The impact of the main trends in the development of education in the world on engineering education in Ukraine

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Abstract.
Through the analysis of statistical information, documents of public organizations, in particular the European Union, UNESCO, the World Bank Group, and scientific research, some trends in the development of engineering education in developed and developing countries of the world have been analyzed. The ways to overcome the negative impact of some processes in engineering education in Ukraine are discussed.

Keywords:
engineering education
vocationally oriented training
lifelong learning
Social and economic development of Ukraine is impossible without education of a new generation of specialists in the field of modern engineering. Ukraine is part of global processes, therefore the development of engineering education in our country is significantly influenced by the processes inherent in other countries of the world. Therefore, the analysis of both positive and negative trends in the education of both developing and developed countries plays a significant role in determining the tasks in the formation of the educational process in higher education.

The purpose of the work: to outline the main achievements and establish general trends in the development of engineering education in different countries through the analysis of scientific studies, documents of public organizations and statistical studies. To consider ways to overcome the negative impact of some processes in engineering education in Ukraine.

Trends in the development of modern education are the subject of research by many state and public organizations [1-7], they conduct constant monitoring of indicators related to educational activities. Based on the analysis of statistical indicators, documents related to selective areas of educational development are formed. The document "Europe 2020" [1] adopted in 2010, which planned the European economic development strategy for the next 10 years, is indicative in this regard. The fourth point of the main goals that Europe was going to achieve by 2020 was: "at least 40% of young people should have a higher education." The issue of educational development was considered as a factor contributing to the resolution of other goals of economic and social development. 12 years before the adoption of the program document "Europe 2020", the main goals of education development in the 21st century were formulated in the UNESCO World Report on Education "World Declaration on Higher Education of the Twenty-First Century" [3]. Also indicative is the document "Digital technologies in education", which was published by the World Bank Group in connection with the situation in education due to the spread of the coronavirus (COVID-19) [5].

Also, since the middle of the last century, there has been a steady trend of almost geometric growth in the number
of students all over the world. Thus, from 1960 to 1980, the number of students increased from 13 to 51 million, and in 1995 this figure increased to 82 million students. According to the program document prepared by the experts of the World Education Monitoring Report (WEDMO) and the International Institute for Educational Planning (IEP) under UNESCO, the number of university students doubled to 207 million people from 2000 to 2014. Some developed countries are considering the issue of universal higher education, or a significant increase in people with higher education.

This global trend was also characteristic of Ukraine at the beginning of the twenty-first century. Thus, according to a World Bank study [6], since the beginning of the 1990s, higher education enrollment has doubled. In 2010, 82% of Ukrainian school graduates received higher education. The share of the population over the age of 25 with higher and incomplete higher education exceeded 40%, which is higher than many other countries.

Unfortunately, the tendency to increase the number of people obtaining higher education has been characteristic of Ukraine in recent times.

Thus, according to the annual report of the National Agency for Quality Assurance of Higher Education for 2021 [7], there were 1,028,350 students of higher education in Ukraine. Compared to October 2020, this number decreased by 3.45% (by 36,793 people). According to the Ministry of Education and Science, as of the 2022/2023 academic year, about 415,000 students studied in Ukrainian institutions of higher education.

This trend can be explained by the negative factors noted in the above-mentioned document [6]. The consequence of the rapid expansion of the higher education system has been an increasing number of graduates who can only find jobs for themselves in the labor market that do not require higher education. This has led to a gap between education levels and employment—especially among young university graduates. Accordingly, the share of persons with higher education among the unemployed increased from 32% in 2004 to 47% in 2013. According to the authors, one of the factors that will allow overcoming this negative trend is vocationally oriented
training [7-13]. The formation of courses that meet all the requirements of education stakeholders, the flexibility of courses will certainly increase the competitiveness of graduates of engineering specialties and their own motivation.

One of the main features of modern education is the creation of a global educational space. The reason for this process is the globalization of the economy and other processes of human activity in the 21st century. Graduates aspire to be specialists who would be ready to work not only in their country, but also abroad, meeting the requirements of regional, European and global labor markets. In the field of science and higher education, the tool of globalization and integration processes is the worldwide character of scientific knowledge and its openness. The widespread use of the Internet plays a significant role in this. One of the forms of the principle of globalization of education is the process of student exchange, which has covered all countries of the world. Among the large international projects in this direction is the Erasmus project, the purpose of which is to ensure the mobility of students from the European Union (for example, within the framework of the program, up to 10% of students must study at a university in another European country). This trend characterizes all countries. In 1995, 1.6 million students studied in 50 host countries of the world. The number of students from underdeveloped and post-Soviet countries was twice the number of students from economically developed countries (1,050,000 and 540,000, respectively). Approximately 50% of foreign students studied in the USA, Great Britain and Germany. Accordingly, 2/3 of the total number of foreign students studied in the six leading host countries. Therefore, there is a clear tendency to "move" higher education seekers to economically developed countries. This factor partially explains the general decrease in the number of people wishing to enter Ukrainian universities for technical specialties. The attractive cost of education fees or lack thereof for foreign students is another factor in the migration of students from Ukraine to other countries [14]. From 2007 to 2014, the number of Ukrainian students abroad increased from 25,000 to almost
50,000 people, and in 2019 it increased by another 54% to approximately 78,000 people. Only in Poland in 2021, more than 36,000 people from Ukraine received their education. The number of teaching staff in the field of higher education increased in actual proportion to the growth in the number of students. So, for example, from 1980 to 1995, it grew by 56% and reached 6 million people in 1995.

According to EUROSTAT data [2], 1.4 million people studied in the system of higher education in 28 EU countries in 2013, of which 83.9 thousand studied in short courses of education. Over a quarter (26.7%) of higher education teaching staff in the EU-28 were located in Germany, with just over 10 percent in Spain (10.9%) and the United Kingdom (10.5%). In 2013, the student-teacher ratio in higher education institutions varied between EU member states and averaged from 10.2 students to one teacher.

The increase in spending on higher education, by states, enterprises and private individuals, exist. In 2022, the global higher education market will reach USD 20.1 billion in 2022. In its outlook research, IMARC Group expects [15] the market to reach $61.1 billion by 2028. Most of the economically developed countries of the world realize that financing the education system (including higher education), which provides intellectual superiority and world leadership in the implementation and use of new science-intensive technologies, and as a result advantages in the economy and politics. Therefore, some of them implement programs of free higher education, as well as systems of grants and discounts in tuition fees for talented students.

According to the program document prepared by the experts of the World Education Monitoring Report (WEDMO) and the International Institute for Educational Planning (IEP) under UNESCO, in 2014 the volume of investments in higher education by private individuals is increasing and the number of higher education institutions of private ownership is increasing.

At the same time, fixed costs per individual student are increasing. So, even in 1995, the cost of studying one student amounted to 3,370 US dollars. The obvious reasons for the increase in aggregate costs are related to the modernization of laboratory and educational equipment, the introduction of
new expensive learning technologies, and the formation of a
global information space. Also, the rapid increase in the
number of students in the higher education system, which
requires significant investments in the development of the
infrastructure of higher education institutions, affects the
growth of costs. Although Ukraine spends a larger share of
its GDP on education than most of the EU and OECD countries,
it cannot compete with countries that are leaders in economic
development in allocating funds for the modernization of
modern laboratory equipment. This means that in the twenty-
first century, in terms of GDP, the Ukrainian economy was not
among the thirty most economically developed countries in the
world. So, according to the International Monetary Fund data,
the Ukrainian economy was only in its 40s in 2021. To solve
the problem of the need for government funds to modernize
laboratory facilities and develop infrastructure, major
initial investments may be expected to be made in the
knowledge of developing countries through the receipt of
private funds. According to the program document prepared by
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and the International Institute for Educational Planning (IEP) under UNESCO, in 2014 the volume of investments in
higher education by private individuals is increasing and the
number of higher education institutions of private ownership
is increasing. Private colleges and universities study 30% of
all students in the world, and in Latin America this figure
reaches 50%.

A characteristic feature of the educational process in
the world is the computerization of education, the use of
information technologies, and the development of distance
education. As a result of the exponential growth of the number
of personal computers in the world, the computer began to be
used as a means of supporting the learning process.

At the same time, the creation of global information
networks actually destroyed the borders between different
states in access to information. As a result, not only
educational institutions, but also global information
resources became the source of obtaining new knowledge and
educational information. As a result, the education system
faced the problem of ensuring general computer literacy and
ensuring free access to information resources of educational institutions. This trend necessitates the improvement of new educational technologies, the development of the foundations and methods of pedagogy in the field of computer technology application [16-20].

The creation of a global information space is a positive factor in the development of engineering education in Ukraine. This made it possible to use the online resources of the best educational institutions in the world, world-famous libraries, virtual laboratories, to involve the best specialists of other universities in joint work and teaching.

The problems of using the Internet and computer technologies are closely related to the problems of distance learning. The development of distance learning has increased significantly with the spread of the coronavirus (COVID-19). The document [5], which was prepared by the World Bank Group, states: "The use of information and communication technologies in education can play a decisive role in providing new and innovative forms of support for teachers, students and the learning process in a broader sense." This document calls for finding a balanced use of all forms of learning: "While investments in EdTech are increasing, learning and outcomes in many countries have not changed significantly. The OECD report found that when it comes to the impact of computer use in schools as measured by PISA, "the impact on student achievement is mixed at best". However, COVID has changed the EdTech debate from a question of whether to a question of how. The experience accumulated to date shows that distance teaching and learning is not the same as face-to-face pedagogy." Thus, the development and improvement of methods and methods of distance learning is one of the most important tasks of modern pedagogy. It should not be thought that distance learning is only a forced form of education in connection with epidemics or a forced measure to organize and study in economically poor countries. On the contrary, this form of education is quite common in sufficiently developed and dynamically developing countries. Even at the end of the twentieth century, China (24%), Latvia (22%), Tanzania (22%), Korea (19%), New Zealand (18%), Hong Kong (17%), Indonesia (17%) and Israel (14%) were among the countries where a significant number of students were studying by distance
learning. Ukraine should take this experience into account, because it is the remote form that allows you to respond quickly and flexibly to the emergence of unsatisfied demand in certain segments of the field of educational services. The need for continuous education throughout life is characteristic of life today.

At the beginning of the last century, the period of renewal of knowledge in most fields represented at least 40-60 years. In this way, obtaining a higher education provided her with knowledge for the rest of her life. However, already at the end of the 20th century, the updating of knowledge in some areas takes place within 2 to 10 years. This especially applies to the so-called computer sciences, construction, and electronics. Now, even a graduate of an elite higher education institution cannot be sure of his sufficient qualifications on a number of issues. Thus, specialists with higher education are forced to retrain once or even twice in their lifetime to maintain the necessary qualifications or master new areas of education. Based on the interests of Ukrainian engineering education, it is necessary to respond to the requirements of the educational service market, creating opportunities for obtaining a second higher education, passing individual advanced training courses. This will provide an opportunity to receive new financial resources that can be directed to improving the infrastructure of universities.

Disparities in the economic and social development of various countries and regions of the world, the incomparable level of remuneration, the purposeful activity of the most developed countries in the world to attract intellectual potential lead to the emigration of the most highly qualified and gifted young teachers of higher education to the richest and most developed countries.

As a result, there are conditions for the degradation of higher education systems and a decrease in the qualifications of university graduates. Unfortunately, this problem is typical for Ukraine. Therefore, in order to preserve the scientific, economic and technical potential, it is necessary to stimulate measures to preserve the teaching staff of universities. In part, this problem can be solved by attracting Ukrainian specialists working abroad to work in Ukrainian universities through distance education.
The financial resources directed by English-speaking countries (primarily the USA) to the development of the infrastructure of education and science, to the research of new technologies, the priority of the USA in the computer field, the field of IT technologies and telecommunications, the economic potential of this country, promote English to the role of the language of international scientific community and the main language in education. The vast majority of modern scientific literature, periodical and educational in all new areas of science and technology, is published in English.

Most of the software both for carrying out scientific research and for providing educational activities is written in the original on the basis of the English language. Operating systems for computers, for written also on the basis of the English language. International conferences usually use English as the language of the conference. As a result, the qualification of a teacher of a higher school, a researcher or a university graduate, his attractiveness in the field of work, directly depends on his ability to conduct a discussion or understand the content of the scientific English language.

It follows from this that an element of higher education in any country, in particular Ukraine, will be the study of English – the language of international scientific communication and digital computer technologies.

The contradiction between the desire of a significant number of students to receive an education in social disciplines and law and the desire of states to receive specialists in the field of fundamental disciplines and engineering is a global problem, also characteristic of Ukraine. In 2013, in the EU-28 countries, one third (32.7%) of all students in higher education institutions studied social sciences, business and law. This number exceeded the combined number of students studying engineering and science. This trend is related to the difference in payment for the professional services of specialists in these fields, and as a result of the social attractiveness of engineering and scientific specialties. This problem also occurs in the rich countries of the world. Thus, an Australian scientist, drawing
attention to the reluctance of young people to study mathematics, physics and chemistry, says, "The consequences of this decline will affect Australia's efforts in both areas of innovation. Universities, pursuing a policy of meeting the urgent requests of students, divert resources from science and technology". This raises the question for society, the state, and higher education in these states: What should education be: a socially significant good necessary for the normal development of the state, or a modern, high-quality service provided to society and individuals on a competitive basis.

Therefore, it is worth paying attention to the governments of some countries that are developing measures to make education attractive in the field of fundamental disciplines and engineering. So, for example, in Poland, the scholarship for humanities and engineering specialties differs three times.

Of course, other trends in the world system of higher education [2], [7]-[8] can be identified, such as fundamentalization, individualization of student learning and work, humanization, democratization, protection of individual rights and freedoms, protection of women's rights, ecology education, the formation of a system of regular evaluation of the performance of higher education institutions by society, but, apparently, it is the trends listed above that will mainly characterize the higher education systems of all countries.

The above-mentioned trends in the development of the global educational space have both a positive and a negative impact on the development of engineering education in Ukraine. In order to reduce the impact of negative factors, attention should be paid to the advantages and opportunities of professionally oriented training. To do this, it is necessary to review the content of existing courses and create courses that meet the requirements of all parties interested in learning outcomes. These courses, aimed at solving specific professional tasks, simulating professional activities, will help develop students' professional creativity and their motivation to study. It will also increase the competitiveness of graduates of engineering specialties in the labor market.
For the successful development of engineering education in Ukraine, it is necessary to widely and effectively use information technologies, to develop various forms of distance education. It is necessary to use all the advantages of creating a global information space, in particular, to use online resources of the best educational institutions in the world, world-famous libraries, virtual laboratories, and to involve the best specialists of other universities in joint scientific work and teaching. English has become the main language of international scientific communication, information exchange and digital computer technologies. Therefore, the ability to use the English language to solve professional tasks is an important component of its professional training of students and their future effectiveness in the global labor market. Therefore, it is important to pay attention to professionally oriented study of English in higher education. In order to prevent the departure of working professionals from Ukraine, it is necessary to meet the needs for lifelong learning to improve their skills and competencies in engineering professions. In order to overcome the problem of decreasing interest of students to receive education in the field of fundamental disciplines and engineering, the experience of other countries in creating measures for the attractiveness of education in the field of fundamental disciplines and engineering should be used. In particular, attention should be paid to the possibility of differentiating scholarships for humanities and engineering specialties, free higher education programs, as well as a system of grants and tuition discounts for talented students.

References:
PEDAGOGY AND EDUCATION


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