Reforming system of professional training of future specialists by taking into account production automation requirements

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Abstract. The accelerating scientific development, equipment upgrade, emergence of new technologies and intensive growth and use of nano-, robotic, bio- and other perspective technologies require the formation of scientific and technological potential in Russia which is suitable for present-day challenges of the global technological growth.

1. Introduction

Pursuant to the Russian Federal law on education [1], the syllabus must be focused on ensuring personal self-identification and generating conditions for personal fulfillment. Labor training integrated into the “Technology” educational discipline as one of its components is intended to assist in addressing such issues. When studying the “Technology” educational discipline, in particular, the students must attain some basic ideas about and skills in transforming materials, energy and information, constructing, designing and evaluating products and technical creativity, ideas about the world of science, technologies and technosphere, the impact of technologies on the society and the environment, ideas about human activities and social production, the variety of professions and the ways to assess one’s own potential. Russian national interests at this stage of development require to pay maximum attention to the focus of students on engineering-and-technical activities in the field of high-tech production. One of the high-tech production components is automation.

2. Materials and methods

An ascertaining and forming experiment was conducted among students of Magnitogorsk State University and Magnitogorsk State Technical University n.a. Nosov, with the participation of 117 engineering students.

The study was conducted in three stages. The first stage involved theoretical analysis of the problem of reforming the system of professional training of future specialists by taking into account production automation requirements and the study of philosophical, sociological, psychological and pedagogical literature on the problem under consideration. The main methods at this stage were theoretical (theoretical and conceptual analysis, generalization, structuring and abstraction) and empirical (direct and indirect observation, interviews, questionnaires and an ascertaining experiment) methods. The second stage involved designing and experimental testing of the structural-and-functional model of reforming the system of professional training of future specialists by taking into account production automation requirements, effectiveness and suitability of the discovered pedagogical conditions and developing methodological apparatus for their implementation. The main
working methods at this stage of the study included a diagnostic method (interviews, questionnaires, and testing), methods of mathematical statistics, modeling and a formative experiment. The third stage involved analysis and improved insights based on the obtained findings. The main working methods included qualitative and quantitative analysis of the obtained findings, the methods of pictorial representation of experimental data and computer methods of data processing.

3. Results and Discussion

Nowadays automated production has become a common and widespread phenomenon. Many managers realized a long time ago that using this tool allows one to reduce costs, optimize work processes and workforce, conduct all business processes in an automated fashion and operate the business more effectively, in general.

Automation refers to applying a system of tools enabling one to carry out production processes without any direct human involvement but under one’s control. Production process automation results in higher production output, lower price and improved product quality. It reduces the number of maintenance staff, increases machine safety and life time, saves materials and improves working conditions and occupational safety.

Implementation of various factory automation systems can enable one to systematize business management and to arrange it in order by having structured online data on the company status and to control all financial activities of the organization.

Business process automation contributes to increased overall effectiveness of the company due to the following elements:

1. Creating an integrated information environment. This allows one to combine databases from different business units into one system which increases the data processing speed.
2. Financial reporting and analytics. Analyzing financial performance allows one to achieve highly accurate planning of future actions.
3. Coordinating the performance of business units. Using modern factory automation systems allows one to reach high coordination of the business unit and department performance regardless of their geographic location which, in turn, will contribute to making important managerial decisions faster [2,3].

Thus, factory automation represents an effective tool for controlling every stage of production and making significant adjustments in the production process.

Business automation performs a number of critical tasks:

1. Improving the quality of provided services.
2. Protecting the company against any dishonest employees and minimizing the damage they inflicted.
3. Allowing one to effectively control the company’s material resources.
4. Simplifying the process of all kinds or record keeping and informing internal and external regulatory authorities.

The advantages of automation largely depend on the type of business specifics. In general, factory automation enables one to organize total employee control which, when applied in the right way, can improve operational efficiency of personnel. Another advantage of applying business process automation at factories involves the possibility of fast adjustment of tasks to be performed by the organization. Automation makes business more manoeuvrable which, in turn, promotes quick adaptation to market changes [4].

More effective integration of automation into production requires the personnel to be prepared for such reformations. In the authors’ opinion, it is necessary to start developing such preparedness already from the school age, during “Technology” classes. Therefore, it is necessary to improve the training quality of teachers in this area to the right level since it is they who offer schoolchildren the possibility to acquire general labor and partly specialist knowledge and skills and ensure intellectual, aesthetic and ethical development of students, their professional self-identification and adaptation to present-day social-and-economic conditions.
All of these impose stricter requirements on the upgrading of the education system which are becoming more and more difficult to satisfy by using an out-of-date program and only conventional means and methods of education. Nowadays the objective of higher and secondary school in the field of labor training is the advancement of the learning process focused on improving the quality of future specialist training and bringing the educational program to a more up-to-date level. With the introduction of the new educational paradigm, the requirements of the improved approach to the teaching process and the professional level of scientific-and-teaching staff are becoming tougher and tougher [5,6]. Acquiring and upgrading knowledge in the field of teaching, psychology and school methods and didactics and mastering the art of developing new educational technologies, applying innovative learning methods in the educational process and using specialist training quality standards in practice have become essential prerequisites of effective educational activities. A new specialist is required in the context of a fundamentally new system of continuous education, whose key feature is to pass knowledge and technologies corresponding to modern social-and-economic conditions. High-tech production is under development and innovation processes are most commonly found in this field of human activities. Therefore, the teacher must be ready for reeducation.

Reforming the system of training future specialists of this profile implies significant modifications in its every component such as informative, methodical and organizational. The capabilities of the intensive path of education development involve searching for new education technologies combining the principles of information development and the principles of understanding the information together with the patterns of personality formation. Therefore, it is necessary to address the following challenges:

1) providing innovative education by upgrading staff, organizational, technological and methodical conditions based on the national educational initiative “Our new school”;
2) implementing the program of continuous pedagogical education by means of the continuous network-based education system and the employment of basic methodical subject platforms, resource centers, interscholl methodical centers, and innovative assessment models;
3) increasing the number of general educational institutions equipped with modern learning and computer facilities;
4) introducing new technologies of organizing and financing the system of reeducation and advanced training of technology and entrepreneurial management teachers.

When creating the training system program for technology and entrepreneurial management teachers, one must be also guided by the following requirements:
- implementing the key provisions of andragogy;
- considering educational needs and professional difficulties encountered by employees involved in education;
- dynamic training system program for technology and entrepreneurial management teachers determined by the changes in the educational and production field;
- differentiated training system program for technology and entrepreneurial management teachers according to the specifics of audience members and their professional environment;
- interaction between federal, regional and higher education components in terms of the training system program for technology and entrepreneurial management teachers;
- practical importance of skills and technologies offered for learning.

When identifying and evaluating the principles of professional training for technology and entrepreneurial management teachers subject to the requirements of production automation, one must also rely on defining the essence of management as a process of performing a set of functions including target setting, planning, organization and control [7]. The authors believe that the performance of these functions is based on the provisions of activity, learner-centred, system and technological approaches.

When determining the structure of the educational process of professional training for technology and entrepreneurial management teachers subject to the requirements of production automation and developing its program-and-methodical procedures, the authors entirely recognized the necessity to
consider the following progressive long-term perspectives of educational system development:
- using non-conventional methods and forms of intensified education, computer equipment and the latest information technologies for controlling knowledge requirements and the level of personal potential development;
- educational process control;
- performance assurance based on selecting a particular version of the technological process of education according to the preliminary evaluation and comparison of expected results and costs;
- combining one-on-one and group training i.e. the required focus of technological modules on both a particular personality and interaction in the course of group and individual-specific training;
- up-to-date and specific training focused on achieving particular practical goals suitable for living requirements;
- integrity i.e. the necessity to cover all personal traits of the student for achieving training goals;
- motivation – the entire technological process of training must be focused on motivating the audience during their interaction with pedagogical technologies.

The main goal of the methodical department is to ensure the availability and to improve the quality of educational services by means of education upgrading focused on achieving the conformity of national education standards with the existing financial resources. Educational quality improvement and innovative education approach must be ensured by using the following means at every level of the education system:
- implementing new education technologies,
- developing interactive forms of education,
- common use of project methods and methods allowing one to imitate real situations,
- up-to-date learning programs.

4. Conclusion
To provide optimal support for the processes of professional training upgrade for technology and entrepreneurial management teachers subject to the requirements of production automation, the authors propose the following organizational structure arrangement for the methodical department system:

The structure is made up of the following three levels:
- educational institution level;
- municipal level;
- district level.

All these activities must contribute to informational-and-methodical support for qualitative modifications in the educational system of future specialist training and ensure studying, distribution and introduction of most effective innovations.

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