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FEATURES OF EDUCATION MODEL IN THE TRANSITION TO HIGH-TECH ECONOMY

OLHA PROKOPENKO, VATALIY OMELYANENKO

Introduction

Popularization of science is one of the most important problems of modern society. Important role in this process is to attract public attention to the various fields of science, which became the source of many discoveries that have had a significant impact on the appearance of the modern world. Scientists as generators and carriers of scientific knowledge, interest in their preservation, development and enhancement, which is impossible without an influx of young people to science. Promote and stimulate interest in the sciences are able to attract youth to science.

With the growth of knowledge about nature and development of research tools mankind began artificially divide the unified nature on segments for easier understanding and learning. So physics, chemistry, biology, geology, etc appeared. As a result of these processes mankind gradually formed a highly specialized system of science and education, which exists and operates successfully until day. This principle of the science led to branch principle of industrial organization.

World experience shows that socio-economic development of the state and its competitiveness in the international market is provided primarily by the presence of a developed environment "generation of knowledge" based on a significant sector of fundamental research combined with effective education system of national innovation system, an integrated public policy and legal provision in the field of innovation.

1. Role of education in innovation development

The process of the development of science in the most general terms, begins with the appearance a plurality of separate, unrelated areas of knowledge, such as zoology and botany, mechanics, chemistry, etc. Later the unification of knowledge in the areas of larger complexes started, and as they expand tend to specialize appeared again.

Technology development is initially different: technology was developing interconnected, and usually breakthroughs in one area were linked to achievements in other areas. In the distant past often such as "catalysts" of technological progress were achievements in the development of new materials (appearance of bronze, glass, steel, etc.).

This trend continued until the present day, and not so long ago, for example, distribution of composite materials made possible the cheap and reliable private space launches. Also, scientists are hoping that the appearance of long (centimeter) of carbon nanotubes in the near future will make possible the construction of a space elevator.

Einstein's well known saying states that we can not solve problems by means of which we created them. One of the basic postulates of systems theory says that the problem cannot be solved at the level at which it arises. As applied to the above problems, this would mean that solve their remaining "narrow specialist" is almost impossible.

Figure 1 shows the conditions of education development and changes in it.

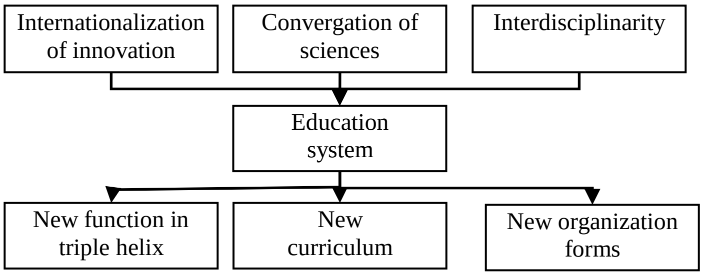

Figure 1. Environment of education development

Today there is a group of people who paint «product space» – set of industries and products, and they say that those countries which produce and export more related product and this is the more developed countries. One of the results of their research says that even visually different countries are arranged differently. In Western countries, more related products than in the developing countries of East Asia, if you look at Africa, where they will be even less connected.

The new mission of higher education in situation of aggravation of global problems of humanity and moving to sustainable development is that:

1) universities are centers of regional development programming, not only in economic but also in social, cultural and environmental sense;

2) new innovative and entrepreneurial university model is formed in which university is transformed into scientific, educational and industrial complex with academic core and interdisciplinary project-oriented periphery consisting of a plurality of network structures and innovative high-tech small businesses that are active on the orders of the authorities, industry, business and society as a whole;

3) the concept of "lifelong education» (life-long learning) becomes extremely relevant: lifelong (lifelong learning) and life wide (study of life in its entirety) or study carried out over the entire range of human life in any its manifestations; learning in lifewide style provides high proportion of informal and non-formal learning that can take place in the family, at your leisure, in public life and daily work.

Adoption of innovations by firms and workers is an important part of the process of technological change. Many prior studies find that highly educated workers tend to adopt new technologies faster than those with less education. Such positive correlations between the level of education and the rate of technology adoption, however, do not necessarily reflect the true causal effect of education on technology adoption[1].

Evolution of models of innovative university should also be considered (table 1).

Table 1. Comparisons of institutional mechanisms of innovative education

	Technology Transfer Unit	Entrepreneurship Education
Goals and Mission	Commercialize inventions; generate income	Develop leadership skills;integrate courses and disciplines; provide the foundation for new businesses; forge links between academic and business communities; promote university technology transfer
Influence of Market Conditions	Significant	Less
Time Horizon	0-10 years	0-40 years
Assessment	Straightforward: inventions commercialized; licenses executed; revenue	Difficult: student enrollment and evaluations; correlations with later behavior and career success
Providers and Constituency	Administrators and firms (that may involve faculty and/or students)	Faculty and students

Source: *Earth and Space Sciences Education in U.S. Secondary Schools: Key Indicators and Trends*. American Geosciences Institute. 2013. Access mode: http://geocntr.org/wp-content/uploads/2013/08/ESS-2013-Status-Report-10-17-13.pdf

The concept of technology transfer has relevance for all technology education programs, including programs in elementary and secondary schools, technology teacher preparation, and industrial technology at the university level. While technology development has been a central aspect of technology education programs through the years, issues dealing with the transfer of technology and its diffusion through society have been neglected. If a goal of technology education programs is to help students understand their technological future, the curriculum must provide a comprehensive study of technology that covers the entire range from technology development to utilization. Technology transfer seems to be the missing element in a comprehensive technology education program[2].

2 World-class expert education

Processes of globalization have changed the principles of the international division of labor. This applies particularly to the space industry, where remote sensing methods of technology design are widely used and components are manufactured worldwide.

The concept of "world-class expert" provides that an expert should possess the following skills:

- broad international vision and thinking;
- international integration of diverse culture , owning several foreign languages, cross- cultural communication skills , the ability to consider the problem in terms of the distribution of global resources;
- familiarization with the international market in a particular business, mastering

[1] Craig Riddell, W., Song, Xueda (2012) The Role of Education in Technology Use and Adoption: Evidence from the Canadian Workplace and Employee Survey, IZA Discussion Paper No. 6377

[2] Scott D. Johnson, Elizabeth Faye Gatz and Don Hicks Expanding the Content Base of Technology Education: Technology Transfer as a Topic of Study, Journal of Technology Education, Vol. 8 No. 2, Spring 1997, pp. 35-49.

the most advanced knowledge, technology and information;

- experience of studying abroad and working in an international environment.

OECD identify four approaches to the globalization of education[1]:

1. Mutual understanding approach encompasses political, cultural, academic and development aid goals. It allows and encourages the international mobility of domestic as well as foreign students and staff through scholarship and academic exchange programmes and supports academic partnerships between educational institutions. Examples of countries using this approach so far are Japan, Mexico, Korea and Spain. The European Union's Socrates-Erasmus mobility program is another example of this approach.

2. Skilled migration approach shares the goals of the mutual understanding approach but gives stronger emphasis to the recruitment of selected international students and tries to attract talented students to work in the host country's knowledge economy, or render its higher education and research sectors more competitive. Scholarship programmes may remain a major policy instrument in this approach but they are supplemented by active promotion of a country's higher education sector abroad, combined with an easing of the relevant visa or immigration regulations. Examples of countries having adopted this approach are Germany, Canada, France, the United Kingdom (for EU students) and the United States (for post-graduate students).

3. Revenue-generating approach shares the rationales of the mutual understanding and skilled migration approaches, but offers higher education services on a full-fee basis, without public subsidies. Compared to domestic students, foreign students generate additional income for institutions that are encouraged to become entrepreneurial in the international education market. Under this strategy, governments tend to grant institutions considerable autonomy and seek to secure the reputation of their higher education sector and protect international students, for example through quality assurance arrangements. Examples of this approach are Australia, the United Kingdom (for non-EU students), New Zealand and the United States (for undergraduates).

4. Capacity building approach encourages the use of foreign post-secondary education, however delivered, as a quick way to build an emerging country's capacity. Scholarship programmes supporting the outward mobility of domestic civil servants, teachers, academics and students are important policy instruments as well as the encouragement of foreign institutions, programmes and academic staff to come and operate private for-profit ventures, generally under a governmental regulation which ensures their compatibility with the country's nation- and economy-building agendas. Twinning arrangements and partnerships with local providers are encouraged (and sometimes compulsory) in order to facilitate knowledge transfers between foreign and local institutions. Examples of this approach are mostly found in South-East and North Asia and in the Middle East (for example Malaysia; Hong Kong, China; China; Singapore).

3 Features of space education

High requirements for training of future researchers of space remain, but most educational processes have changed drastically, which were open to the changed

[1] Internationalisation and Trade in Higher Education: Opportunities and Challenges, OECD 2004.

requirements of methodological and information support, which has set a target developers of new scientific and educational and methodological decisions.

Space education faced two major challenges:

1) training, retraining and advanced training of specialists in accordance with the tasks now facing the rocket and space industry to ensure the country's defense , to create a competitive rocket and space technology , the use of the results of space activities , achieving global priorities in the field of space activities.

2) participation in the development of professional standards of industry workers and state educational standards of professional education, taking into account the provisions of the relevant professional standards and requirements for the training of employees.

Generally the main tasks of space education are:

- get data for designing and creating educational satellite system providing participation of students in the process of design, development and operation (receiving and processing information about the on-board systems of the spacecraft, scientific and experimental equipment, apparatus Earth observation from space);

- improve the quality of training of young specialists and scientists Aerospace Profile - increase the competitiveness of the graduates in the labor market;

- increase the number of graduates, oriented to work after graduation in research centers and enterprises of the aerospace industry and other high-tech industries;

- increase the motivation on the part of students to pass specific training in actual scientific and technical directions for the industry enterprises;

- raise the level of scientific and pedagogical faculty;

- enter in general and higher education "space" component;

- use the capabilities of space systems to ensure the teaching of disciplines in the natural sciences;

- promote the achievements of domestic and world space and enhance the prestige of space activities.

Since 1988 the United Nations, through its Programme on Space Applications, has supported the establishment of Regional Centres for Space Science and Technology Education, affiliated to the United Nations, in Africa, Asia and the Pacific, Latin America and the Caribbean, and Western Asia. In setting up the Centres it was noted that education between nations and even between institutions within the same country varied significantly, which consequently resulted in considerable differences in space science and technology education curricula in terms of content and modes of presentation[1].

To ensure an acceptable common standard of teaching, education curricula have been developed in the four core disciplines taught at the Centres:

1) remote sensing and geographic information systems;

2) satellite communications;

3) satellite meteorology and global climate;

4) space and atmospheric sciences.

Other education curricula on topics such as space law and positioning, navigation and timing are presently under development. In addition to the Centres, other academic

[1] Haubold, H, "Education curricula of the UN-affiliated regional Centres for Space Science and Technology Education", Space Policy 19 (2003) 67-69.
Haubold, H, "Education curricula in space science and technology: the approach of the UN-affiliated regional centres", Space Policy 19 (2003) 221-223.

institutions also use the curricula, which are available in English, French and Spanish languages.

In recent years the growing affordability to develop and launch small satellites has led to an increasing interest in a growing number of countries to establish basic space technology capacities. For this reason the United Nations Office for Outer Space Affairs, in the framework of the United Nations Programme on Space Applications, has launched the Basic Space Technology Initiative (BSTI). The Initiative aims to support capacity building in basic space technology through the organization of workshops and training courses, the development of an education curriculum, the creation of long-term fellowship opportunities and the promotion of opportunities for international cooperation in the development and use of basic space technology and its applications.

Countries that have previously been mainly users of space applications are showing an interest in establishing basic capacities in space technology development. This aspiration has partially been guided by the fact that increasingly capable small satellites can be developed with an infrastructure and at a cost that is now also affordable to universities and smaller institutions. There have been recent examples where university-based small satellite projects have led to the establishment of small and medium-sized space enterprises that are now marketing their products on a commercial and world-wide basis. Developments such as these are not only creating new opportunities for international space cooperation but also contribute to further promoting the use of space technology and its applications[1].

4 Space education tasks

Generally space education must:[2]

1) consult with space technology applications stakeholders at the provincial and or/or regional levels, identifying their needs, status of utilization;

2) put into fore all issues, problems and assess the needs of the space technology research and applications sector, and to be able to resolve such issues, problems through the formulation of a cohesive national program on space technology research and its applications;

3) come up with an action agenda and flagship priority projects which address specific and immediate needs and problems of the space technology applications and research sector.

To achieve this it is necessary to apply the following areas:

1. Development of expert manpower needs, curriculum and educational materials at all levels;

2. Rehabilitation and improvement of earth observation and monitoring systems;

3. Networking among the academe and concerned agencies for data access, archive and analysis;

4. Intensification of preparation and dissemination of information understandable by the general public.

The first direction include:

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[1] Educational Opportunities in Aerospace Engineering and Small Satellite Development, UNITED NATIONS New York, 2010.

[2] Jose Edgardo L. Aban Space Technology Education and Promotion (STEP) Programs and Initiatives in the Philippines – Space Edu Vision 2006-2016. Science and Technology Coordinating Council-Committee on Space Technology Applications for Space Technology Applications (STCC-COSTA).

- establish database of local experts in the fields of remote sensing, GIS, satellite communications, earth science and astronomy;

- establish remote sensing, geographic information, and space communications R&D Networks;

- provide research contracting schemes to existing graduate degree programs in remote sensing, geomatics, astronomy and the earth sciences;

- promote earth science subjects at the primary and secondary levels, through the development of more up-to-date teaching materials/modules and techniques;

- upgrade of engineering curriculum to focus more on small satellite design, data reception, as well as system maintenance and management;

- deployment of hardcore trainees for graduate research degree/non-degree programs in small satellite design, data reception, maintenance and management;

- capitalize on foreign training grants and scholarships;

- encourage experts exchange to enhance foreign technology infusion in key academic institutions involved in space technology applications and research;

- develop indigenous capability in software design, particularly for satellite image processing, geographic information systems (GIS), satellite-based communications and internetworking, through joint researches with both the academe and the industry;

- capitalize on the use of Open Source technologies to suit local software needs in the areas of satellite image processing, GIS and satellite-based internetworking and communications

Conclusion

The education sector is one of the most innovative industries, largely determine the creation of innovation climate and competitiveness of economy.

In view of the existing problem of staffing the space industry, training should be conducted according to international requirements for quality of education and the standards in the field of aerospace education should be based on organizational and methodological informed decisions, based on a lie vast experience in this country with creating the most modern rocketry. Moreover, the development of space technology identifies the advantages of the country – holder of technology, and it shows the strategic relevance of the educational process of training specialists for space industry.

Literature

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[9] *The review of European experience of internationalization of higher education* / Education, Audiovisual & Culture Executive Agency, European Comission TEMPUS. Харьков : Изд-во НУА, 2010. – 56 с.

Abstract

The aim of research is to analyze the features of education in high-tech-economy. High-tech industries have some principle differences from more traditional sectors. High-tech are dynamic areas in which new developments are often ahead expressed or perceived needs of potential consumers and violate the established boundaries between the traditional industrial sectors.

Notes about the Authors:

Olha Prokopenko, Doctor of Economics, Professor, Dean of Economics and Management Faculty, Chief of Economic Theory Department, Sumy State University (Ukraine); Professor of University of Economics and Humanities (Poland).

Vitaliy Omelyanenko, PhD student, Economic Theory Department, Sumy State University (Ukraine).