

Optimisation of quality in environmental education by means of software support

Katarína Čekanová¹, Alena Pauliková¹, Katarína Lestyánszka Škúrková¹

¹ Slovak University of Technology in Bratislava, Faculty of Materials Science and Technology in Trnava, Institute of Industrial Engineering and Management, Jána Bottu 25 T02, 917 24 Trnava, the Slovak Republic, phone: 00421/0908646519, e-mail: katarina.cekanova@stuba.sk, skalen.paulikova@stuba.sk,

Abstract. The main topic of this article is based on the fact that environmental education and edification have got an irreplaceable and preferred position within the framework of a sustainable socio-economic development. Environmental education, which is performed at technical universities, has to offer professional and methodical knowledge concerning questions of environment for students of various technical branches. This education is performed in such way that the graduates, after entering the practical professional life, will be able to participate in solutions to the new actual problems that are related to environment and its protection, as well. Nowadays, during the educational process it is also necessary to introduce technical development in a more extended rate. Taking into consideration the above-mentioned facts it is possible to say that the educational support for environmental studies is a relevant aspect, which should be integrated into the university educational process. It is a positive development trend that greater emphasis is focused on the quality of university education for the environmental engineers. Our society requires an increasing number of environmentally educated engineers who are able to participate in qualitative academic preparation, i.e. the so-called environmentalists. But the worldwide phenomena of technical development and globalisation also pose high claims for quality of their preparations including devices and computers skills. The Department of Process and Environmental Engineering at the Faculty of Mechanical Engineering, Technical University in Košice, the Slovak Republic is the institution specified and intended for quality optimisation. This Department introduced into the study programmes (“Environmental Management” and “Technology of Environmental Protection”) study subjects with software support, which are oriented towards the indoor and outdoor environment and in this way the Department of Process and Environmental Engineering is integrated intensively and effectively into the area of the environmental education and edification with regard to the requirement of sustainable quality

Key words – sustainable quality, software support, environmental education, optimisation

1. Introduction

At the present it is well-known that environmental education and edification have an irreplaceable and preferred position in the frame of sustainable therefore socioeconomic development. At technical universities there is the important aim of environmental education to provide professional and methodical knowledge about the environment for students. It is performed in

such a way that in practice they are able to participate in solutions for new actual problems which are related to environment and its protection as well. Now, in educational processes it is also necessary to introduce technical development at a higher rate.

2. Educational support for environmental studies

It is obvious that greater emphasis is given to the quality of university education for environmental engineers. The chosen institution for quality optimisation has been selected - the department of Process and Environmental Engineering, Mechanical Engineering Faculty, Technical University in Košice, the Slovak Republic. It has also reflected and integrated information technology in its environmental education

within the framework of the complex approach to education for quality development (MARKULIK, Š., NAGYOVÁ, A. 2008).

The department introduced into the study programmes (“Environmental Management” and “Technology of Environmental Protection”) study subjects with software support which are oriented to indoor and outdoor environment, see Table 1. There is listed the structure of these subjects for individual study field and forms.

Table 1 Scheme of the software support subjects of the education software support at the Department of Process and Environmental Engineering (TECHNICAL UNIVERSITY IN KOŠICE 2009)

<i>Study programme:</i> ENVIRONMENTAL ENGINEERING			<i>Study programme:</i> TECHNOLOGY OF ENVIRONMENTAL PROTECTION	
REGULAR BACHELOR STUDY				
<i>year</i>	<i>subject</i>	<i>software applied</i>	<i>subject</i>	<i>software applied</i>
1.				
2.	CAD – Introduction of Volume Modelling	CAD	CAD – Introduction of Volume Modelling	CAD
3.	Computer Support of Environmental Protection Management	Envisim	Computer Support of Environmental Protection Management	Envisim
	CAD – Introduction of Volume Modelling	CAD	CAD – Introduction of Volume Modelling	CAD
REGULAR MASTER STUDY				
4.	Theory of Management in Environmental Study	Matlab	Theory of Management in Environmental Study	Matlab
	Intelligent Production Systems	Vensim	Machines and Devices I.	AutoCad
	Environmental Measuring and Monitoring	Dialux		
	Computer Networks and Database Systems for Environmental Study	Access		
5.			Objectivisation of Environmental Factors	CadnaA
			Noise and Vibrations	X Fér
EXTERNAL BACHELOR STUDY				
1.				
2.	Theory and Management Instruments in Environment Study	Matlab		
3.	Computer Support of Environmental Protection Management	Envisim	Computer Support of Environmental Protection Management	Envisim
EXTERNAL MASTER STUDY				
4.	Theory of Management in Environmental Study	Matlab	Computer Support of Environmental Protection Management	Envisim
	Environmental Measuring and Monitoring	Dialux		
	Intelligent Production Systems	Vensim		
	Computer Networks and Database Systems for Environmental Study	Access		
5.			Objectivisation of Environmental Factors	CadnaA
			Noise and Vibrations	X Fér

The description brief of used software for Table 1:

Access – software is used for a creation of databases and a data summary for environmental purposes, which can be examined statistical analysis, e.g. ecologically loaded localities and can be considered loads which are linked to an elimination of environmental damages, etc.

CAD- application serves for performing of the design documentation e.g. WWT plants, municipal and hazardous waste incinerations, recycling machines and equipments, etc.

CadnaA – program is designed for the calculation valuation, presentation and analysis of the noise loading from the industrial resources, road and railway traffic.

GIS – GIS software is designed to capture, manage, analyse, and display all forms of geographically referenced information. This application allows us to view, understand, question, interpret, and visualize our world in ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts.

Dialux – program application for the design and calculation of illuminating systems, which fulfil environmentally acceptable requirements and save energetic sources.

Envisim – application is used for computer support of the environmental protection management.

Matlab – universal computing program, which serves for the mathematical calculations of the practical task.

Vensim – software is designed for the modelling and simulation of the environmental and ecological processes regarding to sustainable environmental development and protection (e.g. qualification of an effectiveness of alternative power stations, the flow parameters in the WWT plants, the regulation of the animal species population.)

X Fér– software for generation of the noise maps in the environment.

Source: own study

During learning of above-mentioned study subjects, the students are aimed at an obtaining of the special knowledge and skills of software application. Then they can apply this knowledge in the integrated “Laboratory of the Objectivisation and Evaluation of Environmental Factors”, which was opened by the faculty in 2008.

In the laboratory they can verify their experiences and skills practically by means of technical measurements in a simulated working environment.

The objectivisation laboratory is equipped with devices for the noise and vibration measuring in indoor and outdoor environments, the measuring of day and artificial illumination, the measuring of electromagnetic radiation and micro-climatic conditions in the working environment. The employees of the department made a great effort at a building up of the laboratory, from the time of the idea of conception through to its construction and its practical use. Furthermore, laboratory equipment and apparatus cost a considerable expense at approximately 17,000.00 € and hardware approximately 199,000.00 €. So, the support of environmental education has got a ratio 1:12 in favour of hardware.

These expenses gives only a relative imagination of total cost. It is not possible to estimate what is the worth of the laboratory and how the quality of the

complex education will be significantly influenced in the frame of environmental knowledge. This gain has already been considerable (CHOVANCOVÁJ., HARAUSOVÁ H. 2013).

By means of the laboratory seminars former students after their university graduation will be able to identify and analyse the environmental loads in industrial operational plants. Using the applied software they can measure and evaluate various influences on indoor and outdoor environments. They will be improved in an implementation of new environmental and technical solutions for used technologies (KOPAS M., ORAVEC M. 2005).

3. Measurement of Environmental Parameters

The integrated “Laboratory of the Objectivisation and Evaluation of Environmental Factors” was built up step-by-step at Mechanical Engineering Faculty, the department of Process and Environmental Engineering. The laboratory is equipped with the instruments and technologies for a measurement of principal physical factors of environment. For the present there are 5 measured environmental factors:

- Noise (NORSONIC–PHONOMETERS 2009, BSWA TECHNOLOGY 2008)

- Vibration (TESTO 400 A 435. 2009, RADIO LUX 111. 2009)
- Illumination (TESTO545. 2009)
- Electromagnetic radiation (NARDA SAFETY TEST SOLUTIONS. 2009)
- Microclimate conditions: (temperature, relative humidity, turbulence, differential and relative pressure, speed of airflow) (CRYSTAL INSTRUMENTS. 2009)

Conclusion

At present it is necessary in our society to have more environmental educated engineers who participated in qualitative academic preparation, so environmentalists. But technical development and globalisation also pose high claims for quality of their preparations including devices and computers skills (ZGODAVOVÁ, K., PETRÍK, J., ŠOLC, M. 2013).

It is a challenge for academic educational institutions to build many very well equipped laboratories. The establishment of "Laboratory of the Objectivization and Evaluation of Environmental Factors" contributes to the increasing of the quality of studies and preparation of undergraduates.

It appears the fact that the department of Process and Environmental Engineering, Mechanical Engineering Faculty, Technical University in Košice works intensively and effectively on the environmental education and edification for sustainable quality (GIRMANOVÁ, L., MIKLOŠ, V., PALFY, P., PETRÍK, J., SÜTÖOVÁ, A., ŠOLC, M. 2009).

Affiliation

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