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ScienceDirect

Procedia - Social and Behavioral Sciences 143 (2014) 52 – 56

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**Procedia**  
Social and Behavioral Sciences

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CY-ICER 2014

## The Development of Higher Education In Occupational Health and Safety In Estonia and Selected EU Countries

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### Abstract

According to the European Agency for Safety and Health at Work in the EU (European Union) OHS (occupational health and safety) is least likely to be systematically integrated in university courses. In Tallinn University of Technology the OHS education is included to the curricula for all specialities (both technical, social and economical) as a compulsory discipline since 1967 and the courses are permanently provided and developed for all the specialities. The experience of the Department of Labour Protection in Tallinn University of Technology in OHS education in the university will be presented. The purpose of this paper is to analyse the examples of good practice from selected EU countries and the experience of Tallinn University of Technology.

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Peer-review under responsibility of the Organizing Committee of CY-ICER 2014.

*Keywords:* Occupational health and safety, education, universities, e-learning;

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### 1. Introduction

21st century, structural changes in our industries and economics, globalization of our world need responsible new scientists, engineers, architects, designers, finance officers, health professionals, managers and supervisors at all levels. New competence requirements mean new challenges for national educational systems. According to the report of the European Agency for Safety and Health at Work (*Mainstreaming...* (2010)) university level is the most challenging educational level regarding the mainstreaming of OHS.

### 2. EU Strategy on OHS in education

Future professionals of all specialities and all levels need to take account of OHS in aspects in their working lives. The European Directives on OHS are regarding the OHS training and education for all competent persons. There are more challenges to integrating OHS into university-level education compared to other levels of education (*Mainstreaming OHS...*(2010)). The European Union Community strategy on health and safety at work for 2002 – 2006 underlined the need to strengthen the prevention culture by means of educational training. OHS should be part of an integrated strategy to encompass all the necessary aspects of education, training, research, and innovation for tomorrow's European Union. The Community OSH strategy for 2007 again considered the prevention culture to be an important area of action and built upon the aims of the previous strategy in this area. According to the 2007 - 2012 strategy, risk education should be included in all levels of education, including university education. (*Mainstreaming OHS...*(2010)). According to the 2013 – 2020 strategy, risk education is more important due to rapid development of the society, new technologies, globalization and changed demographic processes. (*Priorities...*2013).

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## OHS in the curriculum of university courses

The Agency's report on *Mainstreaming OHS...* (2010) Concluded that occupational health and safety is least likely to be systematically included as an element in courses at university level and that it is the most challenging educational level regarding the mainstreaming of OHS. One reason for this is that universities have a high level of autonomy and therefore there are no common curricula. There is also a lack of teaching resources on occupational safety and health that are suitable and relevant for different university level courses and a lack of professors and lecturers with the knowledge to teach these subjects / topics. In addition, individual professor have to be convinced of the importance and relevance of including OHS as part of their already packed course curriculum.

The full findings of the report regarding university education are the following: In higher education, efforts to integrate OHS should be continued to ensure that designers, architects, engineers, business and finance managers, medical professionals and others who need to know about OHS in their future careers receive adequate education in OHS issues and risk management. There is increasing awareness of this educational need. The mainstreaming of OHS into the curricula of university-level courses is the least well-developed area and represents the greatest challenge regarding getting OHS into education curriculum. Some examples of good practices do exist, for example, in the area of engineering, and there are also some good examples of teaching materials. Systematic inclusion of OHS across relevant university courses is more common in those Member States, whose university system includes technical universities, including in some of the newer, former communist Member States.

The greatest challenge of all is to have OHS included in business studies. Universities and higher educational institutes are not under the same direct national government control as schools and enjoy a high level of autonomy. They have extensive freedom in what they teach and how they teach it. Therefore there are no common curricula, the extent and content of OHS education varies greatly in the higher education sector, and it might not always be proportional to the level of risk that undergraduates could find themselves managing in their future professional working life. Actions to include OHS in relevant courses such as engineering or business studies are therefore generally dependant on the interest of individual professors or particular advocates within professional bodies. To promote OHS education at the university level it is necessary to involve professional associations and make approaches directly to relevant further education institutions and universities. Individual professors need to be convinced of the need to include OHS in courses but it can be very difficult to persuade them. Professors need to be provided with suitable teaching materials that relate directly to their discipline; however, there is also a lack of teaching resources on OHS for university-level courses, although some examples may be found. Case study teaching materials directly related to the discipline, whether for engineering courses or business courses, may be of most use to engage both lecturers and students.

### 3. Some cases of good practice in Member States of EU (*Mainstreaming...2010*).

#### 4.1 United Kingdom: Risk education in engineering

The Department of Engineering at the University of Liverpool began to reform its undergraduate programmes with the introduction of active learning experiences that will provide Liverpool graduates, branded the 'Liverpool Engineers', with skills and expertise relevant to the needs of modern industry. A key element of this approach is health and safety, and risk awareness.

The University of Liverpool, in association with the Health and Safety Laboratory (HSL), set up a project to incorporate risk education into the curriculum of the undergraduate engineering degree course. Integrating risk education into the curriculum involved defining risk education as a set of learning outcomes, and designing a tool to ascertain students' awareness of risk issues and key concepts. Teaching materials have been developed that use real accident case studies, involving student interaction and team building exercises to enhance students' understanding of the concepts of hazard and risk.

#### 4.2 Germany: Good practice databases integrated in chemistry studies

Two consortia from German universities developed websites covering good practice instructions. Both websites provide ready-to-use information that can be applied directly by teaching staff at universities. NOP-online provides good practice instructions on safety and environmental issues in organic chemistry laboratory courses. KMR provides health and safety instruction for working with carcinogenic, mutagenic and reproduction toxic substances.

#### 4.3 Germany: On-line learning platform of OHS related modules

The Institute of Industrial Engineering and Ergonomics (IAW) of the RWTH Aachen coordinated the development of an on-line learning platform concerning industrial engineering and ergonomics, which includes various OHS-related modules. These are suitable for e learning, blended learning and teaching at universities. Currently the modules are being used in undergraduate lectures for students of mechanical engineering, industrial engineering, psychology, business administration and industrial education.

#### 4.5 Austria: Introduction to the principles of laboratory safety

At the beginning of their studies, students at the University of Vienna have the possibility of deepening their knowledge regarding the principles of laboratory safety, prevention and emergency response and handling biological and radioactive substances. The primary objective of the seminars is to raise the students' awareness of the fact that safety and health protection (occupational safety) is an integral part of any research project and that these issues may take on even greater significance when students finish their studies, for instance in their possible future occupation as company safety inspectors. Moreover, the students are expected to become familiarised with basic aspects of safe work practices and to be provided with a legal background.

#### 4.6 Bulgaria: Management to risk in mining and natural environment in academic education and research.

The University of Mining and Geology, St. Ivan Rilski, in Bulgaria, carries out didactic and research activities closely connected to safety issues. The university prepares students to design, organise and carry out work tasks in the area of mining and geology. The scope of interest in the area of OHS covers engineering safety, mining safety and rescue, fire safety, health and safety risk assessment, environmental safety. The university has a long-term tradition in carrying out these activities, aimed at diagnosis, modelling, and design, as well as in developing methods and approaches to risk in mining and the natural environment.

#### 4.7 Portugal: Learning by doing

The Faculty of Science and Technology at the New University of Lisbon offers transversal occupational safety and health courses for graduate and post-graduate engineering students. The OHS skills are developed, not only through theoretical classes, but also by performing practical risk analysis activities based on real-world work situations, from different fields of activity according to each student's vocational area. Students are also encouraged to use the kinds of measuring equipment employed in an OHS assessment of the work environment. They also practise different manual and computer-based calculation methods, for instance for the estimation of work accident statistics, for the risk assessment of manual materials handling, or for the calculation of the number/type of light sources to adequately illuminate a workplace.

#### 4.8 Portugal: Inclusion of OHS courses in Portuguese universities

The changes in Portuguese legislation, as a result of European directives, regarding the OHS training of 'competent persons' created a demand for OHS teaching in Portuguese Universities in order to provide accredited OHS technicians and to improve the OHS knowledge of engineering graduates in general. There are at least four specific OHS programmes for undergraduate students. In some universities, engineering students have both OHS and ergonomics included in their curricula.

#### 4.9 Spain: 'Programa Universitas' for occupational risk prevention

The University of Salamanca offers an online training programme for postgraduate students, named 'Programa Universitas', which is aimed at the management of occupational risks. The programme is sponsored by the *Dirección General de Trabajo y Prevención de Riesgos Laborales* of the *Junta de Castilla y León*, with the collaboration of the *Fundación Mapfre* (Mapfre is an insurance organisation) and the *Fundación General de la Universidad de Salamanca*. The course is designed to promote a culture of occupational risk awareness and prevention among newly graduated professionals entering the work market. This programme is based on an Internet portal where registered users have access to OHS-related materials and tools. In a complementary programme, the opportunity was taken to produce a CD-ROM providing an introduction to OHS, which is given to all graduating students.

### 4. OHS education in Tallinn University of Technology

Tallinn University of Technology began teaching occupational safety in 1967 - 1969 and the department of occupational safety was founded in 1970. It became the Department of Work Environment and Safety in 2000 and is a part of the Economics Faculty. The range of courses it offers has been growing. The course "Labor protection" was compulsory for all the specialties (both technical and economical) and therefore, a laboratory was created. The emphasis on practical work was essential and gave students the conception of working conditions in industrial plants. During transition years of 1991 - 1996 essential changes and developments took place in the working environment. Education of safety had to adapt with the changes as well. Nowadays "Risk and Safety Science" is taught for the students of technical specialties and "Ergonomics" for the students of information

technology and economical specialties. Course “Working Environment and Ergonomics” is given to business administration, public administration and international students.

Additionally, a Master of Science programme for occupational hygienists has been created under faculty of Natural Sciences. The emphasis of the courses is on risk assessment at workplaces, which is a systematic procedure for analysing systems to identify and evaluate hazards and safety characteristics. As the basic aim of risk assessment is to prevent accidents and establish a safe workplace, then the knowledge of occupational health and safety hazards, legislation, standards for measurement of noise, lighting, indoor climate, chemicals in the workplace air, vibration etc. are needed. The department of Work Environment and Safety has a well-equipped student laboratory and an accredited laboratory of ergonomics. The latter is entitled to perform working environment measurements outside the University campus – in industrial enterprises – as well.

The education in health and safety is carried out in three languages: Estonian, Russian and English. The learning process is based on the social constructivist learning theory. Problem based learning (PBL) and blended learning by web support of the Moodle e-learning environment are used. Moodle allows paper-free learning process and forum-based discussions between students as well as possibility to do distance-assignments if needed. Several innovative tools are used to determine the knowledge - such as active learning tools: individual and group works, case studies, writing essays and reports, public presentations. Visits to company are regularly organized, too, with assignments of measurements occupational hazards, assessing ergonomics of workplaces with static postures and so on.

Since 2000 computer-based learning provided the Course of Working Environment and Ergonomics for business administration and public administration, learning materials were available on the Internet (Siirak2000; Tint & Siirak 2000). Since 2006 the course is provided by the web support of the Moodle e-learning environment. Courses are provided as a blended learning: the traditional method face to face is blended by the web-based support in the Moodle e-learning environment. At the end of the courses the questionnaires were given for all groups of students. Aim of the study was to find out how students appreciate the courses provided by web-support by the Moodle e-learning environment. Of respondents 98% answered that the Moodle e-learning environment is a very effective learning tool for encouraging the learning process and enhancing the interest to OHS problems. The advantage of blended learning is that face-to-face contact with teacher’s personality is enriching the learning process. The activities in the Moodle e-learning environment encourage the students interest for working in the classroom face to face with the teacher (Siirak 2010, 2011, 2012).

## Conclusions

The importance of OHS and risk education is enhanced due to rapid development of the society, new technologies and demographic changes. The EU directives are regarding the OHS education for all competent persons. The OHS and ergonomic education is needed in all level, including the university level.

According to the good practice case studies of selected countries of the EU and according to the experience of OHS and ergonomic education in Tallinn University innovative learning methods as a team working, real life case studies, blended learning using the problem based learning (PBL) by web support in the Moodle e-learning environment are very useful for enhancing students (future engineers and managers) interest for developing OHS and ergonomic issues in their future workplaces.

The future research on the OHS and ergonomics education in university will continue for finding new innovative methods and possibilities.

## Acknowledgement

We would like to express the gratitude to the European Commission and Estonian National ICT program for Higher Education for supporting the creation of the course of working environment and ergonomics in Moodle e-learning environment autumn 2006 (EITSA 2 ESF project REDEL).

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