children can observe a lot of unique natural phenomena, wonderful landscapes and views, which makes it quite reasonable to take a camera and take pictures and videos. On coming back, children make posters, edit the pictures and videos, and present them on some events or festivals accompanying them with a report or story. These activities need integrating a variety of skills both technical and creative. They foster development of literary, journalistic, presentation and computer skills that will be necessary for their future. This approach can also be applied in the activities related to theatre art. Children should be involved in every stage of the performance design and implementation: from a scenario and costume design to final performance.

The program was tested during 2 years both in the city and in villages. The positive effect is proved by high performance of the children in various competitions of different levels (city, nationwide, and international).

Currently, such educational process is planned to be studied in the framework of an education system testing site founded by the Minor Academy of Science " Mental power of the future" and Education Academy of Russia. The research will start in 2016-2017 academic year in municipal state funded institution of additional education "Parus", Ufa city, with Savin A.Yu. consulting the study.

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The Engagement of Educational Process Into the Practical Activities as a Main Route for Development of Modern Engineering Education

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The best practices and perspectives of practice-oriented education development are disclosed in the article.

Key words: educational standards, practice-oriented education, new model for organization of educational process.

The cornerstone in the assessment of learning outcomes, including their assessment in higher engineering education, is the issue of the quality of education.

Older generations, who received education in Soviet times, are overall satisfied with its quality and typically showcase it as a good example when speaking with the new generation. It most likely has some reasonable basis behind it. The system of higher education that existed at those times did not have such words as "competence-based approach", the descriptors "to know", "to be able to", "to possess", however the level of education of the majority of graduates was sufficient for the purpose of performing the required functions after a certain adaptation period. Moreover, their level of preparedness allowed them to step up the career ladder or change the sphere of activities more or less seamlessly.

How was it assured? There was an adequate approach to the development of typical curriculum, which joined the humanitarian (soft skills) component, the excessive fundamental basis and, in most cases, the insufficient professional training. The latter one could be considered insufficient due to the fact that, for instance, a mechanical engineering graduate usually was supposed to get the practical knowledge of all: the mechanical engineer, the technologist, the design engineer and the production manager. This insufficient professional training was smoothed by the 3-year "young engineer" status, which gave graduates an opportunity of receiving practical skills at their workplace; and the excess of fundamental education gave them solid basis for future professional growth.

Back then, there were no standards, but a set of disciplines, their content and volume for each major was formed by leading universities that had close ties with field-specific enterprises through developing typical curriculums. This system assured the required level of education for all specialists in the country. The government used to prepare specialists for its own industrial enterprises. The quality criterion was the assessment of graduate's capabilities at his/her workplace.

The drawbacks of such system could be underlined as follows: students did not always understand why they learned one or another course; typically, professors praised their own courses thinking that they are the core basis of specialists' education. However it all fell into right place – the knowledge received by learning the identified set of disciplines assured the evolvement of a graduate (specialist) and lied in the root of his/her further professional development.

Later on, the standards have been introduced and constantly changed: RF 1994, State Educational Standard (SES)-1, SES-2, Federal State Educational Standard (FSES) of Higher Professional Education, FSES of Higher Education. The appearance of the FSES-4 has been declared.

From the traditional 5-year education the majority of programs transferred to the 4-year education; the concept of «young specialist» has dissolved. The economic factors pushed universities towards shortening lecture time, while not always increasing the intensiveness of the students' self-study.

At the same time, faculty pushed for saving the efficient set of disciplines and each department tried to save its workload at the expense of other departments, taking into account the fact that the overall workload has been cut.

Moreover, aiming to win the severe competitive war for enrollees many universities have taken the route of increasing the number of new majors, enlarging the educational profiles, which, in its turn, led to the appearance of artificially created courses with no required material, staff and methodological support, to the enlargement of study groups and to the increase of faculty workload. Overall, these factors have negatively affected the quality of education.

From the mid 90th and almost up to the 2010 all this was not important, since only few graduates actually ended up working at factories and the governmental control of the quality of education (except the thesis defense) was narrowed down to the control of residual knowledge on a number of courses, such as mathematics, economics, material science and other, the control of library fund compliance with the requirements, and – typically the most difficult one – the control of compliance with the licensed (not even officially ratified) indicator of the square meters per student.

The new times came. The engineers knowing brand new technologies and equipment became eagerly sought. However in the context of new economic conditions by far not all the enterprises are able to afford employing graduates and patiently waiting for them to become real "engineers". The graduates with sufficient practical background are in need, those, who can respond to the production issues without a long adaptation period.

The complicating factor is the reduction of the study period.

The only solution is to develop and deepen the direct links with the industrial enterprises by engaging the educational process into the production activity, attracting extra material, intellectual and other resources into the sphere of education, developing demonstrational platforms for modern technologies and equipment.

Omsk State Technical University (OmSTU) has taken this route.

On the first stage we focused on the creation of resource (innovational) centers [1, p. 145-146]. Their development has been financed by the Strategic Development Program won by the OmSTU. By concentrating resources on obtaining new equipment for different specialties, the new quality of education has been assured. Based at the resource centers, the new production lines have been launched; students have been involved in the work processes; and research and development projects have been carried out. All of the resource centers are providing retraining and professional development programs for production enterprises' employees. Overall, there are 18 resource centers at OmSTU.

However it had been noted in a short time that resource centers cannot provide mass education and are more suitable for training of custom-made specialists.

Since 2013, initiated by the Order of the Ministry of the Education and Science of the Russian Federation No. 958 of August 14, 2013, "On the endorsement of the procedure for the professional education organizations and the educational organizations of higher education to create departments and other structural divisions ensuring practical training of students based on the premises of external organizations that undertake activities in the field of corresponding educational program" OmSTU has created 16 industry-based departments on the premises of the largest enterprises of Omsk [1, p. 145-146].

Getting acquainted with the real production during the educational process, conducting course works and final theses on the industry-required themes under the supervision of specialists from the industry allowed to increase significantly the practical component of students' training and ease their adaptation to the work process after getting employed. Based on the requirements from the industry-based departments the curriculum has been modernized and the distributed internships, where students spend one day out of the study week working at the production units, have been introduced.

The university submits proposals and wins funding for joint projects together with the enterprises that allocate industry-based departments. One of such projects is the development of a system for professional training of specialists for military-industrial complex (MIC) in the framework of a call for supporting development programs. The project is "New workforce for MIC". It belongs to the Center for engineers training "Polyet" of the Production Association «Polyet» – a branch of the Khrunichev State Research and Production Space Center. The Center for engineers training, being a structural department of OmSTU, works for training highly qualified specialists in the field of design, production and operation of launch-rocket of the «Angara» series. The Center consists of 4 research, educational and production laboratories.

OmSTU is looking for other ways of increasing practical component of education. Analyzing best practices of training engineers at the leading technical universities of Russia and foreign countries there has been taken a decision to try out the system of training practice-oriented specialists based on the CDIO (Conceive, Design, Implement, Operate) Standards.

The analysis of the military industry requirements of the region, the material and technical equipment and the personnel of the university disclosed that CDIO Standards realization would be most efficient in the framework of Master programs.

The following Master programs have been chosen as trial projects [2, p.103-104]:

- Design and optimization of power supply systems (13.04.02 "Electric Power Engineering and Electrical Engineering").
- Mechanics of small remotely piloted vehicles (15.04.03 "Applied Mechanics").
- Technological design for mechanical engineering production units (15.04.05 "Design and Technological Support for Mechanical Engineering Production").
- Design and structure of flight-vehicles (24.04.01 "Rocket Complexes and Astronautical Science").

The training process within all of these programs is based on the existing resource centers.

In the framework of the international cooperation, OmSTU together with a consortium of HEIs and enterprises won a grant of the European Union program supporting the modernization of higher education – TEMPUS program. The name of the project is "New model of the third cycle in engineering education due to Bologna Process in BY, RU, UA" (NETCENG).

The project is aimed at the development of experimental model for third cycle education (PhD, PostDoc) in the field of engineering disciplines in line with the norms and current recommendations of the Bologna process.

OmSTU is responsible for the development of an educational module on designing of a robotics on-board systems for automated maneuverable spacecrafts for solving the problem of docking with uncooperative objects of bulk space garbage, interorbital hauling, refueling of space propulsion systems on the orbit, replacement of on-board equipment, deorbitting, etc.

However everything described previously is only a modernization of the earlier existing system. And whatever the updates are applied to it, the system will not assure the former level of the quality of education.

There is an appraising need for fundamental changes that would inevitably lead to the changes in the structure of an HEI.

The background for future changes is presented further.

First of all, the words of the Minister for Education, D. Livanov, should be noted: "…in the upcoming years it is necessary to reconsider the educational standards that would be based on the professional standards; and the system for the assessment of educational programs will be structured upon them" (TASS, May 28, 2015).

Further, the Government Executive Order of the Russian Federation No. 881-р of May 14, 2015, should be taken into account. It ratified a schedule-plan for a network of independent centers for the certification of professional qualifications.

Therefore, the transition towards professional standards application is inevitable, and after receiving diplomas of higher education graduates will have to go through an evaluation process, where their level of professional competences' acquisition will be checked. This evaluation will not include asking graduates to take integrals, but will assess their level of knowledge, attitudes and professional skills for conduction of work functions.

This leads to the conclusion that we need to transfer to a different set of educational principles, where the result of education is a competence acquired not formally, but truly. This will be achieved by moving towards the modular principle and omitting some disciplines. At the same time, the module can be not only interdisciplinary, but also inter-department.

A strong need for discarding disciplinary design of curriculum and transiting towards the modular principle of design is already stated in the FSES of Higher Education. Thus, for instance, the major 15.03.05 – "Design and Technological Support for Mechanical Engineering Production" for project design activities has no ground for including such disciplines, as "Theoretical mechanics", "Theory of mechanisms and machines", "Material resistance" in its curriculum. Those are the disciplines that used to lie in the essence of any mechanical engineer's education. The closest two competences (general professional competence 5 and professional competence 5) require for a student to be able to design and develop technical documentation and to draw up and finalize project designs. But that does not mean that a graduate has to know the laws of kinematics and strength calculations. A graduate actually should know them, but not in the context of highly theoretic disciplines. He/she should rather learn them within a unified module, where one of the parts would be devoted to the engineering methods of strength calculations (not of all the possible situations, but in application to the constructions being developed within the educational process).

Having said this, it should be taken into account that for different groups of enterprises the technological component of the educational process may vary according to the development strategy of an enterprise, its attitude towards introducing new technologies and project solution.

Interesting conclusions can be drawn from the comparison of professional competences introduced by FSES of Higher Education and the work activities according to the professional standard, for instance, of a rocket design engineering graduate (Table 1).

Federal State Educational Standard of Higher Education indicates that a graduate of a Bachelor program should have fostered competences complying with the position of a chief design engineer, i.e. the ability and readiness to analyze the current state of space-rocket technology (professional competence-5 (PC-5), to design space-rocket technology (PC-2), to define work specification for designing systems of space-rocket technology (PC-3). But it is impossible to assure these competences' formation within the theoretical education of neither 4 years, nor even 10 years. The analysis of curriculums indicates their overload with various diversified disciplines, which are unnecessary on this stage.

A corresponding professional standard refers to the graduate's ability to collect materials following the task leader's order, to prepare detailed description of an existing assembly drawing, and correct the drawing after receiving remarks.

Table 1.

FSES of Higher Education (24.03.01 "Rocket Complexes and Astronautical Science", Type of activity – project designing)	**FSES-4 (Specialty group 25 "Space-Rocket Production") 25.045 – Design engineer for rocket production**
Professional competences	Work activities
(PC-1) ability and readiness to participate in the analysis of the overall state of space-rocket technology, its different subsections and development of a modern constructions and technology basis	2. Collection of materials for projects of design and calculation documentation on space-rocket technology and its components
(PC-2) ability and readiness to conduct technical design of space-rocket components with application of solid modelling in line with the Unified system for design documentation based on modern computer technologies with an aim to determine parameters of volumetric and mass characteristics of products included in the space-rocket complex	1. Preparation of design documentation on existing developments, conduction of preliminary calculations of space-rocket technology and its components
(PC-3) ability and readiness to participate in development of technical tasks for the design of systems, mechanisms and component units, that are included in the designed products for space-rocket complex, as well as its technological support	3. Arranging adjustments to the design documentation on space-rocket technology and its components

The principle is simple: graduate is supposed to enter work environment and start immediately conducting his/her tasks (received according to the qualification) professionally. In the case that a specialist has a need for professional development, there is an opportunity to apply for a Master program, a PhD program, a program of the system of retraining and professional development.

Omsk State Technical University among another 10 Russian universities became the winner of the project "Flagship university".

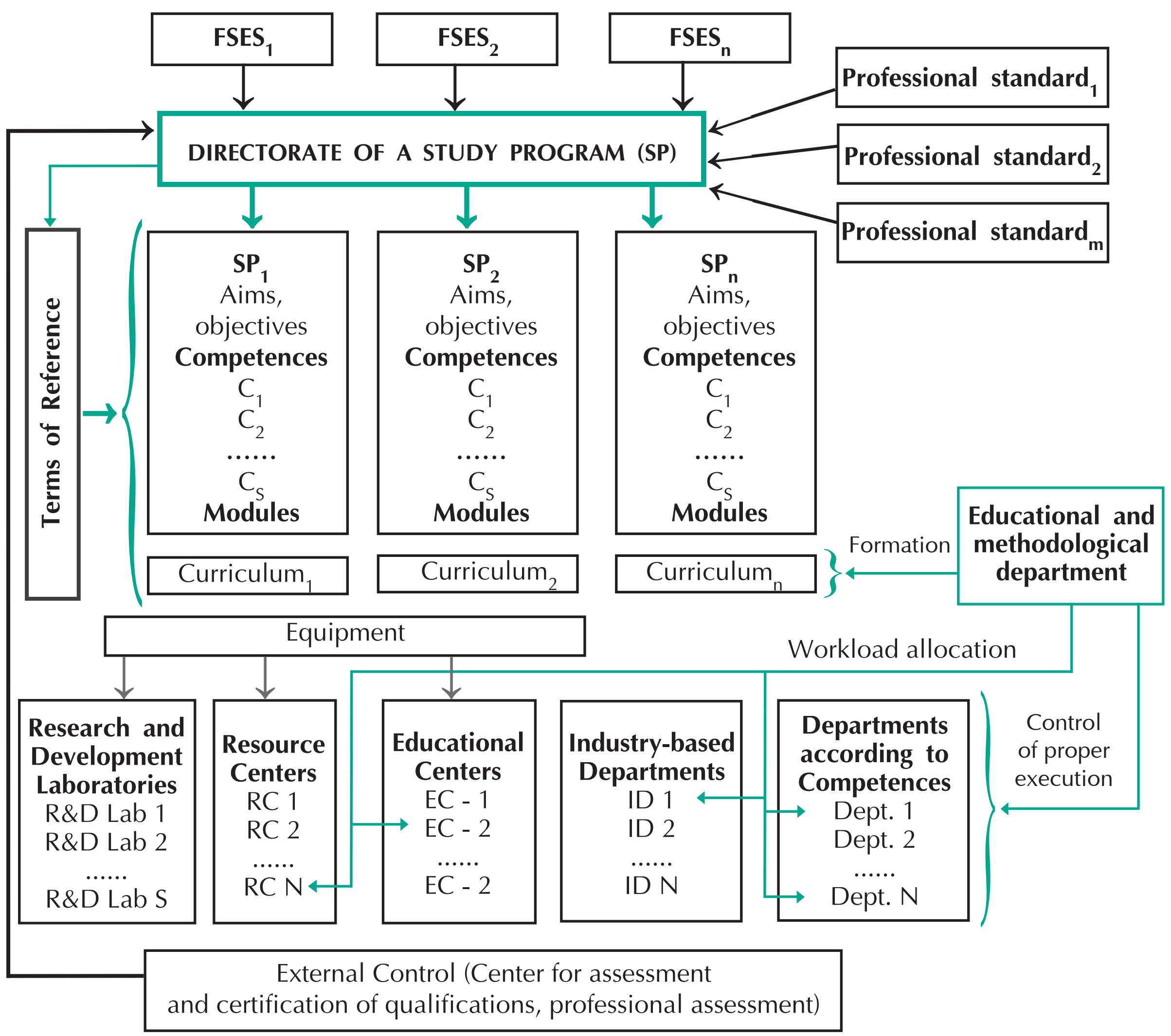
According to the Program for development of flagship universities the modernization of management system of OmSTU includes the development and implementation of a new organizational model of the university. The distinctions of a new model of educational process organization are (Fig. 1):

- Transition to the formation of departments according to competences.
- Different system of formation, realization and monitoring of the study program's results.

The key role here is played by the directorate of each study program, who have to consider the needs of employers through professional standards, the requirements of the FSES, as well as the opportunities of all of the university's structural departments: research and development laboratories, resource and educational centers, industry-based departments or departments, responsible for the formation of one or another competence.

There is a great work ahead of us.

Fig. 1. Model for organization of educational process



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Interdisciplinary Approach and Interactive Self-Learning

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The paper considers theoretical and methodological bases for interdisciplinary approach to interactive self-learning and principles of academic process organization via interactive learning techniques.

Key words: interdisciplinarity, self-education, interactive self-learning, nature-aligned learning.

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In modern post-industrial society, education is a kind of anthropological and social project planning. The foundation of adequate education rests on the social project implying correlation between an individual's ideals and social structure. In social perspective, education fulfils an important function of socialization – an individual acquires knowledge and develops relevant skills, as well as learn social standards and values which stipulate successful life and development in a given society over a definite period of historical time. As for static societies, education is transmission of knowledge, and self-education is a kind of traditional practice. In dynamic societies, which are focused on development, education deals with ideas and practices which have neither become traditional nor been regarded as social and practical standards. Such education implies testing and research, as well as new practices implemented by their creators – fresh graduates. Therefore, education becomes an institution which secures activity development [1].

Education, even reduced to simple acquisition of knowledge in a certain sphere, has impact on an individuals' worldview. Being a complex system itself, the personality is a component of another system – social group, which, in its turn, is included in the system of social relationships. Education deals with psychology and considers existence as polysystemic, with due regard to the integrity of human qualities and particular characteristics. Therefore, the systemic approach to the analysis of education and self-education is the most adequate one. In philosophy, system is "a totality of elements correlated and interconnected with each other to make a unity" [2, p. 584]. The notions and principles of the systemic approach are as follows: unity, links, structure and organization, a number of levels and their hierarchy, management, target and target behavior, self-organization, performance, and development [3]. Systemic integration of new knowledge into the world model is only possible via interdisciplinary links. The interdisciplinary approach to education allows developing the level of thinking and forming holistic worldview. This approach is also contributive to improve professional, worldview, communicative, and cross-cultural competencies. It is a well-known fact that scientific and technological breakthroughs occur through crossing boundaries in science, as a result of integrated research [4].

The system of today's education is focused on new achievement, which can be proved by the correlation of knowledge and skills within educational process. Knowledge is currently losing its fundamental status since today it is easily available while the methodology is becoming disputable. What society today needs more than anything is skills, and they