

THE DEVELOPMENT OF A DISTANCE LEARNING PLATFORM TO SUPPORT THE BLENDED LEARNING APPROACH FOR THE TRAINING ACTIVITIES OF THE GREEK ATOMIC ENERGY COMMISSION

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ABSTRACT

This work presents the experience of the Greek Atomic Energy Commission (EEAE) in developing, establishing and providing training through e-learning. The EEAE is the national competent authority for matters related to radiological protection. Moreover, it is responsible for the provision of E&T and the certification of the competence of occupationally exposed workers. In this framework, EEAE has a range of activities, in providing post-graduate and continuing E&T on radiation protection, at national and regional level. The training provided is mainly based on the traditional face to face component.

In order to increase the effectiveness of the training provided and to optimize the allocation of the related resources, EEAE has adopted the blended learning approach. In this respect, a distance learning platform has been established to support the asynchronous distance learning component. This Moodle based platform (edu.eeae.gr) was developed in house with the support of the EEAE IT department. The development phases included: design and development, implementation of internal test courses, evaluation and use in public. The platform is now fully operative with more than 110 users during its first year of operation. Moreover, in the near future it is expected to be incorporated within the EEAE's quality management system according to the ISO 29990:2010.

E-courses are provided through the platform at national (in the Greek language) and international level (in the English language). At national level, the courses are mainly used to support the face to face training of occupationally exposed workers (e.g. industrial radiographers, veterinarians, technologists, etc.) by providing supplementary information. At international level, the platform supports the e-learning elements of the Erasmus+ programme: Blended Learning in Radiation Protection and Radioecology, in which EEAE participates as a partner. Moreover, it is intended to support the EEAE activities as an IAEA RTC and more specifically the needs of the Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources (PGEC).

1. Introduction

The Greek Atomic Energy Commission (EEAE) is the competent national regulatory authority in the fields of radiation and nuclear safety. The EEAE's mission is the protection of the public, workers and the environment from ionizing and artificially produced non-ionizing radiation. The EEAE's responsibility is to establish and supervise the implementation of a sustainable radiation protection program in the country. Therefore, the appropriate education and training on radiation protection issues of the people involved occupationally in procedures using ionizing radiation is undoubtedly necessary [1]. This fact is clearly stated in the Greek Radiation Protection Regulations (GRPR, 2001) [2]. It is also mentioned in an emphatic way in the new European Council Directive concerning the basic safety standards (new EC BSS, Chap. IV, Art. 14) [3], while the significance of education and training and the importance of the establishment of a sustainable education and training program is emphasized as well. The EEAE has also an important role in providing education and training specifically in the field of medical radiation protection in the country. Furthermore, the EEAE has acted as the IAEA's Regional Training Center (RTC) for radiation, transport and waste safety in Europe in the English language since 2003 and was recognized as an IAEA RTC for nuclear security in the English language in 2013 [4].

The training provided is mainly based on the traditional face to face component. In order to strengthen the capabilities and the potentials of the provided education and training and to optimize the allocation of the related resources, EEAE has adopted the blended learning approach. In this respect, a distance learning platform has been established to support the asynchronous distance learning component. The distance learning platform was developed in house, by the EEAE IT department, and was based on Moodle, an open source learning

management system. The provided e-courses are addressed to national and international educational purposes. This paper provides an outline of both the Moodle based e-learning platform and the e-courses which have been developed and are already in use.

2. Education and training at the National and International level

2.1 National level

The GRPR (2001) [2] require that the persons involved in the practical aspects of radiological procedures shall have knowledge of radiation protection and adequate theoretical and practical training. The EEAE issues certificates of competence to occupationally exposed personnel or recognizes corresponding diplomas or certificates awarded on the basis of the authorized curricula. Moreover, there are provisions for continuous training in the field of radiation protection, addressing in this way the educational needs arising from the introduction of new techniques. In the GRPR it is also stated that a person can only be employed in professions dealing with ionizing radiation if his/her radiation protection training has been approved by the EEAE. Under this legal framework the EEAE undertakes initiatives at the national level covering all the spectrum of applications and facilities of ionizing radiation [1].

In the medical field, the EEAE, since 1994, has been a participant in and a major contributor to the Inter-University Postgraduate Course on Medical Radiation Physics (PGCMRP syllabus) [1].

The Article 18 of the new EC BSS [3] is dedicated to education, information and training in the field of medical exposure. Taking into account the non-medical personnel related to medical exposure, the EEAE recently (2010–2011) organized and accomplished a nationwide extensive education and training project, addressed to medical technologists, which was implemented in collaboration with academic institutions and locally with the Medical Physics Departments of Universities and major General Hospitals [1].

Following this direction, a new training course addressed to veterinarians has been developed by the EEAE and the Department of Veterinary Medicine (Aristotle University of Thessaloniki, AUTH), entitled “Radiation Protection during conventional radiographic systems in Veterinary Medicine”. The veterinarians who use radiographic systems should be properly trained and competent with regard to radiation protection issues. The Veterinary Medicine Schools syllabus does not cover adequately the field of radiation protection. Thus, the course is addressed to professional veterinarians who use conventional radiographic systems for diagnostic purposes as well as to veterinarians who proceed to radiographic procedures outside their private clinic (for example, breeding units, equestrian clubs, etc.).

Industrial applications cover about 10% (in terms of occupationally exposed personnel) of the applications of ionizing radiation in the country. The EEAE through its training activities aims at the development of a safety culture in this area as well. To this end, the EEAE has designed a series of two-day seminars on radiation protection in industrial radiography [1].

For the purposes of the national education and training program described, educational material has been developed. Depending on the seminar, syllabi, lecture plans, presentations, text books and/or laboratory exercises, on-the-job training activities and procedures for the assessment of the participants’ competence have been developed. The curricula of the courses have taken into account the recommendations of international organizations (EC, IAEA, ICRP) and are approved by the EEAE’s board [1].

2.2 International level

Since 2003, the EEAE has acted as the IAEA’s Regional Training Center (RTC) for “Radiation, Transport and Waste Safety” in Europe in the English language. Following the successful completion of the IAEA’s Education and Training Appraisal Mission (EduTA) in 2008, a Long-Term Agreement (LTA) was signed in 2011 between the Hellenic Government and the IAEA to support the EEAE as an RTC in Europe. The LTA was ratified by Law (No. 4085, Official Gazette Folio No. 194, First issue) in October 2012. Moreover, since 2013 the EEAE has been recognized as the IAEA’s Regional Training Center (RTC) in nuclear security in the English language [1].

The EEAE is certified according to ISO 29990 standard for the design, development and provision of non-formal education and training in radiation protection and nuclear safety.

3. Distance learning platform – edu.eeae.gr

The training provided is mainly based on the traditional face to face component. In order to upgrade and broaden the effectiveness of the training provided and to optimize the allocation of the related resources, EEAE has adopted the blended learning approach. In this respect, a distance learning platform has been established to support the asynchronous distance learning component.

Asynchronous distance learning offers the potentiality to expand the provided education and training to those interested parties, who due to practical limitations (distance, available time) are unable to attend the traditional face to face training. Thus, anyone interested may, in his own convenient time attend any course he/she wishes. Moreover, the asynchronous distance learning is a cost effective infrastructure that enhances considerably the education and training potentialities.

3.1 Development of the distance learning platform

The distance learning platform was developed in 2015, in house, with the support of the EEAE IT department. The distance learning platform was based on Moodle.

Moodle (Modular Object Oriented Developmental Learning Environment) is an open source learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environments. It provides a flexible tool-set to support both blended learning and 100% online courses Moodle is a modular system based on plugins for different kind of content and for all kinds of collaborative activities. Moreover it is easy to learn and use, as it provides a simple interface, drag-and-drop features, and well-documented resources along with ongoing usability improvements. Tens of thousands of learning environments globally and more than 90 million users across both academic and enterprise level use Moodle, making it the world's most widely used learning platform [4].

The EEAE has opted to implement Moodle on CentOS Linux server using MySQL database inside a VMware Esxi virtual machine, running on a cluster of VMware servers. EEAE has named its Moodle based distance learning platform as edu.eeae.gr and may be accessed through edu.eeae.gr.

The appearance of Moodle (theme, fonts, colors, plugins) was customized in order to blend with the EEAE preferences. Moreover, a special logo for the distance learning platform was designed. The picture in Fig. 1 is a screen shot of the front page of the distance learning platform of EEAE, edu.eeae.gr, and presents the special logo, the design and the appearance of edu.eeae.gr.

The operation and maintenance of the distance learning platform, edu.eeae.gr, are also supported by the IT Department of EEAE.

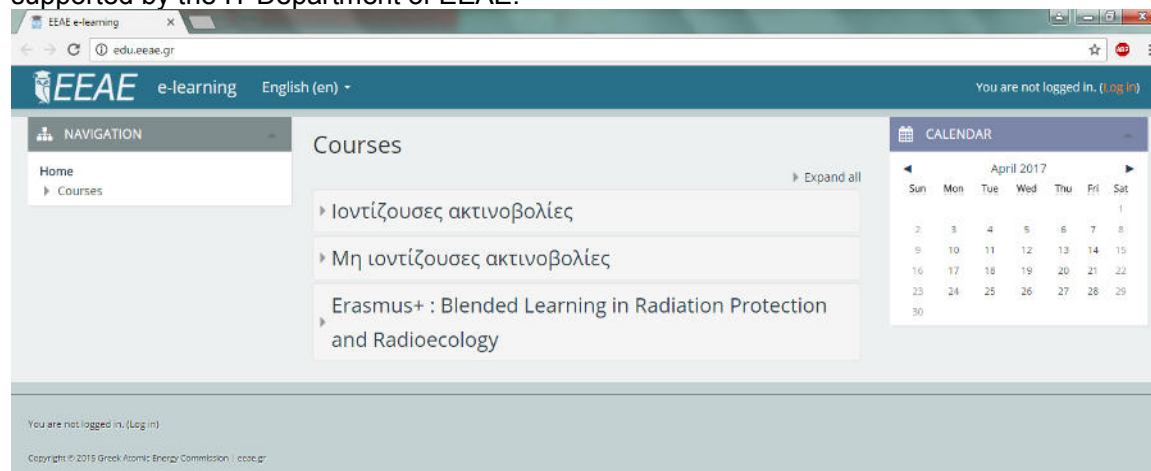


Fig. 1 The front page of EEAE distance learning platform, edu.eeae.gr

Following the installation and development of the distance learning platform, edu.eeae.gr, internal test courses were implemented in order to evaluate the performance of edu.eeae.gr. The distance learning platform was updated according to the reviewers' insightful comments and suggestions.

Afterwards, e – courses at national and international level were developed in the distance learning platform, edu.eeae.gr. The description of the e – courses follows in the next session.

The platform is now fully operative with more than 110 users during its first year of operation. Moreover, in the near future it is expected to be incorporated within the EEAE's quality management system according to the ISO 29990:2010.

3.2 E – courses

E-courses are provided through the platform at national (in the Greek language) and international level (in the English language).

3.2.1 National level

At national level, the courses are mainly used to support the face to face training of occupationally exposed workers by providing supplementary information. Currently three e – courses are available. The first is designed for and addressed to veterinarians, the second is for industrial radiographers and the third is for medical technologists.

Veterinarians' e – course: "Radiation Protection during conventional radiographic systems in Veterinary Medicine"

The purpose of the "Radiation Protection during conventional radiographic systems in Veterinary Medicine" e - course is to properly train and supplement the veterinarians with the necessary knowledge regarding radiation protection. This course embodies the importance that the new EC BSS attributes to the proper education and competence of those who use ionizing radiation.

The course covers the topics of the fundamental physical principles of radiation (both ionizing and non-ionizing) and their biological effects, dosimetry, Computed and Digital Radiography techniques, basic radiation protection standards, radiation protection in veterinarian radiography and the relevant legislation framework. There are also two practical training sessions regarding the basic safety standards in the small and exotic animals (the first) and the horses (the second) radiography techniques. The e – course is comprised of power point presentations and a relevant textbook.

Industrial Radiographers' e – course: "Radiation Safety in Industrial Radiography"

The e – course for industrial radiographers, "Radiation Safety in Industrial Radiography", covers the topics of the fundamental physical principles of radiation and its biological effects, radiation protection basic safety standards, radiation protection in industrial radiography, radiography equipment, design and use of shield enclosures, in situ radiography procedures, safety and transportation of radiation sources, emergency plans and accidents in industrial radiography. The e – course is comprised of power point and video presentations and a relevant textbook.

Medical technologists' e – course: "Radiation Protection for the medical technologists"

The EEAE has developed an e – course which is addressed to the medical technologists, who use medical equipment that incorporates ionizing radiation, in order to support them during their preparation for the prerequisite exams for the acquisition of the certification of competence in radiation protection. The medical technologists" e – course includes the fundamental physics of radiation and interaction of radiation with the matter, basic principles of radiology, nuclear physics and radiotherapy.

The educational material includes power point and video presentation as well as a relevant textbook. Furthermore, for the better preparation of the participants, self-assessment quizzes have been developed.

Besides the abovementioned courses, that have been developed in the field of ionizing radiation, in the field of non-ionizing radiation a training course for the sunbeds' operators has also been developed.

3.2.2 International level

At international level, the platform supports the e-learning elements of the Erasmus+ programme of the European Commission: "Blended Learning in Radiation Protection and Radioecology". The project has started in September 2015 and it is expected to be completed in August 2017. The project is implemented by 10 partners and EEAE participates as a partner. The objectives are to develop mixed educational actions (live and e-learning) on radiation protection and radioecology, as well as the ongoing education and training of personnel occupationally involved with radiation protection. The six modules that have been developed cover the basics of nuclear and radiation physics, the basics of measurement and dosimetry, radiation protection, general safety principles, basic radiochemistry and medical applications. There are also topics about training on risk assessment and waste management.

The distance learning platform, edu.eeae.gr, is intended to support the EEAE activities as an IAEA RTC and more specifically the needs of the Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources (PGEC).

4. Conclusion

The distance learning platform, edu.eeae.gr, which EEAE has recently developed, is now fully operative. Within less than the first year of its operation more than 110 users have participated in the provided e – courses. The distance learning platform, edu.eeae.gr, is expected to strengthen and expand the education and training provided by the EEAE, being a robust, proficient and cost – effective learning tool. Thus the EEAE, exploiting the potentials of the most sophisticated and modern learning tools, is able to provide up to date and flexible education and training to everyone occupationally exposed to ionizing radiation, according to its national and international obligations.

5. References

- [1] K.L. Karfopoulos, E. Carinou, V. Kamenopoulou, P. Dimitriou, Ch. Housiadas. Building competence in radiation and nuclear safety through education and training – the approach of a national regulatory authority. *Radioprotection* 50(1), 59-64 (2015).
- [2] Greek Radiation Protection Regulations (2001) Ministerial Order No1014, Official Gazette of the Greek Government No 216B.
- [3] Council Directive 2013/59/EURATOM (2013) Basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/EURATOM, 90/641/EURATOM, 96/29/EURATOM, 97/43/EURATOM and 2003/122/EURATOM 05.12.13.
- [4] www.moodle.com