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EDUCATIONAL CONCEPT OF ECO-MANAGEMENT AND AUDIT SCHEME (EMAS) AT SLOVAKIAN UNIVERSITIES

Milan Majerník, Martin Bosák, Jana Chovancová

*Katedra environmentalistiky a riadenia procesov,
Strojnícka fakulta TU Košice, Park Komenského 5, 041 87 Košice
e-mail: milan.majernik@tuke.sk*

Abstract

People usually associate the protection of waters with the issue of sewage treatment and with the deployment of new technologies which reduce the consumption of water and waste dumping, while the impact of the society's environmental awareness and of the environmental management upon the effectiveness of water protection generally remains underestimated.

Slovakia is located in the catchment area of two seas: the Black Sea and the Baltic Sea; river springs and river upper sections are located on its territory. Therefore, the country attaches great importance to the protection of waters. This, supported with the belief that one of the prerequisites of water protection is proper environmental management, has encouraged the authors of this study to tackle the issue mentioned in the topic. They believe that such management requires qualified personnel to be prepared beforehand.

The authors present the recent development of environmental education at Slovakian Universities, mainly at the faculty of mechanical engineering, from the implementation of the first environmentally-oriented subjects to the establishment of an independent department. They describe the contemporary state of education in environmental management and audit scheme (EMAS). They also outline the perspectives for its further development. At the same time, they specify the profile of graduates and the educational plans for particular types, forms and branches of study, as well as the personal and laboratory equipment for the scientific and support of the pedagogical process.

Key words: Eco-management and audit scheme, education, study branches, environmental studies, profile of graduates

INTRODUCTION

Environmental education has to be understood, from the conceptional view, as an organic part of the whole educational complex at schools, including universities. Its improvement and increasing of its effectivity is a multidisciplinary and interdisciplinary problem which requires systematic and permanent solution coming from scientific investigation, theoretical platforms, comparison of up-to-date practice, current

status and prognoses of production, consumption and development of environmentalistics itself.

There are more reasons for extensive and intensive environmental education development of mechanical engineers in Slovakia. Firstly, it is the fact that Slovakia belongs to environmentally most indebted European countries also after its integration to EU. Cumulated problems in environment which can technically be solved but their solution is postponed (so called environmental encumbrance), today represent hundreds of billion crowns and more hundreds of billions will be necessary for building ecologization complexes and application of latest ecologization tools for products and production in accordance with the European legislation.

Solving of the cumulated problems depends on the increased level of environmental knowledge, awareness, behavior and activity of mechanical engineering intelligence.

PROPOSAL FOR ENVIRONMENTAL EDUCATION IN THE FILET OF ECO-MANAGEMENT AND AUDIT SCHEME

At present it is possible to study environmentalistics and ecology according the new “Study branches structure of university education in Slovak Republic” within the frame of the 4th group “Natural sciences” in subgroup 4.3 “Ecological and environmental sciences” (see Tab. 1). For particular study branches was developed and nationally approved exemplary “corpuses” as guidelines for developing study programs before their accreditation.

Table 1
Study branches structure of university education in Slovak Republic published by Ministry of education SR no. 2090/2002 – abridgement

Study branches (SB) structure of university education in Slovak Republic published by Ministry of education SR no. 2090/2002 – abridgement								
No. of SB group	Group of SB	No. of SB sub-group	Subgroup of SB	No. of SB	Name of SB	Possibility to study in the 1 st level	Possibility to study in the 2 nd level	Possibility to study in the 3 rd level
		4.3	Ecological and environmental sciences	4.3.1	Prevention and landscape utilization	A	A	A
				4.3.2	Environmental engineering	A	A	A
				4.3.3	Environmental management	A	A	A
				4.3.4	General ecology and ecology of individual and populations	A	A	A
				4.3.5	Synecology	A	A	A

In the year 2003 has been developed educational concept of EMAS at the universities, which respected these requirements and went out from them. At the universities it is possible to study only fields in terms of new study branches structure after accreditation of study branches at particular university or faculty. Study branches have to be conceived so that they will fulfill corpuses for specific branches minimal in 3/5 of ETCS credits.

PROFILE OF GRADUATES IN THE STUDY BRANCH EMAS

A graduate of this study field achieves proficiency of environmental manager with deep knowledge, erudition and practical experiences in the field of environmental management and engineering. Within the study of environmental management systems and principles of production and consumption system's ecologization graduates master to develop the conditions for planning and development of clean manufacturing in a different fields of industrial activity, for example power engineering, metallurgical industry, mining, chemical industry, food industry, electrical engineering, etc. They adopt not only principles of production and consumption preparation considering environmental protection, but also new principles of products construction – green engineering and methods for their recycling including their management.

They are supposed to master environmental strategies' creation, environmental management plans and audits, but also information systems and their practical application. They master concepts of integrated management of environment, quality and production safety as a tool of sustainable development and prosperity.

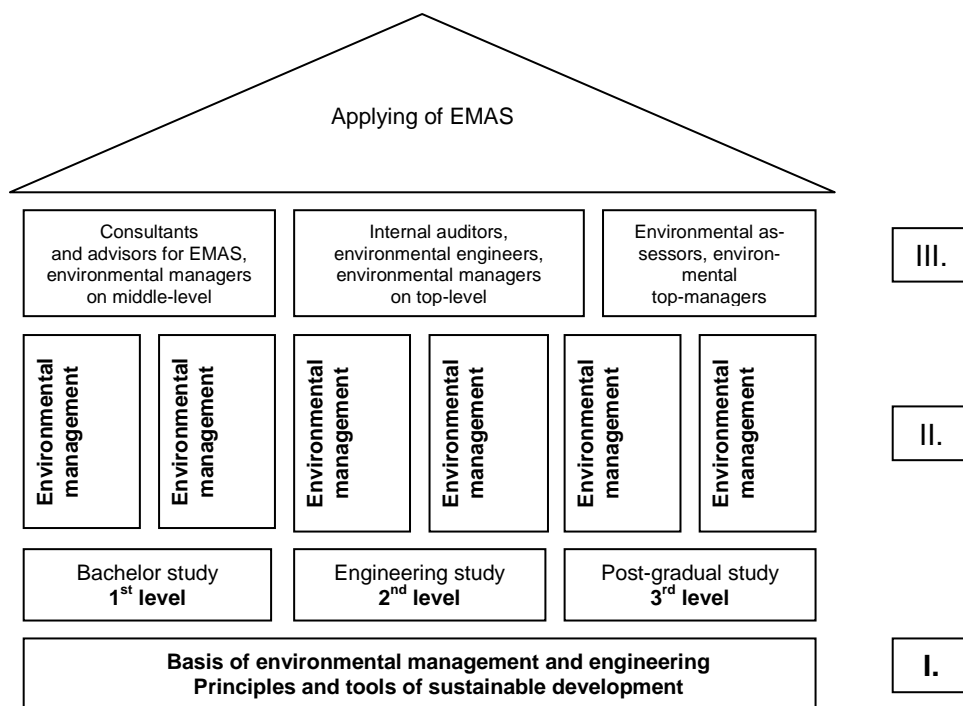
During the study the emphasis on machines and mechanisms for management and environmental safety is put, as well as on their mechanization and automatization and on new principles and development trends in this field.

By choosing voluntary subjects it is possible to closely orient themselves to problematics of environmental production projecting, environmental impacts on management technology of working environment, environmental management and audit. Graduates of the 1st level can find their place at work as experts for environmentalistics and intelligent production systems in departments of environmental managements and top-management of enterprises, in enterprises dealing with production, installation and projecting of automated monitoring stations, as well as in departments of public institutions for environment and landscape protection or in entrepreneurship in the field environmental management and protection. Graduates of the 1st level can also work as consultants or advisors for EMAS and environmental managers in medium management level (see Fig. 1).

Graduates of the 2nd level can practice as internal auditors or environmental managers on top-level, of course after fulfillment of accreditation conditions. Graduates of the 3rd level can work as top-managers and environmental assessors.

Problematics of environmental education, as was mentioned, should be the part of educational processes in all types of universities in Slovakia, of course in particular profundity in dependence of type, and focus of the faculty. Environmental education at faculties without accredited study branches and programs from group "Eco-

logical and environmental sciences” 4.5 should be realized through environmentally oriented basic subjects.



- I. Faculties and universities without accredited study branch Environmental engineering, Environmental management, or Study program
- II. Universities with accredited study branches within the frame of branches Environmental engineering, Environmental management
- III. Dominant application in EMAS

Fig. 1. Structure of study branches for applying of EMAS in the educational process at Slovakian universities

It occurs, that such a subject should be “Environmental management for sustainable development” at the first level of the study, where should be introduced state environmental policy and its tools; legislative, legal, methodical and conceptual management systems for assurance of principles of sustainable development, e.g.:

- Management of environmental aspects, effects and risks (registers of environmental aspects, effects and risks);
- Environmental assessment and labeling of products;
- Environmental impact assessment;

- Environmental management systems and environmental performance assessment according ISO standards;
- Eco-management and audit scheme;
- Prevention of major accidents which involve dangerous substances, environmental and civil safety;
- Integrated pollution prevention and control.

HISTORY OF ENVIRONMENTAL EDUCATION AT FACULTY OF MECHANICAL ENGINEERING AT TECHNICAL UNIVERSITY IN KOŠICE

The beginnings of environmental education at the Faculty of Mechanical Engineering go back to 1988, when the first dissertation works in the field of environmental production and its projection were written, within the scope “Production projection and plant operation” of study field “Mechanical Engineering Technology”. Department “Projection of Automated production systems” of the department of “Automated Production Systems” intensified its concentration on problems in the relationship with the Engineering project (production) – environment especially from 1990. In the two last years, students of the study field “Projecting of AVS” with focus on “Automated management systems of production processes in mechanical engineering” could focus on environmentalistics, including state exam, by choosing voluntary environmentally oriented subjects and by choosing the topic of their dissertation work. Approximately 10 students finished each year in this way.

Knowledge and experience from implementation of environmentally oriented subjects, dissertation works, long term cooperation with the Ministry of environment of SR, regional authorities of environment and industrial practice with realizing the specific projects of ecologization, built up the knowledge base for opening a study field “Development and protection of environment” as a Bachelor study at the faculty in the academic year 1994/95, as well as approval of the study field “Management of ecological impacts of mechanical engineering production” by the scientific court of the faculty within the study field ASR VP in mechanical engineering study. Since then we could mention subjects like “Basics of ecology for engineers”, “Ecologization of products and productions”, “Technologies of industrial waste manipulation”, “Projection and operation of ecological technologies”, “Computer support for environmental”, etc.

The increased demand for environmental studies at the faculty initiated the headquarters to prepare and then to provide the accreditation of study field “Technology of environmental protection” for Bachelor internal and external study, master (Ing.) internal study and study field “Environmentalistics” with focus on “Environmental engineering” for PhD study. Activities in this direction ended up by transformation of “Department of AVS” to “Department of Environmentalistics and Process management” in 1998.

CURRENT STATE OF ENVIRONMENTAL EDUCATION AT FACULTY OF MECHANICAL ENGINEERING AND PROFILE OF DEPARTMENT

Department of environmentalistics and process management belongs to profiling departments of the faculty with very high personal credibility (2 professors, 4 assist. professors, 5 assistants and 5 Phd students) and laboratory equipment (integrated laboratory of environmentalistic, integrated laboratory for assessment and management of environmental noise, technological center for acoustics and vibrations) for the study field “Technology of environmental protection” for Bachelor and Masters study. By choosing voluntary subjects within Masters study students are allowed to profile themselves into fields of projecting and management of environmental production or Technology of working environment (Fig. 2).

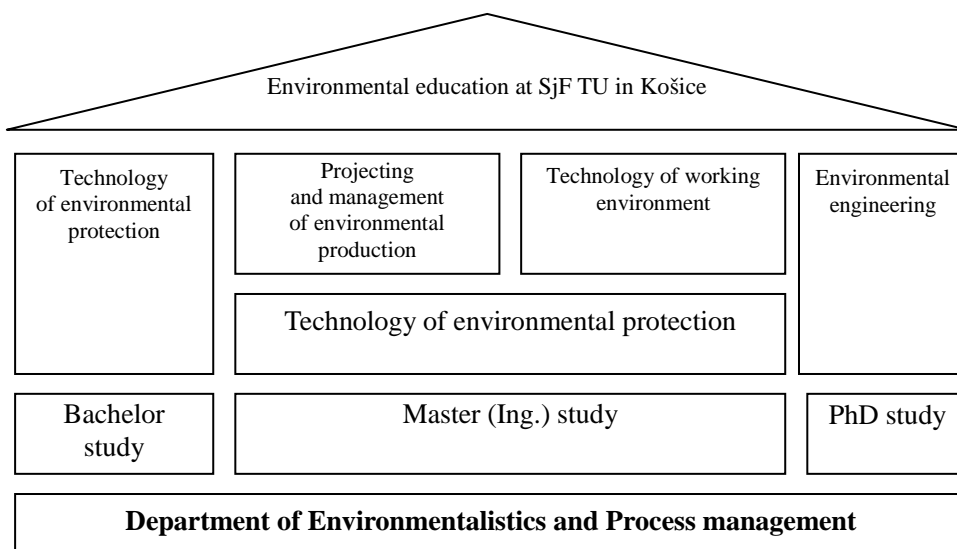


Fig. 2. Structure of study fields and scopes of environmental education at SjF TU in Košice

Besides basic subjects of the study fields such as (Machines and utilities for environmental protection, Waste management and recycling, Ecologization of products and productions, Environmental management systems, Technique of working environment, Projecting of environmental productions, Computer networks for environmentalistics, etc.) the department also provides environmentally oriented subjects in other study fields in faculty (Production quality and safety of technical systems – subject environmental engineering, Mechanical engineering technologies and materials – subject Recycling and Ecology in mechanical engineering production, etc.), as well as basics of environmental engineering in Bachelor and Masters study. It has to be noted, that this form of study is currently in the finishing process.

The new concept of study starts from the academic year 2005/2006, according to study programs within the new structure of study programs at Slovak universities (Fig. 3).

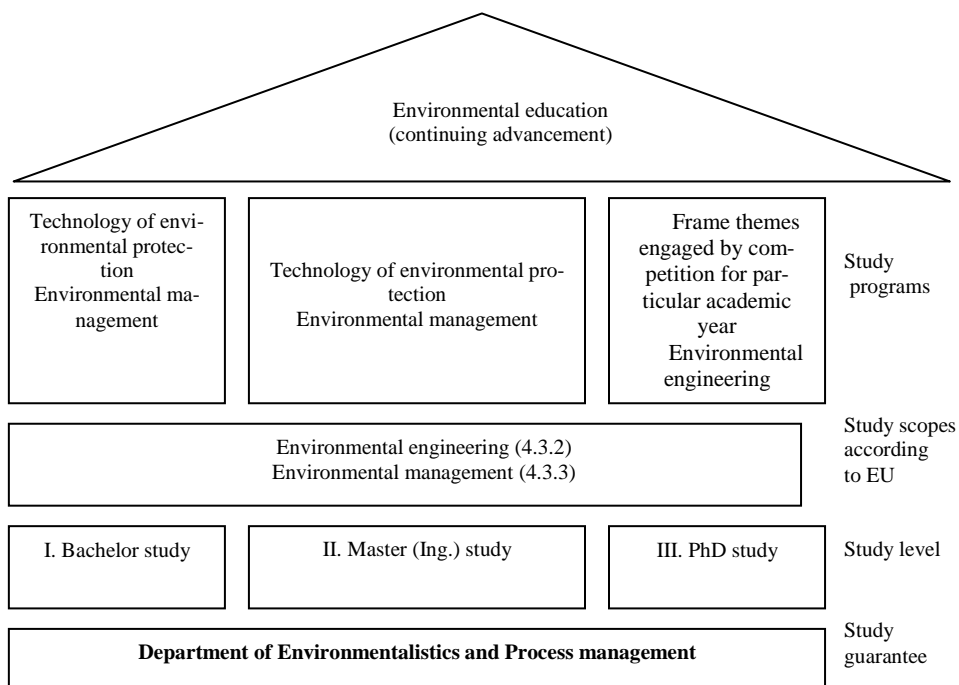


Fig. 3. New structure of study fields and scopes of environmental education at Sjf TU in Košice

In the area of Phd study the department provides scientific education in field Environmentalistics with the scope on Environmental engineering. It also takes part in works SOK technical systems safety and work safety and mineralurgy and environmental technologies. These are being finishing and new accredited three-level study – environmental engineering will start.

Scientific and research activities of the department are oriented into the field of the ecologization of mechanical engineering products and productions, logistics of technology waste of out-lived mechanical engineering products management, recycling-oriented production and multi-criterial assessment of environmental load. More grant projects and international scientific research projects are regularly being solved at the department.

Professional and expertise activities of the members of the department are oriented into the field of Environmental Impact Assessment according to the law 127/94 Z.z., accreditation and certification environmental management systems according to ISO

1400X, authorized legal measurements of noise, judicious expertise in the field of mechanical engineering, etc.

The department is also an organizer of the regular international scientific workshop “Intelligent Manufacturing Systems” and the international conference “Environmental Engineering and Management”, as well as co-organizer of international symposium DAAAM “Intelligent Manufacturing and Automation”.

The department cooperates with more companies and technical universities in Slovakia and abroad (Badger Meter Europa, GmbH, Beuren (D), Netzch Filtrationstechnik GmbH, Selb (D), SE a.s. Bratislava, Siemens a.s. Michalovce, Whirlpool a.s. Poprad, SCP a.s. Ružomberok, Mobilstar s. r. o. Košice, TU Wien (A), BUGH Wuppertal (D), TU Maribor (SLO), TU Novi Sad (YU), TU Clui-Napoca (RO), TU Budapest (HU), and others).

CONCLUSION AND PERSPECTIVES OF ENVIRONMENTAL EDUCATION AT SJF TU

Growing interest for study at the department (annually app. 40 applied students after the third grade of master study, app. 40 applied students for internal bachelor study and more than 100 for external bachelor study and app. 5 applied PhD students) and requirements for pedagogic assurance of environmentally focused subjects from other departments of the faculty as well as other faculties is pleasant on one side, but in relation to quality of pedagogic process and putting into effect of graduates, it is challenging on the other hand.

In academic year 2005/2006, the faculty had to solve the problem with enormously high number of applied students in relation to department capacity (Tab. 2).

Table 2

Number of applied students until academic year 2005/2006 (status to 31 5 2005)

Study program Study form	Technology of environmental protection	Environmental management
1 st level internal	70	158
1 st level external	51	54
2 nd level internal	19	13
2 nd level external	19	26
∑ – study programs	159	251
∑ – department	410	

From the view of human resources and laboratory equipment, the department of environmental studies and process management considers its capacity to app. 120 graduates (app. 30 in each form of study: bachelor, master – internal and external)

per year and 2-3 PhD students. The interest for the study in all study forms exceeds abilities of the department. Trend in number of graduates in the last 8 years is documented in Fig. 4. We can consider as stabilized numbers the data from last 2 years.

In next academic years the main goal will be the improvement and stimulation of teaching process in finished integrated laboratory of environmental studies, quality and safety in the meaning of integrated management of company and preparation of graduates for this perspective and newly developing field in a way that the requirements of industrial praxis will be fulfilled and all graduates will find practical use in their field.

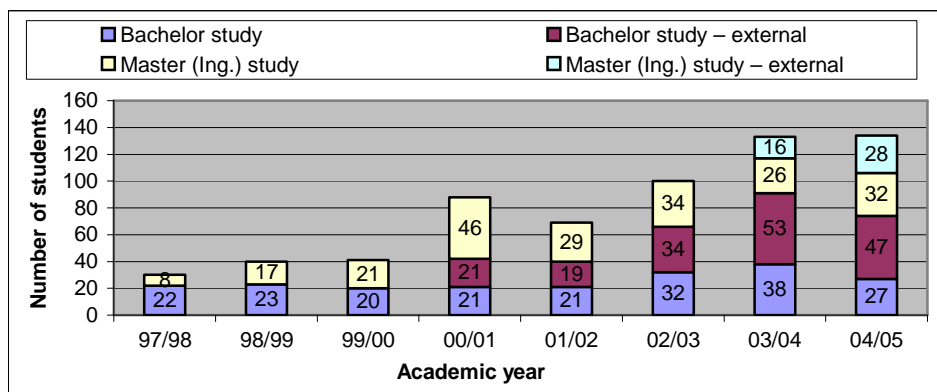


Fig. 4. Development of graduates number at the Department of environmentalistics and process management at SjF since academic year 1997/1998

Presented results are part of solution of the project KEGA 3/120/203: “Approximation concepts of study plans to standard of EU for 3 level study field “Environmental Engineering” at technical universities”.

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KONCEPCJA EDUKACYJNA WDRAŻANIA SYSTEMU ZARZĄDZANIA ŚRODOWISKOWEGO (EMAS) NA UNIWERSYTETACH SŁOWACKICH

Streszczenie

Ochrona wód kojarzy się zwykle z problemem oczyszczania ścieków oraz zastosowaniem w przemyśle nowych technologii ograniczających zużycie wody i zrzuty ścieków. Wpływ świadomości ekologicznej społeczeństwa i sposobu zarządzania środowiskiem na skuteczność ochrony zasobów wodnych nie są na ogół doceniane. Słowacja, leżąc w zlewisku dwóch mórz – Czarnego i Bałtyckiego – dużą wagę przywiązuje do ochrony wód. Na jej terenie znajdują się źródła oraz górne odcinki rzek. Do podjęcia tematu skłoniło autorów przekonanie, że jednym z podstawowych warunków ochrony wód jest właściwe zarządzania środowiskiem, co z kolei niesie za sobą konieczność przygotowania wykwalifikowanych kadr.

Autorzy prezentują najnowszą historię edukacji ekologicznej na uniwersytetach słowackich – głównie w katedrze mechaniki – od wprowadzenia pierwszych przedmiotów o profilu ekologicznym do założenia niezależnego wydziału. Opisują oni obecny stan edukacji w dziedzinie systemu zarządzania środowiskiem i audytu środowiskowego (EMAS). Kreślą oni także perspektywy przyszłego rozwoju. Ponadto określają profil absolwentów oraz plany edukacyjne dla poszczególnych rodzajów, form i działów studiów, jak też sprzęt laboratoryjny wspomagający proces pedagogiczny.