

FORMER STUDENTS, PRESENT TEACHERS - ON BOTH SIDES OF THE DESK

A. R. Budu, M. C. Dumitrescu
University "POLITEHNICA" of Bucharest, Romania

Email address of main author: andreibudu@cne.pub.ro

Abstract. Both authors are currently assistant professors at the University "Politehnica" of Bucharest – Power Engineering Faculty - Nuclear Power Plant Department.

They share the experience of more than 17 years of school from which 5 years in the nuclear power plants department, with the experience they gain in the position of assistant professor.

Using the competence given by the new position, they accumulate the expertise necessary to excel in the nuclear power plants domain.

They try a harmonized approach for education on nuclear engineering bridging the gap between students and teachers.

1. Introduction.

All healthy organizations generate and use knowledge. As organizations interact with their environments, they absorb information, turn it into knowledge and take action based on it in combination with their experiences, values and internal rules. Without knowledge, an organization could not organize itself; it would be unable to maintain itself as a functioning enterprise.

The latest studies have shown that at present Nuclear Power Plants cannot be replaced by other kinds of electric sources and in no case by renewable ones in an efficient manner. Therefore, it is necessary to manage knowledge gathered in the nuclear field during the years and to keep on the nuclear safety research, education, and training to ensure and upgrade safe and reliable operation of existing and future facilities.

Like any highly technical endeavour, the use of nuclear technologies relies heavily on a vast accumulation of knowledge- volumes of scientific research, engineering analysis and many other types of technical information-combined with a complex assortment of people with the requisite educational background insight. They must apply that body of knowledge safely and effectively.

Today's nuclear workforce needs to document knowledge and to mentor the new nuclear scientists to build upon it, rather than having to re-create it. Unfortunately, the nuclear workforce is aging –meaning that more and more nuclear workers are approaching retirement age, without a corresponding influx of appropriately qualified younger personnel to replace them. Some countries are already reporting that the number of students choosing a nuclear-oriented career is too low to respond to industry needs. Probably the principal factor is the student perception that is affected by the educational circumstances: public perception, the industry's activities and reductions in government-funded nuclear programs. With unclear image of the future, many young students now believe that jobs prospects in the nuclear field are poor and that there is little interesting research.

2. Former students experience

Both authors are currently assistant professors at the University "Politehnica" of Bucharest – Power Engineering Faculty - Nuclear Power Plant Department. Moreover, we share the experience of 3 years as students at the same department. This situation allowed us to have an insight and recent view of the university education process in nuclear field in Romania.

We have chosen the Nuclear Power Plant department because it was the most attractive, with the Cernavoda Power Plant Unit 1 in service and the Unit 2 in construction. The other departments were less attractive, with very few work places and opportunities to offer. The

Nuclear Power Plant department offers much more opportunities to affirm ourselves in a field, and to get known, one of which is this conference.

A very interesting experience was the modelling of the main systems in a power plant, with various specific programs, a software simulation of the normal and abnormal regimes of plant functioning, at different power ratios. This analysis is necessary for the acceptance of the power plant from the security point of view.

In other departments, there is not such opportunity, and the experience given by the modelling software helps us to understand better the behaviour of the plant, the ranges of the main parameters.

As students, we were satisfied by the quality of the learning environment, that the University offered us. The faculty encouraged us to choose this line of specialization by using an “open doors” policy and attractive educational programs. Moreover, efforts were made to broaden student awareness of career opportunities in the nuclear field, through mechanisms such as advertising, job fairs and other cooperation between industry and university.

Life as a student begins at the admission exams with all the emotions of the moment, the great expectations and it stops at the moment when you get your diploma. In our case, we obtained an engineering diploma, after five years of studying.

The emotions are amplified immediately after the exams and fade a little bit at the great news: you are a student at a high education institution.

In the first two or three years of the student life we got very few professors that teach more than one course so we did not get the chance to familiarize ourselves with the methods and little schemes that they use to pass the knowledge to the students. This thing changes in the final years, when we learned the notions related to our major specialty.

In this stage, being a student gets more interesting than ever before, because the feed back – professors – students is intensified. Professor and assistant professors has begun to know us better, and the interaction between us grows. The study groups are getting smaller, the new knowledge is passed easier and more efficient from them to us. The professors can spend more time with each student, and the explanations get more accurate, clearer.

In comparison with the first years when the study groups were very large, when the professors had in front of them close to one hundred students and the laboratories were packed with thirty people, in the final years, one course is held with no more than forty, and a laboratory with no more than fifteen.

Sad but true is the fact that the closer we got to our professors the closer we got to the end of our student life. In the final year the courses and the laboratories are taught by professors that we have known fairly well. Moreover, they have known how to give the information that we needed in the most efficient way possible and in the shortest time possible.

At the end of the final year, there is time to part with these people. The student life ends with our theses. We spent a whole semester to write it, check it twice, review it, and after that, we presented it in front of a commission. The whole range of emotions that we had forgotten since the first year came back, and is more amplified by the short time at our disposal to confirm that we have learned something in those five years of student life.

However, there are some problems to comment. One of them is the practical point of view of the department. At the end of the fourth year we had a practical period at Cernavoda NPP.

In the schedule, we visited the following objectives:

- Unit 1 and the annexes, which provided us with a complete image about a fully loaded NPP, with all of the procedures in function.
- Unit 2, that provided us the complete image of a NPP, inside and outside. In the Unit 2 we visited all the components of the plant, including the nuclear building and the nuclear reactor which was installed.

- The CPON "full scope" simulator gave us the clear picture of the life of a NPP operator, and of the complicated inter-ships between various systems in the plant.
- The 400 kW electrical station gave us the possibility to review the electrical knowledge learned.
- The start-up diesel fuelled power plant.

Unfortunately, the allocated time to study deeply each objective was too short. We spent almost three years studying theoretically those systems and two weeks allocated for the practical period was too short to see and to analyze all the equipment and installations closely on site; to see the differences between theory and practice; to see what changes are made from the original plans which are forced by the location, the materials or by the manufacturing processes, all with the nuclear safety requirements imposed by the nature of the plant.

In the nuclear power plant department, at the beginning of each university year pre-engagement contracts between CNE-Prod (Unit 1) and CNE-Invest (Unit 2) are signed with the students in the fifth year or master students with the condition of an average grade greater 8.00 / 10.00.

In the 2002 / 2003 university year fifteen students have signed the contract from the fifth year of study and 4 master students.

After signing the contract, the fresh engineers are put through a vigorous training program that brings them up to the level of knowledge and professionalism demanded in a nuclear power plant.

3. Present teacher experience

On the other side of the desk, things did not appear so easy any longer. Crossing the student-teacher border was sudden and in some ways peculiar. Instead of doing the criticism, we were its target. Consequently, we tried a harmonized approach for education in nuclear engineering bridging the gap between students and teachers.

We tried to attract students to participate in European cooperation programs such as SENECA and EPURE, knowing that this will give the students the possibility to widen their knowledge horizon and increase their confidence and they could have a carrier in the nuclear field. We are convinced that the credits system, inserted in 1997 according with European Union requirements offers the possibility of competition and allows increasing the quality of the trainers and trainees and access to the most prestigious research laboratories and universities in the world.

We tried to involve students in nuclear organizations like "Romanian Association for Nuclear Energy." Here they even have the possibility to participate in making decisions, in editing "Nuclear Energy" magazine, in organizing "Nuclear Energy Days" Festival.

They are encouraged to participate with scientific articles at International Symposium on Nuclear Energy, biannual conference held in Bucharest. We try to attract the best students from senior years in research projects considering that this activity plays an important role in academic formation. These projects are part of national nuclear plans such as ORIZONT 2000 and RELANSIN, or they are contracted directly from beneficiaries within the nuclear industry.

Presently, Power Engineering Faculty it is coordinating the national program MENER (Environment, Energy, Resources), which includes the subprogram nuclear energy in which student could be determined, as an exercise, to participate in evaluating projects.

Besides attracting students, it is well known that assessment plays an important part in the teaching-learning process at high levels of education. Since assessment plays such an important and significant part in the future of students, there is no doubt that any assessment system will determine what students learn and the way in which they do this.

However, assessment is not just about grading and examinations. It is also about getting to know our students and the quality of their learning and to use this knowledge and understanding to their benefit. Assessment is without doubt one of the major 'drivers' of the teaching-learning process. It is thus important for teaching staff to be familiar not only with the technical aspects of the many different forms of assessment currently in use but also with their advantages and limitations and about assessment issues and concerns.

In the context of outcomes-based education, assessment should provide evidence that student performances are consistently judged in accordance with prescribed outcomes, should be authentic (i.e. involve students in the use of relevant and useful knowledge, understandings and practical skills) and should be an integral part of the learning process and produce reliable results.

The number of students who are choosing this specialization in Romania is fluctuating in terms of national nuclear program variation. To increase this number, our university is working in collaboration with European Union to establish the basis of distance learning.

Students performance improvement can be performed not only through lectures, but also through its integration in formal technical training in areas such as communications, teamwork and problem solving.

We also try to achieve a high grade of cooperative and collaborative learning. In this kind of learning, students generally work together in groups of two or more. These are usually face-to-face groups but, with the rapid expansion and availability of communication and information technologies such as e-mail, this can also be done effectively at distance.

In Romania, government support for nuclear education is rather insufficient. We are well aware that this is an expensive domain. A financial support from IAEA or other European Nuclear Societies will be in the benefit of both parties.

For instance, a nuclear training reactor to serve in different practical exercises will have an extraordinary impact regarding the level of nuclear education. We will be able to practice for real operations like reactor shutdown, reactor start-up, criticality experiments etc. Thus, the student will have an incomparable better understanding of the extremely complex processes that take place in such an installation.

The evaluation of teaching and of courses is important in the quality assurance process in higher education. However, there is frequently disagreement and debate as to how the evaluation should be carried out. The debate is often most vigorous on the issue of teacher evaluation. What is the value of student feedback? What is the best/most effective way of obtaining student feedback? Who has "ownership" of the evaluation data?

In Romania lecture is a widely used method of teaching in further and higher education. As part of the teaching staff coming to lecturing for the first time we found this instance be a challenging and even frightening prospect. Just because one knows one's subject does not automatically mean that one will be good at putting it across to large groups. Yet many lecturers find themselves standing in front of their first large group, without ever having been trained in any way to stand and deliver! There is also the challenge to more experienced lecturers to find ways of coping with increasingly large numbers of students in our classes.

This does not just happen to lecturers. Library staffs, support staff and research students are all likely to find that at least part of their work revolves round working with large groups of students, sometimes in lecture theatres, and sometimes in classrooms.

We are concerned what kinds of understanding, abilities, dispositions, habits of mind, and ways of thinking, knowing, and problem solving do faculty members believe students should achieve by the time they graduate? How do faculty members contribute to these expectations within courses and programs? How do faculty members build on one another's work to ensure

that students have many opportunities to develop institutional and programmatic learning outcomes?

What evidence would document students' progress towards those expectations, and how could that evidence be captured so that faculty members could learn about patterns of student achievement to inform pedagogy and curriculum? Similarly, what evidence would document students' level of achievement at the end of their studies?

How do educational experiences outside the classroom complement and contribute to expected learning outcomes? How do students make connections between what they learn in the classroom and what they learn or experience outside of the classroom? What do the curricula and other educational experiences "add up to"?

Being in this new posture of assistant-professor, we have to deal with all these problems. Answering to these questions will make us as proficient as our professors would like us to be.

4. Conclusions

The experience accumulated in our student years helps us to be better teachers. Being at the beginning, we are closer to students but on the other side of the desk. Our youthfulness allows us to be closer to their way of thinking, closer to their way of setting priorities. In this way, we are able to bring an advantage on our side. Knowing the students more than professors do enables us to communicate easier. Therefore, the knowledge is passed easier and the most important concepts are deeply implemented.

REFERENCES

- [1] Nuclear Energy magazine -Vol.16 / Nr. 1 – 2 / 2004
- [2] D.Urjan, A.Havris Knowledge Management: Preserving Skills and Expertise for Nuclear Industry – SIEN 2003;
- [3] IAEA – Tecdoc – 1204 A systematic approach to human performance improvement in nuclear power plants: training solutions, March 2001;
- [4] University "Politehnica" of Bucharest web site <http://www.upb.ro>;
- [5] Power Engineering Faculty web site: <http://www.energ.pub.ro>;