

# Education for Sustainable Development: from the History of Bauman State Technical University

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**Abstract**—The article investigates the history of formation and development of environmental education in Bauman Moscow State Technical University. Using the problem chronological method of study, the authors consistently analyze the contribution of teachers in the process of forming a modern attitude to environmental engineering specialties. There is a close relationship between the activities of the university in this direction and the stages of the scientific and technical revolution. The authors conclude that the University's experience in training professionals in the field of ecology is coordinated with the modern tasks formulated by the UN regarding the renewal of education for the transition of mankind to sustainable development. The university makes a significant contribution to the solution of this problem, primarily because a modern graduate should be able to deal with complex problems of interaction between man and the technosphere.

**Keywords**—environmental education; interaction between nature and man; scientific and technical revolution; Bauman Moscow State University; theoretical and practical training; United Nations; education for sustainable development

## I. INTRODUCTION

The international community did not immediately realize that nature and human beings interact so closely that concern for the environment means effectively protecting human well-being. Only in the second half of the 20th century did the discussion of the problem begin seriously [1]. The most important contribution was made by the UN Conference on Environment and Development (1992, Brazil). It was then, in Rio de Janeiro, that the Declaration and Programme (Agenda 21) was adopted and the Commission on Sustainable Development (CSD) was established. And for the first time it was said that it is necessary to change the approaches to education in order to implement the human transition to sustainable development. This means the development of civilization in such a way that human life improves, and the impact on the environment remains within the limits of the economic capacity of the biosphere or the maximum allowable anthropogenic impact. Thus, the natural basis of human activity is not destroyed; the possibilities of future generations are not infringed. Education for sustainable development implies a complete reform of the educational system [2]. At the same time, a number of important tasks include: incorporation of environmentally friendly social

technologies of development while denying everything ecologically untenable in the life of society [3]. "Education for sustainable development should ensure that everyone can participate in improving the quality of his or her own life, and the life of the community around him or her and of all mankind" [4]. First of all, the acuteness of the problem was noticed by the higher education figures. In our country, a great contribution to the awareness of this project was made by a professor at Bauman Moscow State University.

## II. PREHISTORY OF ECOLOGICAL EDUCATION AT THE BAUMAN MOSCOW STATE UNIVERSITY

Ecological education at Bauman Moscow State Technical University has its own history. The roots should be looked for in the XIX century, which was the time of great scientific discoveries, rapid development of industry, serious changes, as well as the lifestyle of people and their ideas about the world around them. The impact of the working environment on employees, their health and safety in the industry became the subject of close attention of teachers of the Imperial Technical College in the 1870s.

Thanks to Professor F.M. Dmitriev, a whole galaxy of teachers was formed, who in their classes dealt with topics related to the protection of people from the effects of unfavorable working conditions, and began to teach a special training course "Fundamentals of technical supervision" [5]. It would not be an exaggeration to say that all four pre-revolutionary faculties of IMTU contributed to the formation of the department, which appeared in the university in the Soviet era, in 1930, and was named "Safety Technology". The head of the department was P.I. Sinev, who until 1934 was the head of the department at the Institute of Labor Protection. He began to build a new department, headed the creation of a new academic discipline. It should be noted that during the first five years such changes in the technical university were necessary and quite met the needs of production.

However, the Great Patriotic War interrupted the case. After the Victory in the Second World War, during the third wave of the Scientific and Technical Revolution, they returned to the pre-war developments, began to fill them with modern content. At the state level, they also paid attention to the needs of the time, which contributed to a number of decisions and the appearance of a ministerial order in 1965,

according to which the course was called "Labor Protection". It consisted of four sections: the basics of safety engineering; industrial sanitation and occupational health in industry; the basics of fire prevention; and the basics of occupational safety legislation. The development of industry required that the engineer be familiar with the subject matter.

In December 1966, by the order of the Moscow Higher Technical School, the chair of "Safety Engineering" was named "Occupational Health and Safety". At that time, the faculty of the department was ready to participate in solving the problems that arose in connection with the understanding of industrial tasks on the new round of NTR [6]. It had to be done under the guidance of E.Ya. Yudin (1914-1991) — Doctor of Technical Sciences, professor-acoustics, the founder of the discipline "Labor protection". He headed the department in 1967-1975. Within the limits of the given article interest to the scientist's personality is caused by the fact that he repeatedly expressed conviction in necessity to transfer from sphere of manufacture all aspects connected with a labour safety, in a wider field, having extended on the Nature. He was a researcher who understood the changes brought about by the scientific and technological revolution and the costs of a hasty and ill-conceived technical breakthrough.

Yudin was a man of action and a wonderful organizer. In the 1970s, he and his colleagues established the Faculty of Advanced Training (FPK) in the field of labor protection. It was during the training sessions of the Faculty that the training courses were tested, which later formed the basis for the training of engineers in "Life safety"; "Environmental protection and rational use of natural resources". At his time, the department became a subdivision of the Faculty of Energy Mechanical Engineering — "E-9". It is also important that the team has developed a new program of the course "Labor protection" for all specialties of MHTS.

In accordance with the program, a new textbook was written, modern teaching aids appeared, and laboratory works were compiled. In 1976 the book "Nature Protection" was published [7]. This is how the idea of extending the protection of nature from the purely industrial sphere to the nature as a whole was gradually implemented. Exactly at the time when the department was headed by Professor E.A. Yudin, the perspective direction was considered and the way of transition of the given scientific division to a new stage of scientific and pedagogical development was planned. And it coincided with the world trends of education renewal.

So, the period from the 1930s to the mid-1970s was a period of prerequisites for the development of environmental education at MSTU. The Department of "Safety Engineering" laid the foundation for educational principles meeting the high criteria of the School and based on the "Russian method of engineering personnel training", which is based on a combination of serious practical training, in-depth study of fundamental courses, and constant multifaceted communication of the university with industrial enterprises. At that time, a team of teachers was formed, who in their vast majority were able to engage in educational and scientific work, to deal with graduate students, ie were ready

to grow a shift. An important feature of a good university is a harmonious combination of traditions and innovation, which is manifested in the activities of most of its subdivisions. It also became a constant of the E-9 department. The ground for changes was prepared. And the changes did not take long.

### III. THE ESTABLISHMENT OF THE DEPARTMENT OF ECOLOGY AND INDUSTRIAL SAFETY AT THE END OF THE XX CENTURY

Changing the established model to a modern paradigm is not easy. This work was headed in January 1976 by Professor S.V. Belov (1932-2013). He began to effectively implement environmental ideas. The scientist was one of the first to realize that technical transformations put an alternative in front of humanity: either to destroy the world in pursuit of new achievements, or, without abandoning them, to focus on the preservation of nature and ensuring their own safety. In the midst of a growing crisis, he saw man. That is why he was sure that it was man who had to be brought up and educated. It should be noted that the same thoughts arose in the advanced world educational community [8].

One of the tools of change, S.V. Belov considered education, which was actively updated during the entire period of the department's management. It is necessary to understand that it was a consistent, everyday work, gradual and scrupulous. But it was never routine for either Belov or his colleagues. It was creative and breakthrough. I would like to pay attention to how much was done in those years. First of all, topics related to environmental protection were included in the methodological plans. Then, a course on "Occupational Health and Engineering Ecology" was introduced. They managed to include the new course "Environmental Protection" in the cycle of subjects at the Federal Program of the Ministry of Higher Education of the USSR. We prepared and published textbooks, in which the worthy place was taken by the coverage of the problems of environmental protection and protection, industrial ecology, ergonomics, etc. In 1983, students received a textbook "Environmental Protection". The changes made allowed renaming the Department of Labor Protection into the Department of Labor and Environment in 1980. This, in turn, paved the way for major changes in the educational process. The trend of teaching environmental topics has become stable and has become a phenomenon [9].

By the 1980s, the Chair had come to understand that it could begin to train specialists in the field of environmental protection. In the USSR, only branch universities (chemical, engineering, construction, and textile) trained such professionals. However, no one trained students for future activities at instrument-making and machine-building plants. However, such enterprises have been polluting the environment by their rash actions from year to year. That's why it was impossible to postpone further training of such specialists. The achievements of MHTS teachers turned out to be in the trend of the tasks facing the country. In 1989, the department significantly changed the essence of its work and began to be called "Industrial Ecology and Safety". In 1990, the department specified the name "Ecology and Industrial Safety". In September 1989, the university approved the

course program "Industrial Ecology and Safety". In 1990, the discipline "Life Safety" replaced the courses "Labor protection", "Industrial ecology" and "Civil defense" at the higher school. Thus, the need to train such professionals was recognized on a nationwide scale [10].

The educational task was solved in each separate University in its own way. At MSTU named after N.E. Bauman the E-9 department acted decisively and not ordinary. In 1992 she accepted the graduates of her university into the group of the seventh year of study. They began to prepare them on a speciality "Protection of the environment and rational use of natural resources". Then, in 1992, she began to recruit freshmen on a speciality "Environment protection and rational use of natural resources". Thus, the team took one more step forward. The chair became a graduating chair.

Historical documents allow us to assert that it was the team headed by S.V. Belov who initiated a new direction in education and a new discipline "Life Safety", which is still being implemented in the country's universities. It should be emphasized that S.V. Belov believed that training in the field of security should cover the entire educational system, from pre-school institutions to the system of retraining of teachers. In addition, it should be accompanied by a great deal of educational work [11].

We emphasize that the Committee on Higher Education of the Russian Federation has recognized the discipline of "Life Safety" as a general engineering (professional) discipline and approved it as an educational discipline that is mandatory for teaching in all universities of the country. Note: further development of this area in education was supported at the state level, was supported by the activities of the Scientific and Methodological Council (SMC) on Life Safety (BR). The structure united the representatives of related departments of MATI — K.E. Tsiolkovsky Russian State Technical University, I.M. Gubkin Russian State University of Oil and Gas, Leningrad Forestry Academy named after M.M. Lomonosov and Leningrad State University of Oil and Gas. He is a graduate of the Kirov State University, the Moscow Power Engineering Institute (Technical University), the Moscow State University of Oil and Gas (MISIS) and the Bauman Moscow State Technical University. A number of teachers were awarded the Prize of the President of the Russian Federation for their scientific and practical development of the "Creation of a system for the training of life safety specialists in higher education institutions". Among the laureates were the representatives of MSTU named after N.E. Bauman. In 2000, a new course on "Ecology" was introduced into the curricula of all departments of MSTU.

#### IV. DEPARTMENT OF ECOLOGY AND INDUSTRIAL SAFETY IN THE XXI CENTURY: EDUCATIONAL TASKS AND WAYS TO SOLVE THEM

By the 21st century, the world community has come to understand the primacy of environmental problems [12]. The task was to renew education. In our country, this problem had to be solved in the new socio-economic conditions. Of

course, they were very difficult. But the domestic education did not just stand still. In some areas it was actively developing [13].

Since December 2008, the Chair has been headed by Doctor of Technical Sciences, Professor G.P. Pavlikhin, and the new Head of the Chair has managed to raise the prestige of the Chair not only in all-Russian, but also internationally. The Chair, along with other higher education institutions of the country has started the implementation of the project of the Commission of the European Union "Training of Master's Degrees in Water Resources Management Technologies". Students took part in the International Environmental Olympiads. Gradually, the equipment of the Chair and its laboratories began to change. The approach to education, loyalty to the "Russian method" of engineering personnel training remained unchanged". Faithfulness to these postulates allowed the Department of Ecology and Industrial Safety to become today the head department of Russia in the direction of 20.00.00 "Technospheric safety" and the discipline "Life Safety".

Since 2012, "E-9" is headed by Doctor of Technical Sciences, Professor, and Rector of the University A.A. Alexandrov. The University trains bachelors and masters in "Technosphere Safety" programs. Theoretical and laboratory classes allow students to prove themselves during the practice, which is carried out at leading enterprises in the country and abroad. The diploma of MSTU named after N.E. Bauman, which graduates receive, testifies to a decent education. The companies they work for are the best proof of this: RENO Russia, RUSAL, Metalloinvest, All-Russian Research Institute of Labour of the Russian Ministry of Labour, Scientific and Technical Center "Industrial Safety" and many others.

#### V. CONCLUSION

Today, at the beginning of the XXI century, the combination of fundamental training and scrupulously built practice, allows to train in the walls of MSTU an erudite and thinking professional. The graduate Bauman Moscow State University is capable not only to give various forecasts concerning a condition of environment, but also is ready to calculate degree of its influence on the person, is able to project means of protection of the nature and the person from adverse situations. Finally, it is important that he can deal with complex problems of interaction between man and technosphere.

Bauman Moscow State University professors and teachers share the principles formulated by the United Nations in the program documents on education that can ensure the transition of mankind to sustainable development. "In modern conditions, environmental education is an integrating factor that determines the strategic goal and the leading directions of global sustainable development" [14]. They are ready to make a significant contribution to the solution of not only domestic, but also global, planetary tasks based on traditions and refracting the "Russian method" in the conditions of the current stage of scientific and technological development.

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