

ПРОБЛЕМЫ И ИНОВАЦИИ В ИНЖЕНЕРНОМ ОБРАЗОВАНИИ

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PREPARATION OF A NATIONAL ENGINEERING STAFF AS A FACTOR INNOVATIVE DEVELOPMENT OF KAZAKHSTAN*Taskimbaev O.**Kyrgyz State Technical University named after I.Razzakov, Bishkek, Kyrgyz Republic
E-mail: ongarmbay@mail.ru***Summary**

The increasing complexity of modern engineering systems and devices, the increasing of their functionality, exacerbation of competition between industrial structures make to create more complex systems and improve their reliability, simplify the management, use nonstandard solution in their design. For each employee, this means constant pressure from "outside" and "inside" on the base of searching knowledge, to find necessary information in order to make quick and correct decisions, change technological process, management style, etc. , that's why the value of knowledge increases many times. Therefore, knowledge is a key resource of the company. Level of knowledge "know-how" ensures the success of the organization, allowing it to stay leaders in the market. Thereby there is a change of engineering functions and in requirements to professional and personal qualities of graduates of higher technical educational institution.

The purpose of the work is to improve the quality of engineering specialists training in the state educational system. Methods of the research: empirical, the analysis of engineering-industrial problems on specialties, etc.

Conclusion. The long-term objective of the new system of education of the Republic is to prepare

creative moral and psychologically stable individual, in particular the National Engineers of Kazakhstan.

High dependence of the economy on the resources gap, production and investment decisions against the labor shortages is contained that adversely affect the competitiveness, that is, effectiveness of domestic products and sectors of the economy. Education is one of the major social and economic priorities, affecting all spheres of public life it largely determines the efficiency of the economy, the opportunities for integration, etc. For countries with rapidly growing economies in investment in human capital (HC) are priority national competitiveness, preservation and reproduction of resources, the formation of a knowledge society.

Over the past 10 years, the highest average GDP growth recorded in China - 8.3% and Russia - 5.4%. It also has the highest annual result by 10%. Average growth rates of GDP in Kazakhstan for 10 years also consistent with achievements of the most dynamic economies of the world. According to think tanks in 2009, the 10 fastest growing economies of the world include: Russia, Brazil, China, India, Poland, Mexico, Argentina, Turkey, South Africa, Indonesia (Table 1). [1]

(Table 1). - The main macroeconomic indicators of the country in 2011

| Country | Population, million | Size of GDP, billion dollar | Size of GDP according to ППС, billion dollar. | GDP per citizen, thousand dollars. |
|------------------|---------------------|-----------------------------|---|------------------------------------|
| World in general | 6928,2 | 70160 | 78950 | 10,1 |
| Australia | 21,8 | 1507 | 917 | 69,1 |
| Canada | 34,0 | 1759 | 1389 | 51,7 |
| Netherlands | 16,8 | 858,3 | 706 | 51,1 |
| USA | 313,2 | 15060 | 15040 | 48,1 |
| Japan | 126,5 | 5855 | 4389 | 46,3 |
| Germany | 81,5 | 3629 | 3085 | 44,5 |
| France | 65,3 | 2808 | 2214 | 43 |
| United Kingdom | 62,7 | 2481 | 2250 | 39,6 |
| Italy | 61,0 | 2246 | 1826 | 36,8 |

| | | | | | |
|----------------------------|----|--------|-------|-------|-------------|
| EC | 4 | 492, | 17690 | 15390 | 35,9 |
| Spain | | 46,8 | 1537 | 1411 | 32,8 |
| South Korea | | 48,8 | 1164 | 1554 | 23,9 |
| Czech Republic | | 10,2 | 220,3 | 272 | 21,6 |
| Chile | | 16,9 | 243 | 281 | 14,4 |
| Poland | | 38,4 | 531,8 | 765 | 13,8 |
| Russian | 9 | 142, | 1885 | 2373 | 13,2 |
| Brazil | 4 | 203, | 2518 | 2284 | 12,4 |
| Kazakhstan | | 15,5 | 180,1 | 214 | 11,6 |
| Mexico | 7 | 113, | 1185 | 1657 | 10,5 |
| Argentina | | 41,8 | 435,2 | 710 | 10,5 |
| Turkey | | 78,8 | 736,1 | 1053 | 9,3 |
| Malaysia | | 28,7 | 247,6 | 447 | 8,6 |
| Romania | | 21,9 | 185,3 | 264 | 8,5 |
| Iran | | 77,9 | 480,3 | 929 | 6,2 |
| Belarus | | 9,6 | 57,7 | 141 | 6,0 |
| China | ,7 | 1336 | 6989 | 11300 | 5,2 |
| Thailand | | 66,7 | 345,6 | 601 | 5,2 |
| Ukraine | | 45,1 | 162,9 | 327 | 3,7 |
| Indonesia | 6 | 245, | 834,3 | 1121 | 3,4 |
| India | | 1189,2 | 1843 | 4463 | 1,6 |
| Source: CIA World Factbook | | | | | |

Sustainable system of education - is not only a powerful mechanism for mitigating of the effects of unemployment during the crisis, but also an effective mechanism for the preservation and accumulation of intellectual potential for exiting the crisis. Realizing the importance of specialist's professional skills the President in his message to the nation, "Socio-economic modernization - the main vector of development of Kazakhstan" has identified one of the major challenges as achieving of quality growth of human capital and the need to strengthen the educational component of the learning process, "patriotism, morality and ethics, inter-ethnic harmony and tolerance, physical and spiritual development, law-abiding should be instilled in all schools". [2]

In the modern economy, educated and creative workforce forms a part of its most skilled part, ensures the effective use of human capital, improving the environment and functioning of intellectual labor, that is, acts as core for accumulation of national human capital. Fig. 1 shows the content of the quality values of the individual that influence the formation of the creative component of the specialist. Of course,

such distribution is conditional; however, the education received by a person throughout his life is the basis of his citizenship and professionalism.

The values of the conditional distribution of the creative personality are shown in picture 1

A key factor in the successful implementation of development programs of people is the level of literacy and the ability for constant update of knowledge. Researches of international organizations in the field of literacy in different countries, access to education and training system, demonstrate the current status and potential for their development (Table 2). According to UNICEF, 26,5-30 thousand children die every day due to poverty, 27-28% of children living in developing countries are underweight. According to estimates of the publication «New Internationalist», 1% of global military spending would be enough to ensure that all children of the world had the opportunity to go to school. [3] Currently, Kazakhstan is actively integrating into the international educational space, increases export of educational services. However, our high schools are not effectively involved in these processes, with substantial re-

serves for improving of the competitiveness of the national higher education: Kazakhstan's share in the global education market is less than one percent, which is significantly lower than the proportion in the

population or the economy of the world. The global education market is about \$ 100 billion, with the U.S. each year on average 14-15 billion dollars from international students.

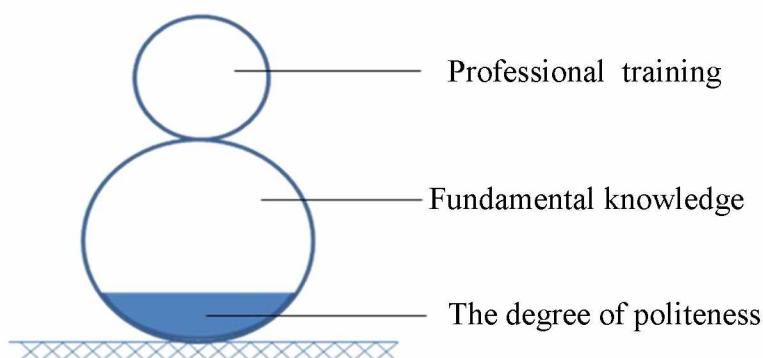


Table 2 - the Educational level in the countries with the population over 15 million people, 2010










| Country | Enrollment, a million people. | | | The percentage of students in the country's population, % |
|-------------------|-------------------------------|------------|----------------|---|
| | initial | average | post-secondary | |
| China | 26,6 | 99,2 | 31 | 2,4 |
| Mexico | 4,6 | 11,7 | 2,8 | 2,5 |
| Japan | 2,9 | 7,3 | 3,8 | 3 |
| Italy | 1,7 | 4,6 | 2 | 3,3 |
| Brazil | 6,8 | 23,6 | 6,6 | 3,4 |
| France | 2,6 | 5,9 | 2,2 | 3,4 |
| Netherlands | 0,4 | 1,5 | 0,6 | 3,5 |
| Thailand | 2,8 | 4,9 | 2,5 | 3,6 |
| Malaysia | 0,8 | 2,5 | 1 | 3,6 |
| Kazakhstan | 0,5 | 1,7 | 0,6 | 3,8 |
| United Kingdom | 1,1 | 5,4 | 2,4 | 3,9 |
| Turkey | 0,8 | 7,1 | 2,9 | 4 |
| Romania | 0,7 | 0,8 | 1 | 4,8 |
| Chile | 0,4 | 1,5 | 0,9 | 5,3 |
| Ukraine | 1,2 | 3,1 | 2,6 | 5,7 |
| Poland | 0,9 | 3 | 2,2 | 5,8 |
| Australia | 0,2 | 2,3 | 1,3 | 5,9 |
| Argentina | 1,5 | 3,6 | 2,4 | 6 |
| Russian | 5,1 | 9,6 | 9,3 | 6,5 |
| South Korea | 1,5 | 4 | 3,2 | 6,5 |
| USA | 8,8 | 24,2 | 20,4 | 6,8 |
| Indonesia | 3,9 | 20 | 20,4 | 8,5 |
| India | 41,3 | 107,7 | 120,7 | 10,9 |

Source: *Opportunities lost: repetition and early school leaving/ Global education digest of UNESCO, 2012. – 194 p.*

Kazakhstan aims at modernization, rather internationalization of higher education. Under these circumstances of training, domestic graduate "lose" even within the existing Customs Union (CU). So, generally can be compared in terms of public expenditure on education to GDP (Russia - 5%, Belarus

- 4%, Kazakhstan - 3.5%). If we take into account the population size and the number of higher education institutions, the lack of financial support of the future Kazakhstan's specialists is obvious

(Table 3) - Indicators of Higher Education of the Commonwealth of Independent States

| Страна | Academic year | | | | | | | | | | |
|--|---------------------------------|--------------------|---------------------------------|---------------------------------|-------------------------------|---------------------------------|---------------------------------|-------------------------------|--------------------------|-------|---|
| | 2000/2001 | | | 2005/2006 | | | 2011/2012 | | | | |
| | The number of institutions, ed. | Number of students | Graduates, thousands of people. | The number of institutions, ed. | Number of students, thousands | Graduates, thousands of people. | The number of institutions, ed. | Number of students, thousands | Graduates, in thousands. | | |
|  Azerbaijan | 7 | 20 | 4,5 | 7 | 30 | ,5 | 32 | 1 | 43 | 0,8 | 3 |
|  Armenia | 0 | 1 | ,8 | 9 | 8 | ,3 | 13 | 8 | 5 | 4,9 | 2 |
|  Belarus | 7 | 82 | 8,7 | 5 | 83 | ,6 | 53 | 5/54 | 46 | 5,8 | 7 |
|  Kazakhstan | 70 | 41 | 4,6 | 81 | 76 | 4,2 | 15 | 46 | 29 | 60,9 | 1 |
|  Kyrgyzstan | 5 | 89 | 7,9 | 1 | 31 | ,9 | 32 | 3 | 39 | 1,8 | 4 |
|  Moldova | 7 | 9 | 2,2 | 5 | 26 | ,4 | 17 | 4 | 04 | 7,8 | 2 |
|  Russia | 65 | 741 | 35,1 | 068 | 065 | 51,6 | 11 | 080 | 490 | 442,9 | 1 |
|  Tajikistan | 0 | 8 | 3,6 | 6 | 32 | ,1 | 15 | 3 | 52 | 8,0 | 2 |
|  Ukraine | 15 | 03 | 73,6 | 45 | 204 | 2,4 | 37 | 45 | 955 | 29,8 | 5 |

Source: www.gias.unibel.ru

For the implementation of the adopted in the execution programs of industrial-innovative development of Kazakhstan, the qualified personnel, particularly engineer is required. Therefore, the fundamental training of future engineers, creating a methodologically systematic invariant knowledge provides the basis for further learning of professional application training material, develop creativity and systems thinking, arms by methods of learning, promotes and improve the scientific world, increases the level of professional and general culture of the future expert [4]. To improve the quality, value and performance of national human capital in particular engineering disciplines we offer the following system of education in technical institutions of the Republic of Kazakhstan (Fig. 2). High school graduates according to the results of public examinations or a single national test to receive a high school diploma with the rules of the Ministry of Education and Science, to go to universi-

ty for a period of 2 years for the special training and certification of the initial higher education.

Human capital is formed by investing in improving the level and quality of life, intellectual activity, including in education, training, health; knowledge (science); business skills and climate; information support of labor; the formation of an effective elite; human safety and business and economic freedom, as well as in culture, art, and other components. On the other hand, gained quality human capital is at the base of the innovation system and innovation economy. Thus, the foundation which is created an innovative economy and the information society, serve the rule of law, high quality human capital, quality of life and effective industrial economy, which gradually evolved into a post-industrial or innovative economy.

Currently, to bring up the creative personality especially through ethnopedagogics - is one of

the main objectives of the new national education. The formation of the students in order to prepare highly skilled specialists, i.e. applying up-to-date knowledge is now unthinkable without the development of creativity, level of education. Safety, stability of society and the individual depend on the level of education of all members of society, and in particular its creative side. In his address to the nation, the Pres-

ident Nursultan Nazarbayev noted the necessary strengthen of the educational component of the learning process, "Patriotism, morality and ethics, international agreement and tolerance, physical and spiritual development, law-abiding. These values should be instilled in all schools, regardless of ownership "[1].

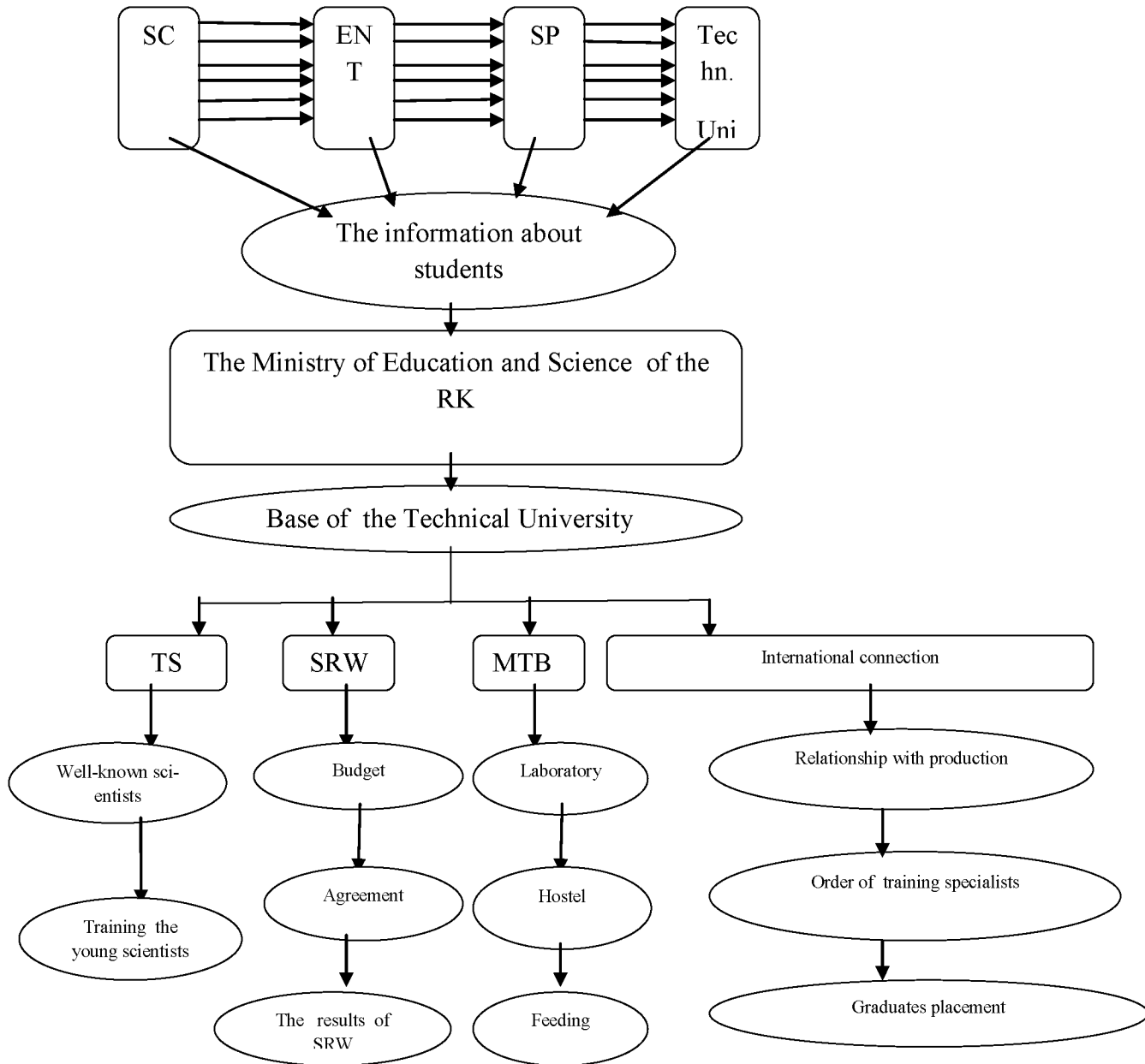


Table 2 - The schematic diagram of education and training of engineers in the national technical universities of Kazakhstan

The purpose of special training (SP) of students is personal development, the transition from the opinion to the self-determination, and training to understand and analyze the subject of contradictions. To achieve the above-mentioned objectives modern technical university should be an elite institution, in which, along with the professional knowledge, stu-

dents can receive basic training in the natural sciences, social and psychological, general engineering, socio-economic and humanitarian fields.

Unfortunately, at present the technical universities of Kazakhstan are not able to fulfill the above-mentioned goals and objectives, due to lack of scientists and professional teachers. Therefore, the

proposed 2-year training for all students, regardless of the chosen specialty, should be organized on the basis of state pedagogical universities. Modern state pedagogical universities preserved the scientific and pedagogical potential and have years of experience and techniques of organization of educational and training processes in mathematics, physics, psychology and other general subjects. After 2-year program, students enroll in technical universities with higher levels of education and basic training. Such training schemes exist in the developed world and shown to be very effective. For example, in Germany, the curriculum consists of two parts: a 12-year-old - mandatory and the 13th year of the exam for a high school diploma. After which an applicant has the right to study in the university bachelor's degree in 4 years.

In the UK, after the 11-year school program are usually issued a certificate of secondary education and 2 additional years of secondary school - certificate higher level, with the certificate applicants enters university (Bachelor 3 years) without examination.

France adopted a 12-year school program and two-year start-up phase of higher education, as well as 2-year college education after which students receive the title of TRIZ (BA).

To improve the quality of technical training in the universities of the Republic of Kazakhstan, on the basis of preliminary research and experience of foreign universities we offer the following scheme for the placement of state orders for the preparation of specific specialties and admission of students (Figure 3).

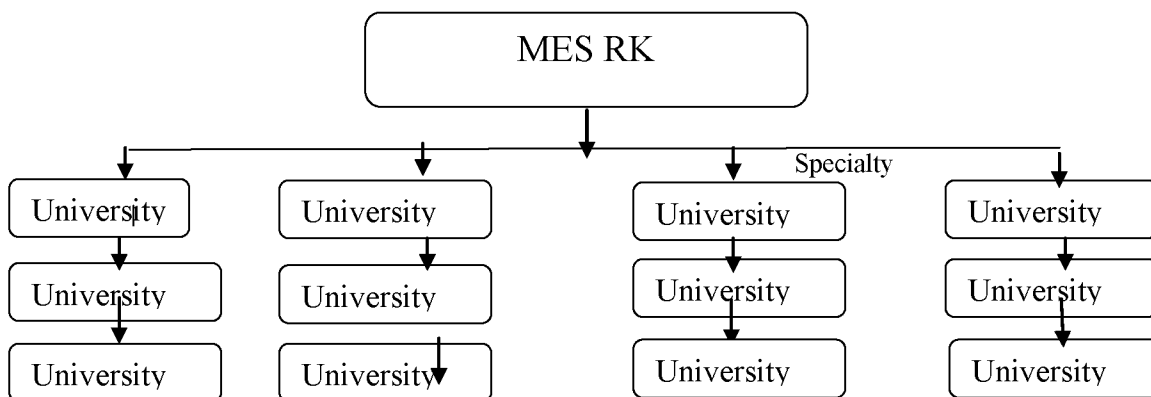
Table 2 - The main goals and objectives of the technical universities of the Republic on the proposal of the national training system engineers

| 3 course | 4 course | Masters | PhD (professional- manager) |
|--|---|--|--|
| The purpose - to teach students the methods of problem-thinking The objective - to give professional technical and economic knowledge | The purpose - to teach students to think from questionable to undisputed. The objective - to give professional, managerial and sociological knowledge. | The purpose - to prepare a specialist or future researchers and teacher The objective - to teach how to act, to work and live in situations of misunderstanding | The purpose - to train modern top managers and scientists. The objective - to teach how to develop their own point of view and not be afraid to include in conflict of the different point of view. |

In the period of final examinations and the results of issuing certificate of secondary education MES creates a database of students, including student performance over a 2-year study. If a student with a certificate on the initial higher education wishes to continue his studies at the university, it takes all the necessary documents to the appropriate technical college in electronic form, which is in compliance of the requirements of a particular student's university without examination takes 2-year vocational training.

For the distribution of government contracts for training in institutions of the republic MES also creates a database of all technical colleges, and depending on the skill level of the teaching staff and the training of young scientists, logistics, volume performed research and implementation of the research

results in production, due to the specific production structures and international cooperation, placing the state order for training of national engineers with the specific skills. In Fig. 4 is a schematic diagram of the distribution of state orders for the training of engineers for specific specialties in the context of technical colleges. Placing state orders for training engineers we must take into account the needs of the economy of a specific region or city, and the availability of a technical college. Thus, the core of a new paradigm of development strategy should be comprehensive and systemic vision and strategy for the development of Kazakhstan's national human capital through better training of engineers for the innovation economy of Kazakhstan.



The proposed scheme of distribution of state order for training of engineers of technical universities.

National higher vocational education (HBO), as well as the economy, developed for a long time, focusing on the needs of the domestic market. The processes of globalization have accelerated the trend of integration of Kazakhstan into the sphere of international education and identify problems in conformity of qualitative results of learning to the new requirements of the competence approach to training. Developed not in favour of Kazakhstan situation may worsen after the joining of Kazakhstan to the World Trade Organization and the inflow of foreign providers of academic services. Thus, VPO structural problems, indicating the need of organizational and economic change can be solved by applying the capabilities of the Bologna protocol of choice of the individual educational planning and receiving of additional career advantages in both domestic and international labor market, thus increasing its availability and quality.

Literature

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