Implementation of the Innovative Concept of Sustainable Education in the Engineering Center of Avionica

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Keywords: Advanced Education, Innovative Development of Education, Information and Communication Educational Space, Blue Ocean Strategy, Engineering Center, Innovative Information Technologies, Educational Programs.

Abstract. The engineering center implements the concept of innovative development of higher professional education, which has the ability to advance the training of specialists with professional skills that will enable them to work in areas of knowledge and competencies, and they will only appear at the time of their release. In the paper directions of works within the engineering center are presented. Methods for implementing promising research and educational programs integrated into an innovative development package have been developed. The symbiosis of new developments and programs allows us to obtain a new quality of specialists and innovative technologies.

Introduction

An indispensable condition for ensuring a high level and quality of people’s life, their reliable social protection is the sustainable civilizational development of society. "The transition to sustainable development must provide for the future a balanced solution to the problems of socio-economic development and the preservation of a favorable environment and natural resource potential, meeting the needs of present and future generations of people" [1].

One of the defining spheres of society, the most important resource for its sustainable development is education. When implementing the education systems of China and the Russian Federation for the period until 2030, it is necessary to form a flexible and diversified vocational education system that meets the requirements of the labor market and the needs of the innovative economy.

Characteristics of Advanced Education and SEC

It is vitally important today to move from a supportive education oriented mainly to teaching a person the rational use of the experience of past generations already accumulated, to advanced education aimed at solving global problems of the present, the disclosure of a person's creative potential, his ability could make responsible decisions in conditions of uncertainty [1].

The strategy of advanced training is characterized by:

- increased requirements for the level of preliminary training of trainees;
- the leading nature of the content of training;
- innovation of implemented educational technologies;
- the excellence of scientific and pedagogical schools;
- development of strategic partnership of subjects of educational institutions with research and production organizations.

All participants of the educational process are objectively interested in developing a system of
advanced education. The orientation of educational institutions and scientific and pedagogical workers to outstripping education becomes an effective factor in improving the quality of training of young specialists, a weighty argument in the competitive struggle in the market of educational services. Students receive education, which for a long time will not lose its relevance. Employers gain confidence that soon they will receive employees trained to work in conditions that are still being formed, but which can become dominant in the future.

The implementation of the concept of advanced education presupposes the formation of the ability of the education system to “foresee” its future and to be able to make decisions about its actions in the present in accordance with this foresight. When choosing the areas of advanced training of specialists for the foreseeable future, one should follow the strategy of the "blue ocean" [2, 3]. "Blue Oceans" in the sphere of higher professional education are unknown, competition-free subject areas in which demand is not won, but is created. The strategy of the "blue ocean" is aimed at reorienting the organization from competitors to alternatives, moving it beyond the "scarlet ocean" of competition, creating for it such market niches where for some time one will not be afraid of competitors.

"The opportunities that are associated with the formation of new technological markets should not be missed. The meaning of the national initiative is precisely to create conditions in our country for the development of industries that will become the leading sectors in the world economy, maybe not even now, but in 20-25 years "[4].

The strategic nature of the national technology initiative, its focus on the future, makes it necessary to set special requirements for the level and quality of the training of specialists who are called upon to participate in its implementation [5].

An important factor in the formation of the concept of training specialists is the specific feature of the modern young generation. Young people under the age of 20 in the majority have a fragmentary or clip-type mindset. This feature allows you to process large amounts of information, based on key points and without going into details, without comprehending the information received and without conducting a logical analysis.

To develop the analytical abilities and critical thinking of young people, various methods are used, for example, the "paradoxes method" of M. Kazinik [6]. Time requirements: modern technological processes, the speed of the changes and the huge amount of incoming information predetermined the emergence of clip-on thinking, which is in conflict with the ability to think in order to solve complex problems. Most of the modern educational concepts implemented in the secondary school and higher educational organizations are focused on the clip-on thinking of students. Therefore, the main contingent of modern entrants is able to quickly process large amounts of information and make general decisions that are not considered, based on a "rough" representation of the solved problem. The modern specialist who will work in the next 20-30 years should not only be able to work with new information technologies and large amounts of information, but also create creative ways to solve complex problems that the information society confronts it with.

To form specialists who have a balanced set of these necessary qualities, an educational concept has been developed, which is successfully implemented in the N.E. Bauman MSTU. The main components of the concept are the "Russian method" of training, modern information educational technologies, various forms of habilitation. These components are combined into a continuous educational process, in which the state of mutualism is constantly maintained, and provides the appearance of the effect of synergism. The implementation of the developed educational concept envisages the creation of various scientific and educational centers and scientific laboratories, close interaction with the leading enterprises of the industry.

In the process of teaching, the Gabor principle [7, 8] - the principle of freedom of choice is realized in the structures of the university.

In university, a student from the first year has the opportunity to try himself in research and development in different directions and forms. For example, scientific and educational center (SEC) "Technopark MSTU-Mail.ru" provides training of elite specialists for the Internet sphere on the
basis of real "combat" tasks. Such specialists will determine the image of IT-sphere, form perspective directions, and develop information technologies and software on new principles with original logic. Realized elitist training has already proved itself - the graduates of SEC, working in company Mail.ru and its partners, help to maintain the leading positions in the field of development of IT-technologies. In the Internet laboratory things created with RT-software, a project-oriented approach is realized in educational activities. Students not only develop new projects, but also often come up with them. Regularly held hackathons to identify the best projects; form the skills of working in a team. Many projects have already been approved for implementation.

The Engineering SEC, which has the ability to advance the training of specialists with professional skills and will enable them to work in those areas of knowledge and competencies.

For the implementation of modern innovative technologies, the structure of the engineering center is used, which is a joint project of the N.E. Bauman MSTU and Ramensky instrument-making design bureau with the involvement of Nanjing University of Science and Technology through the International Russian-Chinese Laboratory «Intelligent Electromechanical Systems» (international laboratory(IL)).

The Engineering SEC works on the following main scientific and educational areas:
- preparation of bachelors, engineers, masters and highly qualified specialists in priority areas;
- improvement of training methods, creation of a highly effective system of training in technical specialties;
- joint research;
- participation in scientific competitions, grants, prizes, including a grant from the Ministry of Education and Science for Engineering Centers, International grants;
- joint organization of international conferences, symposia;
- international cooperation (an international laboratory with the Nanjing University "Intellectual Electromechanical Systems" is organized);
- organization of a joint scientific journal;
And scientific and methodological base of IL;
- work on the creation of joint intellectual property (obtaining patents);
- joint participation in competitions, grants, prizes and scientific funds.

It is expedient to carry out scientific research in the following areas:
1. Carry out research in the field of aerodynamic characteristics of new materials, application of nanotechnologies and study of aerodynamic properties of surfaces, creation of models and their working out on the modeling complex of the Engineering Center.
2. Works on the dynamic formation of the flight task on the basis of predictive models, genetic approaches, taking into account the changing operating conditions and condition of the aircraft, connections of aircraft units and enemy kaolits.
3. Investigate measuring systems and complexes of modern aircraft, to form the concept of synthesis of a measuring complex with a variable structure, which makes it possible to obtain information with the greatest possible accuracy in conditions of intensive aircraft maneuvering, to develop methods for correcting the measurement systems of aircraft operating in diverse conditions.

Prospective Areas of Work
- development of the theory of intelligent control systems;
- creation of intelligent systems for space purposes;
- development and application of intelligent technologies for control systems for atmospheric aircraft;
- research in the field of management theory;
- global integration and management of multi-object complexes and coalition.

It is advisable to carry out the realization of these tasks within the framework of the Engineering Center with the participation of the IL. The IL "Intellectual Electromechanical Systems" was created, the main purpose of which is the creation of a world-class science and engineering school and on its basis research activities on the development of new scientific solutions and technologies.
for their application, training highly qualified specialists of the appropriate profile.

The main tasks of IL are:
- attracting to work in the IL large scientists as scientific leaders of creative teams of young researchers to solve urgent and promising problems of technology, technology and educational programs within the framework of innovative projects [7];
- development and coordination of fundamental and applied research work conducted at the N.E. Bauman MSTU and Nanjing University of Science and Technology;
- increase on the IL basis of the level of fundamental education and engineering training of young specialists. The organization of new lecture courses with the invitation of leading scientists, the preparation of new textbooks, monographs of educational methodological aids, new laboratory works, the use of the latest scientific achievements in course and diploma design by students involved in the implementation of research and development. Preparation of a new generation of young scientists through the attraction of students and graduate students to the performance of scientific topics IL. Active involvement of young scientists, graduate students and students to participate in international seminars, conferences, symposia, organization of internships for young scientists and specialists on the basis of leading world scientific centers and Universities;
- creation and use of profile research stands, simulators equipped with modern equipment, measuring instruments, computer facilities, multi-channel high-speed communication devices and information display [8];
- development of international cooperation in the areas of research and educational activities, joint research with foreign partners in the framework of international projects and on the basis of bilateral agreements, including in the form of contracts;
- creation of a base for the practice of foreign students and post-graduate students;
- organization and holding of international scientific and technical conferences, symposiums, competitions, seminars, exhibitions on IL activities;
- the creation on the basis of the IL of a modern laboratory workshop for students and graduate students from the RPKB and Nanking University of Science and Technology, studying at the MGTU them. N.E. Bauman, providing a mode of remote access to this workshop [9];
- organization of scientific research work of students and post-graduate students on the topics of scientific directions of IL activity;
- propagation and popularization of knowledge in the field of engineering sciences and advanced information technologies, creation of a joint scientific journal;
- attraction of additional resources for the development and strengthening of the material, technical and scientific-methodological base of IL;
- work on the creation of joint intellectual property (obtaining patents);
- joint participation in competitions, grants, prizes and scientific funds.

Thus, the creation and successful functioning of the engineering center will allow solving one of the most important urgent tasks of the current stage - the creation of a new generation of young scientists capable of creating breakthrough technologies in the defense industry.

Conclusion

Ensuring the competitiveness and security of the nation, the individual, society and the state is achieved through education, social and pedagogical support for the formation and development of a responsible, creative, proactive, competent citizen. The features of the implementation of the innovative educational concept [10] within the framework of the ISEC are:

- application of the advanced approach to training, which assumes orientation to the forecasted future of the country;
- carry out the choice of directions of advanced training of specialists for the projected future in accordance with the "blue ocean" strategy;
- application of pre-active plan, consisting of predicting the future (forecasting the country's socio-economic development for the long term) and preparing for it, including planning the industry's need for workers in certain specialties, including promising ones, and reflecting this in training programs;
• application of a participatory approach to planning, which assume direct involvement in the planning process of all participants in educational processes [11];
• development of strategic partnership of subjects of the educational complex with economic entities of the real sector of the economy;
• increase the participation of students, undergraduates and graduate students in research and development work related to the areas of advanced training;

References