

Good communication on nuclear science and its applications is a challenging practice. Nuclear topics are generally perceived as being complex from the technical-scientific point of view, and also from the societal point of view, agreement and acceptance is not straightforward. Moreover, the application fields of ionising radiation are numerous and spread over many areas. The nuclear industry and the nuclear research sector, the medical sector, several branches of the non-nuclear industry and several disciplines in the academic world, all appeal on the phenomenon of the nuclear process of reduction of an excess of inner energy, called radioactivity. Besides these sectors who consciously use radioactivity in one or other application, other branches such as aviation and the fossil fuel industry are faced with artificially raised levels of natural radioactivity.

Maintaining a high level in nuclear competencies is crucial in order to guarantee the safe use of current nuclear applications and to ensure the protection of workers, the public and the environment. Next to this, an up-to-date nuclear knowledge is vital in R&D related to the optimisation of current and the development of future technologies.

An essential component in ensuring a high level of expertise in the future is a sustainable Education and Training (E&T) infrastructure. Educational systems provide the initial study to young learners. It is knowledge-based and generally provided by the academic world. Complementary to education is the unceasing maintenance of the level of competencies. Training activities need to be provided to young and not-so-young professionals working with ionizing radiation in all disciplines and at all levels.

When it comes to the future development and the realization of new great infrastructures, obviously preservation of knowledge through education and training is a necessary but not sufficient element, and also research itself is subject to support by government and public.

Good science communication can contribute to the scientific literacy and to the maintenance and increase of a social basis for the peaceful nuclear applications.

At SCK•CEN the expert group "Communication, education and knowledge management" works on the development of an overall science communication in nuclear, based on our scientific expertise (content), transdisciplinarity (method) and critical reflection (attitude).

In this spirit, and based on the general mission on E&T and communication developed by SCK•CEN's isRP's (international school for Radiological Protection), the cornerstones of our science communication policy are (i) organisation and coordination of courses, (ii) policy support and (iii) research on the transdisciplinary aspects of E&T. Following paragraphs give more detail.

### **Coordination and organization of training and education programmes on radiological protection**

Thanks to its thorough experience in the field of peaceful applications of nuclear science and technology, SCK•CEN has garnered a reputation as an outstanding centre of not only research, but also education and training (E&T). The E&T activities at SCK•CEN cover a.o. reactor physics, reactor operation, reactor engineering, radiation protection, decommissioning and waste management.

Our courses are directed to the nuclear industry, the medical and the non-nuclear industry, national and international policy organizations, the academic world and the general public. E&T programs are also organized in cooperation with universities and technical universities, nuclear power plants and public and private health services. Successful examples are SCK•CEN's contribution to the BNEN (Belgian Nuclear Education Network), and to the formation of radiation protection experts (a collaboration between SCK•CEN, XIOS Hogeschool Limburg, IRE and ISIB Bruxelles). In addition, SCK•CEN is involved in international research networks and training programmes, such as those of the European Commission and the IAEA.

Next to courses, SCK•CEN also offers students the possibility to perform their research work at our laboratories. Final-year students and PhD candidates can enter a programme defined by an SCK•CEN mentor, in close collaboration with a university promotor. PhD candidates and post-docs are recruited in specialised research domains that reflect the priority programmes and R&D topics of our institute.

## Policy support with regard to applied education and training on a national and international level

Although working with a variety of responsibilities and towards specific professional aims, practitioners have a triple common need:

- basic education and training to provide the required level of understanding of artificial and natural radiation;
- a standard for the recognition of skills and experience;
- an opportunity to fine-tune and test acquired knowledge on a regular basis.

From an executive perspective, education and training are undoubtedly the two basic pillars of any policy regarding safety in the workplace. Supported by a European Directive, the implementation of regulation on E&T and recognition of skills is most important in the field of radiation protection (RP). The RP rationale that serves as the basis for this policy is basically the same all over the world, going beyond cultural differences and disciplinary applications. In this sense, the implementation of a coherent approach to education and training in radiological protection becomes crucial in a world of dynamic markets and increasing worker mobility.

Through networking and participation in international programmes, SCK•CEN aims to contribute to an improved harmonisation of training practice and skills recognition on a national and international level. Specific issues of interest are the standard requirements for course programmes and educational material, the development of transdisciplinary training programmes, e-learning and distance learning, the link between radiation safety and conventional safety, the organisation of experience feedback, international exchange of knowledge and experience, and the sharing of lecturers, training facilities and educational source material... SCK•CEN coordinates 6FP ENETRAP (European network on Education and Training in Radiological protection, is member of the Steering Committee of the EUTERP (European Platform on Training and Education in Radiation protection), and is a partner in other networks such as ENEN and CHERNE.

## Research on transdisciplinary aspects of education and training

Understanding the benefits and risks of radioactivity requires technical insight and training, but also an insight into the context, as well as a sense for the social and philosophical aspects of the situation. In coordination with the academic sector, the research of SCK•CEN's isRP concentrates on how to integrate this transdisciplinary approach within education and training programmes for professionals as well as students and pupils.

Pupils have a wide attention span and are eager to learn. In our complex society, they should be able to develop an open and critical mind in order to gain more insight in and confidence towards multi-aspect issues, such as the risks and benefits of radioactivity and nuclear technology, and their possible applications in the medical and energy sector. In this sense, isRP interacts with teachers of secondary schools in order to discuss how the standard education programme can integrate a pluralistic approach to complex technical issues, such as the applications of radioactivity. The aim is to identify gaps in the existing curriculum and to find out how to establish links between specific courses and how to organise 'cross-over' sessions in practice.

Towards the general public, isRP works together with industry's visitor centres as well as with regional and Belgian state-sponsored communication activities on physics and nuclear science. In cooperation with SCK•CEN-PISA (Program of Integration of Social Aspects into Nuclear Research), isRP has build up experience with the theory and practice of participation and involvement in technology assessment. On various occasions, the two groups organise round tables, workshops and focus groups with schools and local communities, and this on topics such as medical applications of radioactivity, (nuclear) energy policy and radioactive waste management.

In this scientific report, three topics within this field of Education, Training and Communication are highlighted: "Training courses on integrated safety assessment modelling for waste repositories", "research on transdisciplinary aspects of education and training in radiological protection" and "reactor physics training".

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