Inter-knowledge an Innovative Environment for Teaching and Training in Radiation Protection using ENEA ICT: CRI & IES Internship Experience

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ABSTRACT

The dissemination of knowledge on radiation protection in our millennium is more relevant: the most representative Italian Associations in this field as the Italian Association for Radiation Protection (AIRP), the Italian Association of Medical Radiation (AIRM), carry out a plan to inform the population, students and specific groups. The Department of Environmental Radioactivity Measurements Central Laboratory of the Italian Red Cross (CRI-LC-SMRA) in 2003 initiated a collaboration with The Institute For The International Education of Students (IES) in Rome (Italy), American University Union, for activities Internship cooperating also with the Social Activities, Health, Social and Health of the CRI Central Committee. The Inter-Knowledge Project has among its objectives the promotion and dissemination of intercultural training and orientation for American students, engaged in various sectors, wishing to develop new knowledge in the field of radiation protection. This collaboration made it possible for IES students can live a highly formative academic experience based on research and social. The trainees have received academic credit from the home university of the most prestigious in the United States. In this context, new teaching methods, based on web technologies and e-learning in terms of platforms, online courses, video lessons and multimedia content accessible via the Internet have been introduced. The new environment, called "Inter-Knowledge", has been designed by ENEA Usability & Media LAB of Rome to manage data, information and knowledge gained by students in Radiation Protection Internship. The virtual e-learning environment is managed by the users, teachers and students, in a collaborative way to produce, in real time, multimedia contents, documentation and courses. All didactical materials can be directly usable with last generation of the mobile devices like: net-books, tablets and smart-phones. The IES (Program Review 2009) has recognized the Italian Red Cross high quality teaching and training given by the tutors and the staff of Central Laboratory. In the 2012 the ENEA E-Learn platform service has been integrated in the National institute of Health (Italy) Portal to disseminate information and knowledge about the Depleted Uranium. This e-learning platform was judged 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”.

Introduction

In 2003, the Italian Red Cross (CRI) and the Institute for the International Education of Students (IES) signed a collaboration agreement to guide internships for university students from the United States. Since its conception in 1950 with a trip of 20 students to Vienna, the program has grown to offer programs in over 32 cities and enrolls approximately 5000 students a year. Each semester, the IES program site in Rome hosts about 30 participants in its internship program from some of the best universities in the United States. The selection of these students for the internship program is made by IES and is based on their scholastic curriculum (art, humanities, sciences, etc.) and to their preferences and interests (art studio, film, technology. The internship placement gives the young adults a new humanitarian experience, allowing them to conduct volunteer work in their field of interest in an enriching social context.

In ten years of collaboration between IES and CRI (2003-2012), 18 American students have thrived at an internship at the Service of the Measurement of Environmental Radioactivity Laboratory. These students came from diverse backgrounds at a variety of universities across the United States, including: Ithaca College Biochemistry, Johns Hopkins University Biology, Hometown: San Pedro, CA; Occidental College History, Pre-Med Hometown: Spring Valley, CA; University of Rochester Physics, Mathematics Hometown: Barrington, RI; College Biology, Hometown: Albuquerque, NM; Emory University Anthropology, Human Biology, Hometown: Hilton Head Is., SC; University of Rochester Biology, Anthropology Hometown: Voorheesville, NY; Temple University Biology, Chemistry; George Washington University Public Health Hometown: Southbury, CT; etc.

Over the years we have designed a cohesive internship curriculum that consists of theoretical and practical activities held in the laboratory as well as field work in the environment. A main component of the curriculum includes a basic training course on ionizing radiation. At the end of the semester each participant prepares a thesis, either in Italian or English, which is evaluated along with his or her group work during the semester. The students receive guidance from the SMRA/CRI staff and a tutor to write this thesis. Students are also guided to take an interest in a specific internship activity that takes place in the CRI laboratories:

- LAB. Radon, dedicated to the measure of natural ionizing radiation;
- LAB. Gamma Spectrometry, dedicated to the measure of natural and artificial ionizing radiation following the Chernobyl incident.

Our program gives students the opportunity to get in touch with the world of scientific research and acquire expertise in the field of environmental radioactivity, a topic that is generally not covered in undergraduate programs. The program therefore exposes our students to a unique set of tools and techniques, allowing them to apply and understand various aspects of radiation protection in their future academic endeavors.

On the initiative of CRI, between 2009 and 2010, SMRA collaborated with students to create a data CD containing a complete collection of all instructional material produced by interns since the start of the program in 2003. In 2011, this data was synthesized into a new multimedia CD with the collaboration of the Usability Lab and Media ENEA Casaccia. The interactive video learning experience includes a basic training course in radiation protection, which can also be found on the CRI and IES websites. The course uses new web technologies to manage the interaction between students and teachers during learning activities and experimental field work.

The Inter-Knowledge Environment

It has become more common for teachers to use a combination of contiguous training and e-learning to guide the undergraduate internship experience. E-learning systems allow teachers to implement a strongly structured lesson plan as well as to share essential resources collaboratively over the internet (M.G. Moore, independent study). This advanced environment was integrated with a platform of e-learning called MATRIX and its functional modules, called “inter-knowledge”. This type of web-based environment has been used since the first years of the 2000’s both in other European projectsand in“Web and multimedia database design” (DB LAB II) course of the Computer Sciences Department, “La Sapienza” University,Rome, Italy. The general architecture of this system, shown in Figure 1, applies an integrated web content management system, called CMS, to create dynamic site structures, web pages, information, and training materials.

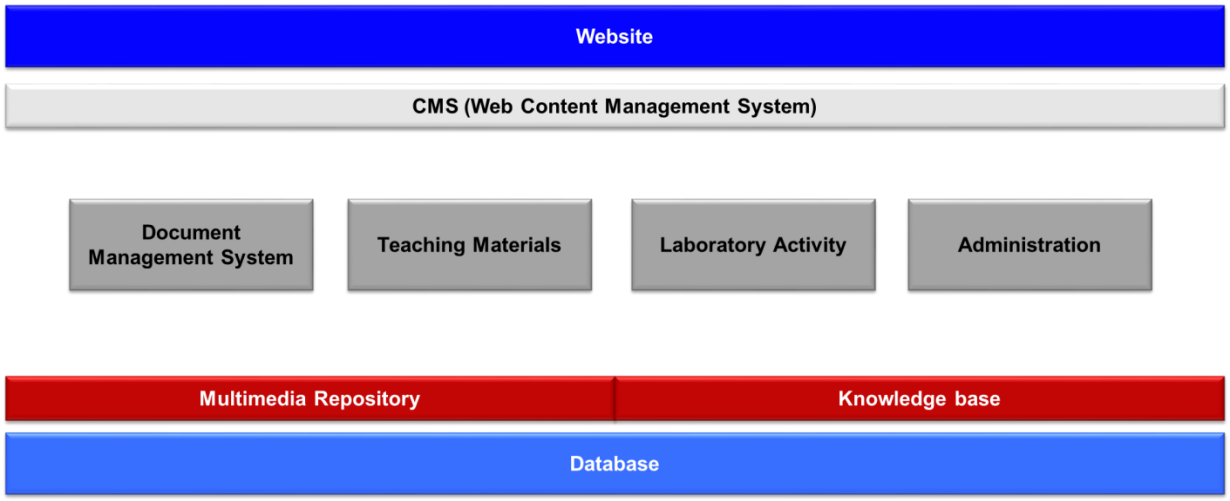
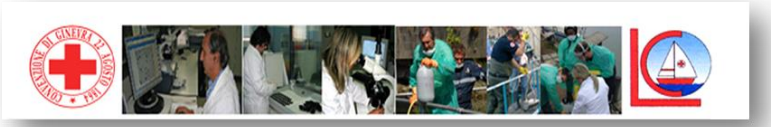


Figure 1 - Web Content Management System Plan

The environment also includes a system of scientific and technical document management (WBDMS) which gives teachers access to modules and lesson plans. "Inter-Knowledge" allows you to manage, therefore, teaching material (courses and e-learning objects), in a synchronous and asynchronous way using the form DM (Didactic Material). The functional form of management of activity of the laboratory results fundamentally for the planning of the use of instruments, the management of experimental activities in the laboratory (LA "Activities of the Laboratory") and the work field. The networking and sharing of such information represents a significant step forward in the collaborative work that characterizes this kind of teaching experience. The system architecture and the management of cards (CARDs), of various participants through an Administration module includes a Multimedia Repository (MR) that allows students to understand and comprehend through visual means (video, photo, etc.). The Inter-Knowledge Environment also makes use of a function module called Knowledge Base (KB), which manages general knowledge through a shell of Wiki Media. The more specific knowledge is managed with conceptual maps integrated with a set of rules of detailed knowledge in a natural language with the IALINA experimental interface. Finally, the data base managed with DBMS Mysql collaborates, in a functional way, with all website system modules. This database will also have the option to manage the data of the individual student in a personal area. The website starts from the homepage and includes a registration form and login with a UserID and Password to access to the system that requires a student registration, successively validated by the system administration. The structure seen in Figure 2 has an informative section for laboratory work, including research data, technical data, and scientific documentation that is handled by WBDMS.

Figure 2 - Web site of "Inter-Knowledge "

In addition to the management of didactic material and data, the website will also manage news of interest to students through a Newsletter. The site has the ability to dynamically manage significant links to other sites that describe national and international events such as seminars, symposia, and conferences that would be relevant to radioprotection. Figure 3 demonstrates how the "Home" tab allows new students who are interested in the internship program to explore what the program has to offer. They can learn about the activities involved in the internship, who the partners are that coordinate the internship, how university credits are issued, and the location where the internship takes place.



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
IES Student Services Coord.	Dr. Simona DI GIUSTINO
CRI Student Tutor	Dr. Claudia FONTANA
Description of the Activities of the Intern	**The training provides:** Δ knowledge base for learning the phenomenon of natural radioactivity and artificial, Δ The risks associated with ionizing radiation, methods of investigation adopted in Italy according to new international standards Δ Allows to learn the methods of sampling and measurement protocols for the environmental assessment of radiocontamination and social health risk from technological or hostile nature Δ Particular attention is given to the main topics of radiation protection, technical and operational aspects of the emergency and in general to preventive health care workers. **Training is divided into three stages:** **Stage A** (basic): general introduction to radioprotection in the CRI **Stage B** (approach to experimentation) **Stage C** (hands on work): 1)Laboratory Practice 2)Radioprotection Course - Natural Ionizing Radiation 3)Inter-technology
Beneficiaries of the Training	The training is aimed at American students engaged in humanitarian potential sectors who wish to know this theme which explores issues of civil protection and health education on the basis of the doctrine of the Red Cross
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. Amos DAWODU, Director of National Health CRI Dr. Anna Rita ROCCALDO, Manager of the Service of Social Activity, Health Committee Centrale CRI

Figure 3 - Summary of the Program Student InternshipSMRA/LC/CRI

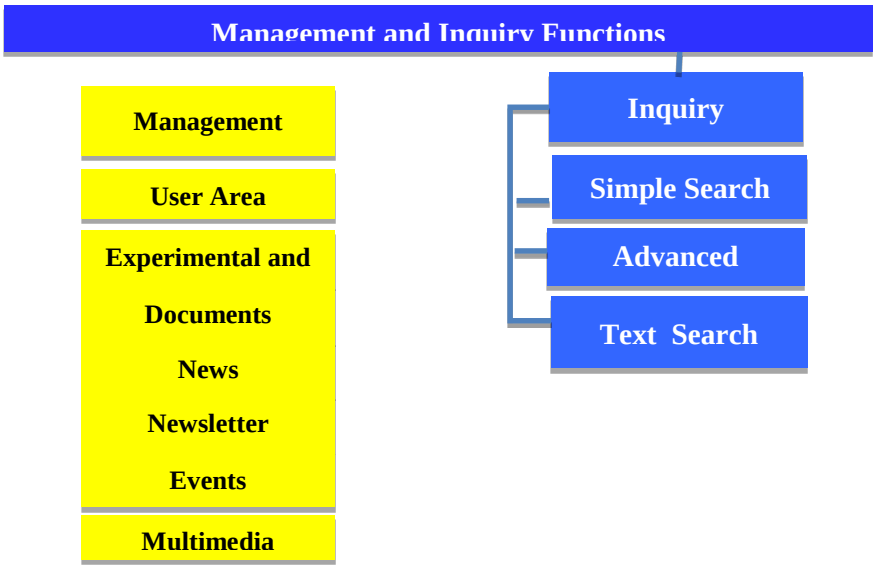
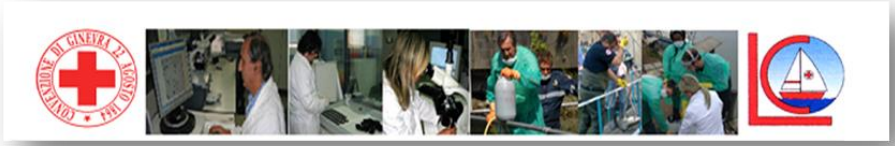


Figure 4 - Functions of the management and integration of the Inter-Knowledge Environment

In Figure 4 is shown the main features of the management query system would 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 network.

These functions allow to manage the web information sections. The information and data are visualized by means of several, simple and advanced, queries to the document (title and the text).
During the training periods is given by Tutors SMRA a curriculum tailored to the scientific and cultural interests of students, with particular regard to the monitoring of environmental radioactivity. Students learn in the laboratory and field methods of sampling and analysis adopted by national standards laboratories of the National Network Resorad (Ispra). The Figure 5 shows the IES CRI student card with information on the activity and the profile.



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	Training is divided into three stages: **Stage A (basic):** general introduction to radioprotection in the CRI **Stage B (approach to experimentation):** 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 **Stage C (hands on work):** a) **Laboratory Practice:** preparation of biological samples, practice with gamma ray spectrometry b) **Radioprotection Course - Natural Ionizing Radiation:** methods for active and passive measurements of radon, as well as effects on health c) **Inter-technology:** contributed to the realization of the Inter-Knowledge Project
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. Amos DAWODU, Director of National Health CRI Dr. Anna Rita ROCCALDO, Manager of the Service of Social Activity, Health Committee Centrale CRI

Figure 5 – Inter-knowledge Student CARD of the Internship SMRA/LC/CRI programme

The structure of the Repository of Figure 6 was defined on a time scale for a year and generation of students. The management is relative to the individual student and access occurs from the work area.

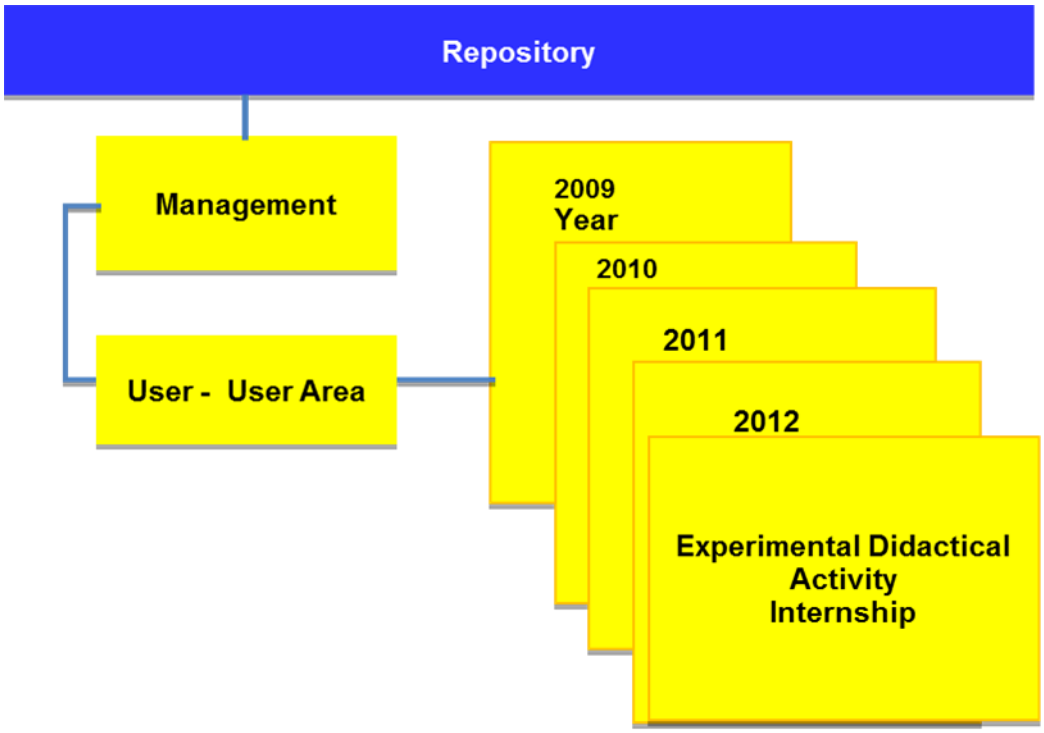


Figure 6 – Inter-knowledge Environment Repository

This structure for the directory is therefore accessible in a direct way across the module of interrogation (Query System) and for half of the management module of documentation of multimedia.

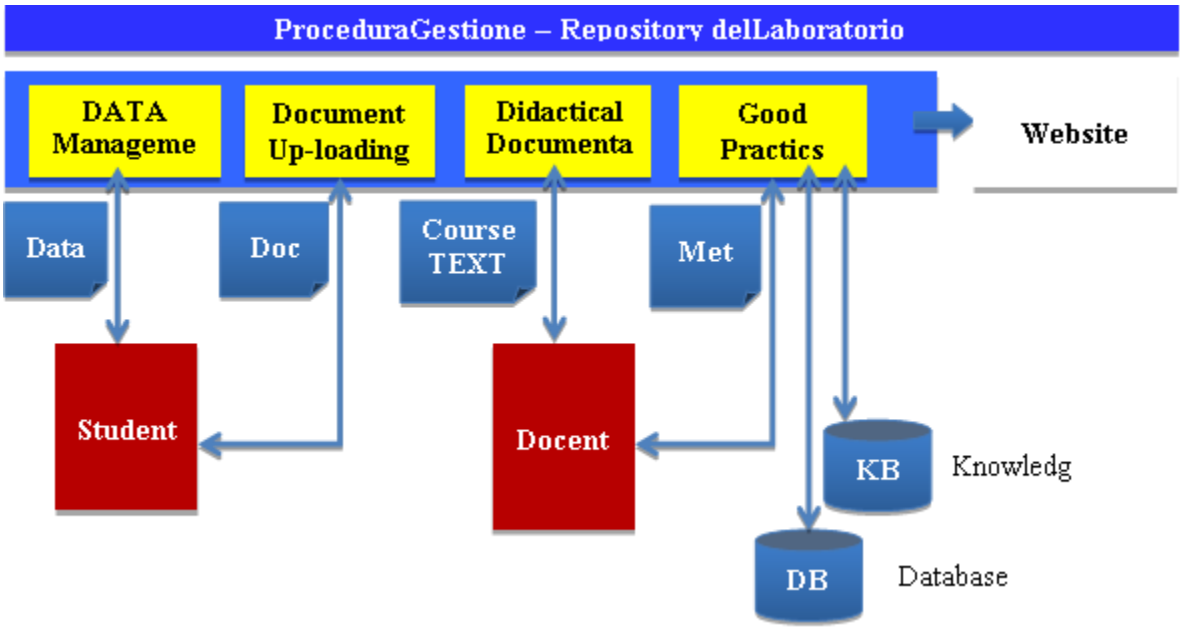


Figure 7 – Repository Management Procedure

The procedure of management of the Repository, demonstrated in detail in Figure 7, allows the intern to insert data and documents, while allowing the teacher to manage course texts, methodologies and procedures. This collaborative environment also implies a synchronous communication between teacher and intern for the purpose of analyzing data, understanding the laboratory, and properly processing results. Finally, the system manages new documents that can be used to supplement the didactic material of the teacher.

In our experience, students have assembled the materials pertaining to various activities during the internship of the course of the year. In particular the work is organized in the following manner:

- archive of entrance forms;
- studentspersonal information database;
- archive at school;
- activity sheets for students;
- photo materials from the laboratory and work field;
- thesis paper;

With guidance from mentors in our laboratory, students have assembled all of the material stored in files into an organized collection for future use on the website. Figure 8 demonstrates how this work has been organized.

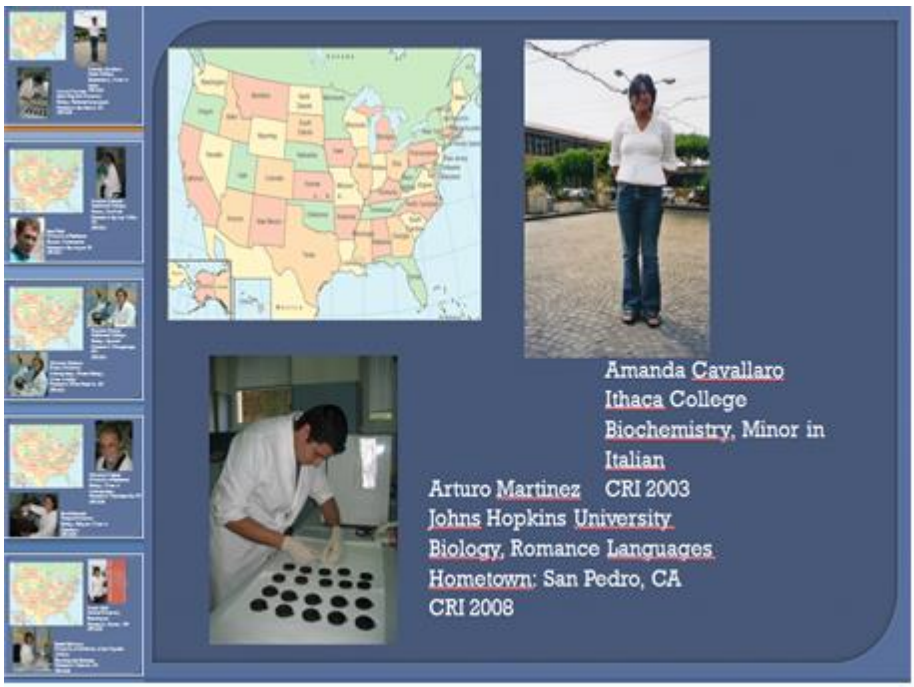


Figure 8 - Internships participant Cards

During the internship periods students work with SMRA Tutors on a Training Course on theoretical and practical radioprotection, technical and operational aspects of nuclear emergency, and prevention of natural and artificial ionizing radiation with particular regard to monitoring activities of the Network. At the end of each internship, students present what they have learned in our program to other interns within the IES program, introducing their peers to new issues, terms, and concepts.

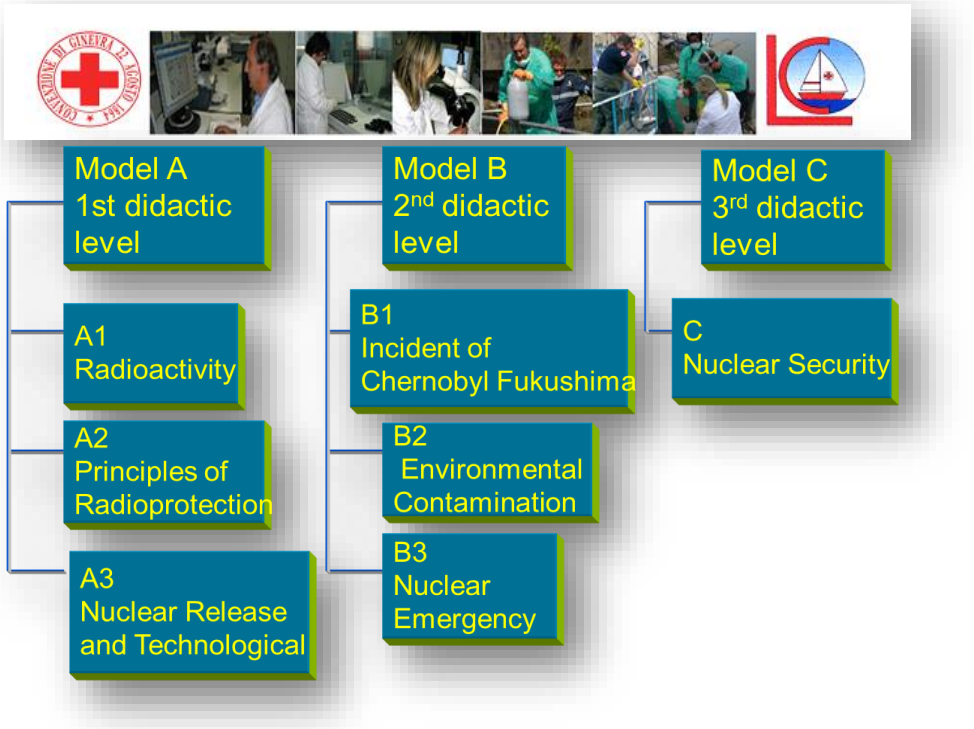


Figure 9 - Internship _Training Course on Ionizing RadiationSMRA/LC/CRI

One can observe the theoretical and practical Training Course that is divided into 3 Levels: A, B, and C, each corresponding to a different educational level, which includes specific topics. Level A is divided into 3 sub-levels of learning and provides an introduction to radioactivity, including an overview on the principles of radiation protection and the risks associated with radiation. Level B has 3 sublevels of learning, including training on environmental contamination, the history of the Chernobyl accident and Fukushima, and nuclear emergencies in general. Level C deals with Nuclear Security and in particular on how a risk is perceived. Figure 10 demonstrates the conceptual Entity/Relationship of the database of the Inter-Knowledge Environment used for the development of a 2012 application.

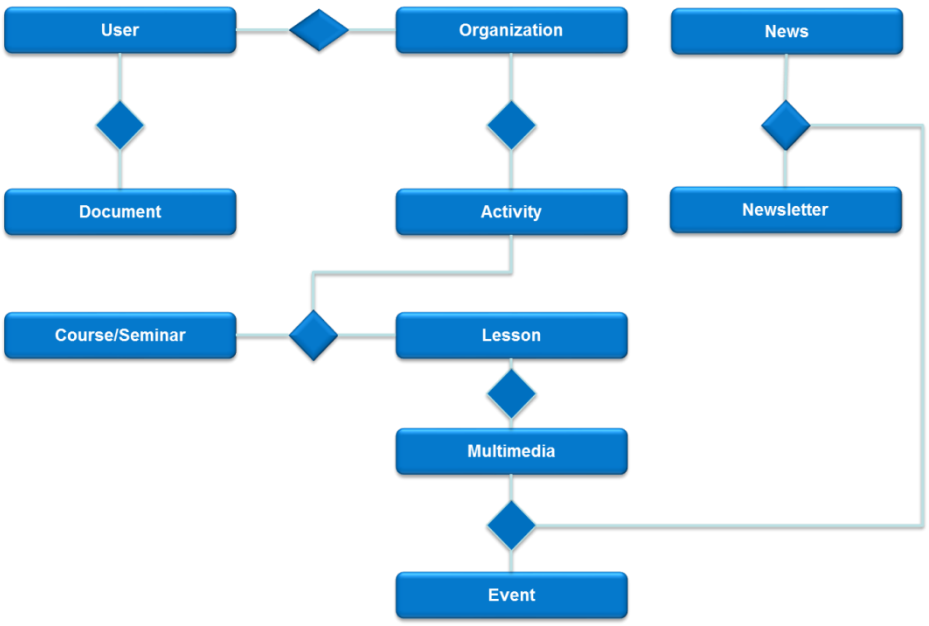


Figure 10 - Inter-Knowledge Database Entity Relationship Conceptual Schema

Conclusion

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 ofthe 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 friendly 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 understand how a lab and some have begun to think about the industry 'public health' for their future career. In conclusion we can say that the testing of technologies of ICT and e-learning is particularly significant to give indications on the potential of these systems to disseminate, nationally and internationally, knowledge of large groups of students and experts.

In fact the network sharing documentation 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 formaximum mobility, accessibility, and usability in the laboratory and in the field. In particular, the e-learning platform MATRIX has been also 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, over time, 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.

Acknowledge: *thank you for your cooperation and willingness of Dr. Simona Di Giustino, "Internship Coordinator" and student Jennifer Rocks.*

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