program will also be proposed to persons already in the work market. For the workers already involved in radiation protection jobs, the program will propose the opportunity to refresh and increase their specific knowledge. For those who are not involved in nuclear sector, it can be a possibility to increase their employability by adding some new competences. In these last two cases, fees can be asked for the participation in both e-learning and training modules.

For students, the e-learning modules will be used as a preparation for advanced course modules and for practical sessions (pre-requisite) but also for the follow-up of the global program. The real mobility will give the opportunity to access large experimental facilities not present in each country and also to apply for internship in other EU countries.

The global program will be constituted of six e-learning and six training modules.

3.3 Intellectual output proposed

Three categories of intellectual output have been proposed for the partnership:

- O1: Analyze of the present situation in radiation protection and radioecology within the European countries.
- O2: Implementation of course modules on an e-learning platform.
- O3: Trainings in Radiation Protection and Radioecology.

For each output, a leading institution have been defined during the kick-off meeting. Each institution give a contribution regarding their specific skills. For the training modules, the choice of the organizing partner will depend on the facilities and devices they can propose according to the purpose of the training course.

For each teaching activity, a certification in the radiation protection field will be given to participants. It can be Europass Certificate Supplement for professionals, or Europass Certificate Supplement and ECTS for students. This certification should be recognized by the national authorities of the partner institutions.

The result of the analysis of the existing situation regarding the implementation of teaching issues in radiological sciences (output O1), will be presented in a report during the next meeting of the CHERNE network (May 29- June 1 2016) [5].

3.3.1 E-learning modules

Six different 2-ECTS e-learning modules have been defined to cover the field of interest for the partnership. The modules will be implemented on a Moodle platform [6]. The Greek Atomic Energy Commission is in charge of the development of the platform environment, and the access administration. For each module, an institution has been defined as leader and has the duty to organize his own module. The University of Athens will ensure the continuity and homogeneity of the contents.

Each module will consist in a commented slide show. In some case, a small video can be uploaded to describe a phenomenon, to explicit the use of a device... A special place will be dedicated to questions and answers. The different modules of the course are listed below with a contents summary.

Module 1. Basics of nuclear and radiation physics.
Radioactivity, radionuclides and ionising radiations, nuclear reactions, applied nuclear physics, interactions between radiation and matter, description of a radiation beam.

Module 2. Basics of measurement and dosimetry.
Measurement and spectrometry using different types of detector, dosimetry (concept and calculations).

Module 3. Radiation protection.
Basic principles of radiation protection, European legislation, shielding evaluation, ALARA principle.

Module 4. General safety principles.
European legislation, risk related to industry (chemistry, electricity, biology), risk assessment (methodology).

Module 5. Basics of radiochemistry.
Laboratory and industrial applications of radionuclides, handling of unsealed sources and decontamination techniques.

Module 6. Medical applications of radiation and radionuclides.
Techniques for diagnostics and therapy, quality assurance, radiation protection of workers, patients and public.

Till the end of the 2016-2017 academic year, e-learning modules will be mainly used as prerequisite for the training module. Each partner is free to use them for their regular study courses. Each student using an e-module will be asked to pass an exam but also to evaluate the module as learning tool. The qualification obtained by the student and the note for the evaluation will be used to improve the contents and the form of the module.

3.3.2 Training modules

Training modules will consist in five days (2 ECTS) of experimental work on real devices. They will involve student and staff mobility, from academic and non-academic partners.

The institutions hosting each module will also be in charge of the development of its contents. These institutions have been chosen according to the experimental devices and facilities they can give access to. Other partners will contribute to the development or the implementation of some part of the module according to the skills of their teaching staff.

Module	Content	Location
Probability risk assessment.	Principles, application to nuclear industry, software exercises	Spain (UPV)
Environmental measurements	Fieldtrip, collect of samples, laboratory analyze	Belgium (UHasselt + ISIB)
Safe industrial applications of radiation and radionuclides	Radiation protection in industry Real manipulation on large devices ALARA workshop	Czech Republic (CTU)
Radiochemistry	Radiochemical techniques Safe handling, Tracer applications Decontamination techniques	Germany (FHAachen)
Radioactive waste management	Identification of radioisotopes Calibration: experimental and/or MC calculation, Activity measurement in real samples	Belgium (UHasselt+ISIB)
Practical radiation protection in medical field	RP of the workers, patients and public Practical cases Measurement of doses Calculation of shielding	Italy (UNIBO)

Table 1: Training modules

A total number of 16 students per module is foreseen. The student selection will be based on their knowledge in nuclear and radiation physics (developed in the distance learning module) and in English. The real mobility is really important by bringing together students and teaching staff from different countries and to increase their mutual understanding.

The Czech Technical University is in charge of the administrative coordination of training modules.

3.4 Sustainability

After the two years of funding by the European Union, the sustainability have to be achieved. The e-learning modules will be developed during the first funded year. The material will be ready for use as a part of the regular courses of each academic institution. These modules can also be followed by workers, teachers, etc. as part of a continuous education process. For people not being ~~a~~ regular students, fees can be asked to follow the course and passing exams. Certificates can be delivered to assess the acquired skills. Some of the modules can, for instance, be used to fulfil the requirements to ask for recognition as expert (Radiation Protection Officer or Expert).

Funding of travels and accommodations for both students and teaching staff can be an important problem. A contribution to decrease the cost of traveling is to organise "geographical partnerships". An example of this, already existing, is the collaboration between the two CHERNE Belgian academic institutions (ISIB and UHasselt) to organise a two-week course on environmental radioactivity measurements. Such collaboration can be enhanced by the development of the different training modules.

4. Conclusions

Regarding future developments in nuclear sciences, especially in the use of radiation and radionuclides, it is essential to maintain a high level of competences and skills in the framework of the safe use of nuclear facilities, radiation protection and waste management.

A European harmonization is going on with the new European directives. Following that way, teaching and learning tools will be better developed within European collaborations.

The Erasmus+ program linked to the Horizon 2020 gives opportunities to build large partnerships including non-academic institutions. This allows to develop courses programs as close as possible to labour market needs and new regulation principles.

The European funds are of first importance to develop course materials but also to give the opportunity to bring people together. This leads to harmonize the knowledge and helps to develop common courses. Nevertheless, the sustainability of all these activities have to be achieved after European funding. The decrease of the travel cost can be obtained by local geographical partnerships. The e-learning system allows people wheresoever they are, to access specific knowledge.

5. References

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