The Transformation of Education at the Faculty of Mining

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Abstract *— The political and economic changes in Eastern and Central Europe necessitated a reorganization of the former Faculty of Mining and the introduction of new fields of study and within them of new study programs. New engineering study fields "Control of processes of raw material extraction and processing" and bachelor study fields "Tourist trade", "Implementing information technology in companies and public administration institutions" turned out to be attractive to the students. As a result of this faculty transformation the enrollment numbers increased almost threefold .*

Index Terms *— change of economic conditions, reorganization of faculty, new study fields and programs, high interest in study*.

INTRODUCTION

The current Faculty of BERG,Mining, Ecotechnology, Process Control, and Geotechnology is an integral part of the Technical University in Kosice which is comprised of seven faculties and three university institutes. Each year, an average of 10,000 students study at the Technical University in Kosice. The predecessor of the BERG Faculty was the Mining Faculty that was a de facto successor to the Mining Academy in Banska Stiavnica in Central Slovakia. The Mining Academy in Banska Stiavnica was founded in 1762 by an imperial decree in the former Austro-Hungarian monarchy. Also, the present-day universities in Miskolc, Hungary, and Loeben, Austria descend from the Mining Academy.

The Mining Faculty successfully provided education to engineers to cover the needs of the mining industry in former Czechoslovakia. From the former global point of view, when the world was divided politically into two (so-called socialist and capitalist) coalitions, strategic raw materials had great significance. Ore, non-metallic, and coal resources were mined even at the cost of economic inefficiency. After the break-up of the socialist coalition, the state gradually ceased to subsidize the inefficient ore mining. The closures of ore mines for non-ferrous metals mining in Eastern Slovakia and the threat of brown-coal mines shutdown in Central Slovakia as a result of political changes of 1989 in Eastern and Central Europe caused a sudden decrease of interest in study at the Faculty of Mining. Less than half the number of students compared to previous years enrolled in the freshman class. The Faculty had 8 accredited study fields but some of them could not have been introduced because of lack of interest on the part of students.

TRANSFORMATION OF THE MINING FACULTY INTO BERG FACULTY

The main reasons for the sudden decrease of interest in studying at the Mining Faculty were:

- Political upheavals in Central and Eastern Europe
- Disintergration of Czechoslovakia into the Czech and Slovak republics
- The importance of domestic strategic raw materials dropped
- The state ceased to subsidize economically inefficient mining

At that time, the management of the faculty had to come up with a new initiative in order to preserve the existence of the Mining Faculty. Two tasks were being solved in parallel:

- Renewal of human resources (teachers, researchers) and a Faculty reorganization
- Preparation of new study programs

REORGANIZATION OF THE FACULTY

The preparation of new study programs was not possible without new qualified experts. In 1990 a new department was established with the name "Department of process control in raw material extraction and raw material processing". This

department was created by merging the pedagogical and research workers from two different establishments within the Technical University in Kosice. 30 workers came from the Computer Center TU (the mainframe-based computer center era was over) and 9 workers from the Department of Economics and Organization of the Mechanical Engineering Faculty. At that time it was the largest department of the Mining Faculty. During the years 1990 through 2000 the deans of the faculty were professors at this department.

This department worked out new study programs [1] that turned out to be successful later on as the study field became more popular.

Similarly, also the original departments adjusted to the new political and economic conditions as regards the renewal of human resources and elaboration of new study programs. Of the original departments the Department of Geology and the Department of Geodetics underwent the most successful transformation. Later on a new department named "Department of Geopropagation" was set apart from the Department of Geology. Finally, in 1994 the faculty was renamed to the Faculty of Mining, Ecology, Process Control, and Geotechnologies. An overview of the transformation of the Mining Faculty in different time periods is shown in Fig.1.

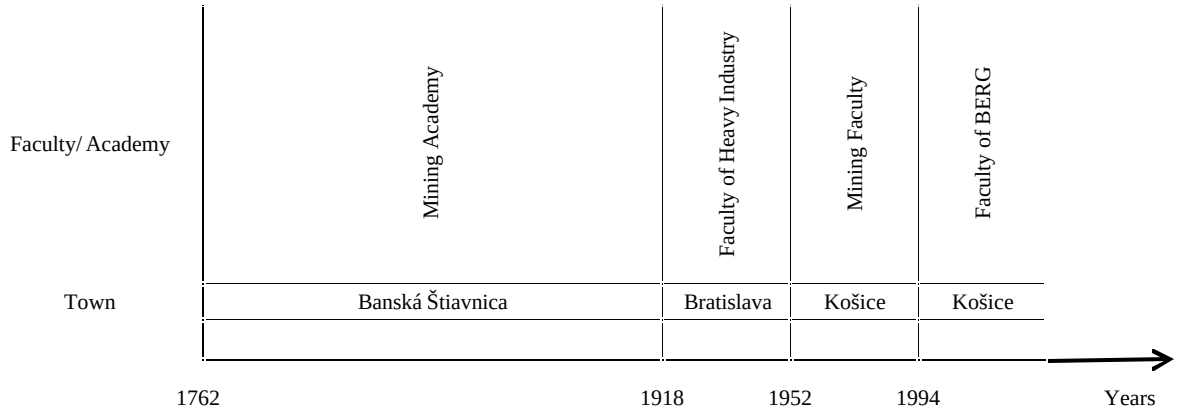

Figure 1
Historical milestones in the transformation of Mining Faculty

One could argue about the wordy name of the faculty suggesting rather the scope of an entire university, however, under present-day conditions of dynamic social changes it is justified. If we emphasize that financing of running the faculty depends on the number of students, then we can state that the present model is optimal since the sufficient number of students in new study fields makes it possible to saturate the education in classical mining fields. The demand for mining engineers in the mining practice is high, however, small number of graduates would not be sufficient for the faculty to exist. Due to this transformation the number of departments at the faculty rose to such a number that it became ineffective from the management point of view. The ineffectiveness consisted in unequal specific pedagogical performance, costs of running the faculty with varying numbers of the staff (small – large) at the departments. Therefore the advisory board of the dean at the suggestion of the dean of F-BERG passed a resolution in 2002 on a new organizational structure of the faculty. The faculty is divided into 4 institutes which in turn consist of 3 departments on average. At the department level, teaching activity is managed and at the institute level educational and research activities are coordinated, research is managed and the executive is provided including economic activities.

NEW STUDY PROGRAMS

At present the faculty has 12 accredited study fields [2]. Groups of main engineering study fields are encoded also in the name of the faculty, and they are:

- Mining
- Ecotechnical
- Process control
- Geotechnological

In addition to these there are 4 accredited bachelor study fields at the faculty:

- Tourist trade
- Introduction of information technology into company and public administration activities
- Machine maintenance and diagnostics
- Waste processing and recycling

From the viewpoint of student interest, the first two study fields together with their study programs belong to the most attractive at the faculty since the demand for admission is approximately five times the number of students that can be enrolled eventually. In engineering study fields, the top spot, measured by student interest, belongs to the study field "Control of processes of raw material extraction and processing" followed by the study field "Geometry, geodesy, and cartography". Since up to 70% of engineering students at the faculty study the field "Control of processes of raw material extraction and processing" only this field will be further characterized. According to content a study field can be characterized as follows:
The graduates gain knowledge, abilities, and proficiencies for the control (management) of processes. To this end they take up the following technical disciplines.

Information technology

Gathering and processing of information is necessary to each manager (senior manager) whose main activity is decision making and execution of the decision. Within the subjects on information technology application the students gain knowledge on information technology, methods and tools for information processing (theory of algorithms, information technology introduction, statistics, programming, computer systems). They gain proficiency in modem technologies of processing and information transport (programming tools and systems, information technologies, database systems, etc.).

Production technological systems

Without the knowledge of production technological systems a manager is not really a manager. In order to be able to analyze and mathematically formulate the properties of controlled processes the students gain knowledge about production and technological processes in the area of extraction and processing of raw materials (process theory, technological and production processes, modeling, plant economics, etc.).

Process control

Modern managers must be able to analyze, control, and design control systems effectively. For that purpose they gain knowledge about the control of technological and production-economic processes (decision theory, control theory, production and technological processes control, quality control systems, enterprise management). Optimal control of production-technological processes is required from the managers, therefore they gain knowledge about optimal control (optimization methods, etc.). The essence of work of a successful manager is gathering, processing of information, and the optimum decision. Therefore, within their study fields, among others they take up subjects directed toward modeling, optimization, financing, database systems, and programming. Characteristic about the study is a strong support of computer technology and teaching takes place in special laboratories equipped with computer hardware. The study field is divided into: technological management, engineering management, quality management, industrial logistics, information technology in process control, entrepreneurship. From the viewpoint of subject pattern we can characterize the above study field as follows:

Term	Subject characteristics
1 – 5	Basic subjects, natural sciences, economics, information science
5 – 6	Technologies of extraction and processing of raw materials
7 – 10	Technical profiling subjects according to elected study program

Gradually, since 1990, within the above study field were accredited the following study programs:

- Technological management
- Engineering management
- Management of quality
- Applied information science in processes
- Industry logistics

- Utilizing and protection of sources
- Industry business

EVALUATION

14 years of the existence of the study field "Control of processes of raw material extraction and processing" is a time period long enough for its evaluation. Even though the current relatively high unemployment rate (approx. 15%) makes it difficult for our graduates to find jobs, we can state they find jobs in various industry areas both abroad and at home. In Table 1 we give the number of students at our faculty since the academic year 1988/99 through present.

Academic year	Number of students	Number of study programs
1988/89	505	8
1989/90	428	7
1990/91	508	7
1991/92	527	6
1992/93	611	6
1993/94	642	7
1994/95	932	11
1995/96	1132	11
1996/97	1252	11
1997/98	1449	11
1998/99	1655	11
1999/2000	1547	11
2000/01	1905	11
2001/02	1957	11
2002/03	2239	11
2003/04	2796	12

Table 1
Review of the number of undergraduate students at BERG faculty

It follows from Table 1 that the number of students is rising continuously. In contrast to the academic year 1989/90 there are 7 times more students today. The truth is, the number of students at Slovak universities rose too. In Table 2 [3],[4] is given the number of university students in selected years beginning again with the academic year 1989/90 up to the present.

Academic year	Number of students
1989/90	52000
1990/91	63784
1995/96	72525
1998/99	109332
1999/2000	117432
2000/01	123506
2001/02	131088
2002/03	136922
2003/04	142253

Table 2
Review of the number of undergraduate students in Slovakia

If we compare the numbers of undergraduates in the last academic year, then we can say that since the critical academic year 1989/90 the number of university students rose almost threefold. By comparing Tables 1 and 2 we conclude that the increase in the number of students at BERG is approximately two times higher than the increase at all Slovak universities.

CONCLUSION

In the submitted paper we present a characterization of the problems that the BERG faculty had to solve after the political and economic changes in Slovakia. Some newly-formed study programs were more successful, others were not. The study field "Control of processes of raw material extraction and processing" with its study programs analyzed above turned out to be

very successful and attractive to the students. Perhaps, if the transformation had not been done in such a way and in proper time, we can assume the faculty would not exist today.

ACKNOWLEDGEMENT

This project was worked out with the support of Grant Agency VEGA, project No. 1/0362/03.

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