



# INTER-KNOWLEDGE ENVIRONMENT FOR TEACHING AND TRAINING IN RADIATION PROTECTION USING ENEA ICT: CRI & IES INTERNSHIP EXPERIENCE

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## 1. INTRODUCTION

In this millennium, the dissemination of knowledge on radiation protection has become increasingly important. The Italian Association for Radiation Protection (AIRP) and the Italian Association of Medical Radiation (AIMR) work to inform the population, students and groups of experts about the risk of natural and artificial radiation in the environment. In 2003, our laboratory, the Department of Environmental Radioactivity Measurements Central Laboratory of the Italian Red Cross (CRI-LC-SMRA), initiated a collaboration with The Institute for the International Education of Students (IES) in Rome to create a unique internship experience. This Radioprotection Internship aims to provide American students from a variety of backgrounds with an intercultural training experience in the field of radiation protection. In nine years of collaboration between IES and CRI (2003-2012), 19 American students have thrived within a meticulously developed internship curriculum that consists of theoretical and practical activities held in the laboratory as well as field work in the environment.

In recent years, we have also taken steps towards developing an e-learning experience that has already successfully enhanced the internship experience. In 2011, all instructional material produced by interns since the start of the program in 2003 was synthesized into a multimedia CD. This new environment, which we call the "Inter-Knowledge Project", has been designed by ENEA Usability & Media Lab of Rome to manage data, information and knowledge gained by students in the Radiation Protection Internship using interactive videos. We have created a scheme for a virtual e-learning environment which will be managed by users, teachers and students in a collaborative way to produce multimedia contents, documentation and courses in real time. The IES Program (Program Review 2009) has recognized the high quality teaching and training given by tutors and staff of Central Laboratory. This collaboration made it possible for IES students to benefit from a highly formative academic experience based on research and social interactions. In the 2012 the ENEA MATRIX platform service has been integrated in the National Institute of Health (Italy) Portal to disseminate information and knowledge about depleted uranium. This e-learning platform was judged as among the 10 best practices in International reported the document CWA 15660 of February 2007, CEN Award "Providing good quality practice for E-Learning 2007" and, moreover, ENEA received the SEE AWARDS 2008, "Sustainable Energy Europe Campaign", for the "Co-operation programmes".

## 2. OBJECTIVES

- > Promote an internship program for American university students in collaboration with IES using innovative tools;
- > Create an integrated environment for the management of experimental activities and teaching materials utilized during the internship at CRI;
- > Synthesize an organized collection of experimental data collected by students in the field of natural and artificial ionizing radiation of the laboratory of the measurement of environmental radioactivity;
- > Create a report of documents created by the students during the internship period, including reports of technical activity in the laboratory, notes from fieldwork, references of scientific literature, conferences, photos and videos;
- > Create a teaching method using new technology based on a website on the internet, allowing for the use of multimedia lessons, videoconferences, and other collaborative methods of disseminating information;
- > Disseminate knowledge in the field of radiation protection acquired by the Italian Red Cross to a broader international community of students;
- > Provide a network of knowledge that can continue to be a resource to our interns even after the internship period;



## 3. METHODS

### 1. Research Project

#### Relationship Between CRI & IES

The Italian Red Cross since 2003 and IES. In these 10 years of working Americans have 19 students attended the internship at the Central Laboratory CRI.

### 2. Activity Internship

Service takes place in the Environmental Radioactivity Measurements / LC / CRI: 1. Radon Laboratory : measures natural ionizing radiation

2. Gamma Spectrometry Laboratory : measures artificial and natural ionizing as a result of Chernobyl and Fukushima.

The Internship gives the student experience in the laboratory as well as in the field. At the end of the semester each student writes an essay in his/her choice of Italian or English. The essay is evaluated along with the student's overall learning progress and teamwork abilities at CRI. Figure 1 provides an example of the program with a description of our latest intern's activities.

Collaboration	Italian Red Cross (CRI) and the International Education of Students (IES)
Acronym	Internship SMRA/LC CRI & IES
Division	Central Laboratory CRI - Roma
Internship	XIII
Student	Jennifer ROCKS
IES Student Services Coord.	Dr. Simona DI GIUSTINO
CRI Student Tutor	Dr. Claudia FONTANA
Description of the Activities of the Intern	<p>Training is divided into three stages:</p> <p><b>Stage A (basic):</b> general introduction to radioprotection in the CRI</p> <p><b>Stage B (approach to experimentation):</b> description of the methods used by CRI, which follow the standards set forth by the National Campaign of Monitoring and the Network of Surveillance of Environmental Radioactivity in Italy</p> <p><b>Stage C (hands on work):</b></p> <p>a) <b>Laboratory Practice:</b> preparation of biological samples, practice with gamma ray spectrometry</p> <p>b) <b>Radioprotection Course - Natural Ionizing Radiation:</b> methods for active and passive measurements of radon, as well as effects on health</p> <p>c) <b>Inter-technology:</b> contributed to the realization of the Inter-Knowledge Project</p>
University Credit	University credit will be transferred to the home school in the United States after evaluation of a final term paper by both CRI and IES
Period of Internship	One semester, February 2012 to May 2012
Director and Managers of the Italian Red Cross	Dr. Anna Rita ROCCALDO, Manager of the Service of Social Activity, Health Committee Centrale CRI

Figure 1 - Summary of the Program Student Internship

### 3. INTERNSHIP - A Training Course on Ionizing Radiation Base

that is followed by the use of slides. Given student interest in learning more about radiation, a CD with instructional material was made between 2009 and 2010 (Figure 2). This data CD was then used to create a multimedia CD for a course on the website of Italian Red Cross and on the University of Chicago of IES (Figure 3). The program includes Study Days held by professors and experts in the field. At the end of the internship, there is a workshop meeting and discussion with tutors and students in the class of IES and CRI (Figures 4-5)

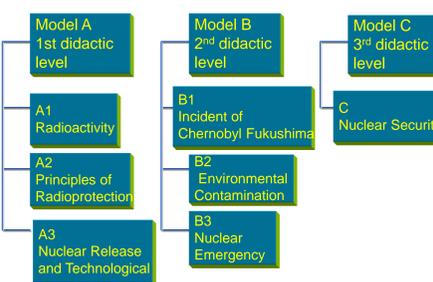


Figure 2 - Internship \_Training Course on Ionizing Radiation Base



Figure 3 - Internship \_ Study Day



Figure 4 - Internship \_Workshop Meeting

## 4. RESULTS

### GENERAL STRUCTURE OF THE "INTER-KNOWLEDGE" ENVIRONMENT

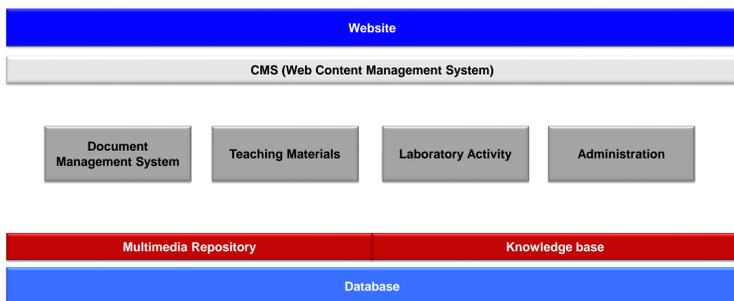


Figure 5 - Web Content Management System Schema

In Figure 5 is shown the general structure of this system. It has an integrated website with a Web Content Management System (CMS). This system allows for the flexible management of the site structure as well as the dynamic management of learning materials.

### REPOSITORY MANAGEMENT STRUCTURE & PROCEDURES

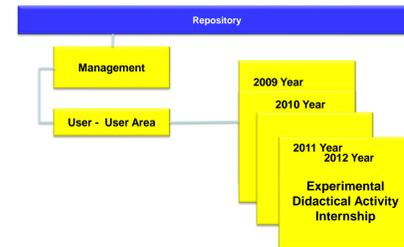


Figure 8 - Repository of the Inter-Knowledge Environment

### MANAGEMENT AND INQUIRY FUNCTIONS

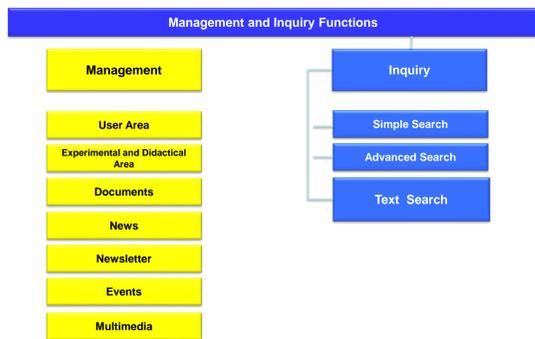


Figure 6 - Functions of the management and integration of the Inter-Knowledge Environment

In Figure 6 the main functionality of the management and query system are shown; they include:

- > **Users and user space:** the system manages the data of students, their profiles and the work areas;
- > **Experimental and teaching activity:** the management of research and teaching activities with information on the work done and the data collected and processed, as well as the results achieved;
- > **Documents:** management of teaching and scientific materials as well as journals and information produced by the students;
- > **News and Newsletters:** independent management of information content about the news of the moment in the form of a mini-magazine for an online community of internships of various disciplines;
- > **Multimedia:** video seminars and lectures accessible via the Internet network.

During the internship the student benefits from working with SMRA Tutors who provide personalized training tailored to the scientific and culture interests of the student, with particular attention to education on monitoring radioactivity in the environment, focusing on sample and analysis methods promoted by the national standards of the Laboratory of the National Network Resorad (ISPRA).

Figure 7 shows the Entity / Relationship Schema of the Inter-Knowledge Database where the user is linked both to the document and the didactical material.

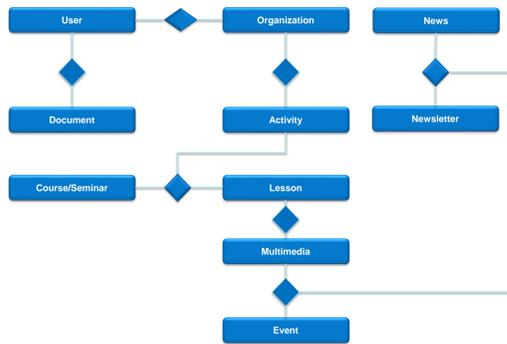


Figure 7 - Inter-Knowledge Database Entity Relationship Conceptual Schema

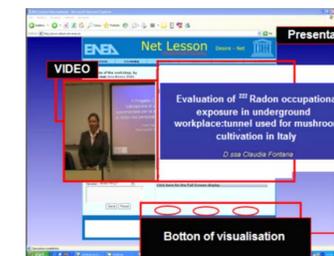


Figure 9 - Internship \_Course of e-learning



Figure 10 - Archive of Internship Participants

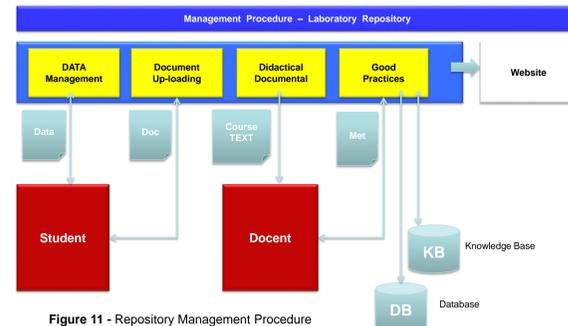


Figure 11 - Repository Management Procedure

## 5. DISCUSSION AND CONCLUSIONS

The activities carried out by the Central Laboratory Service and the Social-Medical activities of the Red Cross has strengthened exchanges between the Italian Red Cross and several American Universities, enhancing the education of foreign students and enriching the scientific activities of the Central Laboratory. Our interns have provided valuable support to various sectors of the Service of Environmental Radioactivity Measurements CRI. Moreover, the disclosure of the activities of CRI has allowed American students, already involved in volunteer work, to study and understand the commitment of the Program of Aid and Development to vulnerable populations in different areas of the world.

In addition, students who worked on internships have developed great interest and involvement in their experiences, thriving in constructive work environments throughout the internship. The friendly and helpful staff at SMRA and CRI have encouraged students to overcome language difficulties and strive to expand their Italian vocabulary and speaking abilities. Their advancement in the language allowed them to better understand concepts concerning radioactivity.

The students were involved not only in laboratory activities, but also the outputs for sample collection and preparation of articles for scientific journals and conferences. For many participants, this experience was also crucial to understanding lab research and some have begun to think about pursuing public health in their future careers. In conclusion we can say that our success in teaching with ICT and e-learning indicates the potential of these systems to disseminate, nationally and internationally, knowledge of large groups of students and experts.

In fact the network of shared documents and scientific content can be a good basis to achieve, over time, a knowledge base to support both one-on-one training and self-teaching. The use of the web and its technologies is now inevitable and the spread of Wi-Fi networks and mobile devices allows for immediate access to the management server's repository, allowing for maximum mobility, accessibility, and usability in the laboratory and in the field. In particular, the e-learning platform MATRIX has also been used to disseminate a complete didactical and information program based on lessons and seminars on Depleted Uranium by means of the Italian National Institute of Health (ISS) Portal Project (2012). These technologies will allow the intern to continue work on the web and allow for the intern to stay updated even after the internship period is over.

The future goal of this program must be not only to continue creating internships with IES, but also to enlarge the program to include other departments in the Red Cross that deal with international operations.

