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NEW APPROACHES TO EDUCATION UNDER CONDITIONS OF DIGITAL ECONOMY AND SOCIETY FORMATION

Kniazieva Olena, Doctor of Economic Sciences, Professor of the Department of Business Economics and Corporate Management, State University of Intellectual Technologies and Communications.
ORCID:0000-0002-9853-0637
E-mail: 7234275@gmail.com

In a time of the digital economy and society formation, the issue of reviewing the forms and methods of teaching in higher educational institutions has become relevant, since the traditional methods are not able to ensure the acquisition of the competencies, necessary for working under the new management conditions. The most immediate problems have been determined and the number of areas for transforming teaching approaches have been offered.
These approaches are capable of giving an impetus to the development of national education integrated with the world educational space.
Keywords: *digital economy and society, educational process, educational institutions, digital services, transformation of approaches, clustering, competencies, development.*

НОВІ ПІДХОДИ ДО НАВЧАННЯ В УМОВАХ ФОРМУВАННЯ ЦИФРОВОЇ ЕКОНОМІКИ ТА СУСПІЛЬСТВА

Князєва Олена, доктор економічних наук, професор кафедри економіки підприємства та корпоративного управління, Державний університет інтелектуальних технологій і зв'язку.
ORCID:0000-0002-9853-0637
E-mail: 7234275@gmail.com

Метою статті є формування нових підходів до навчання студентів в умовах активізації процесів діджиталізації суспільства загалом і в освітньому просторі як його складової. Обґрунтовано, що в період побудови цифрової економіки і суспільства актуальними стають питання перегляду форм і методів навчання у закладах вищої освіти, оскільки традиційні методи не в змозі повноцінно забезпечити набуття тих компетенцій, які необхідні для роботи в нових умовах господарювання.
На основі аналізу статистичної інформації та проведених емпіричних досліджень узагальнено найбільш актуальні проблеми освіти в Україні, серед яких: зростання вартості навчання; виїзд на навчання за кордон; скорочення попиту на професіоналів унаслідок зменшення підприємств, що працюють; застаріла матеріально-технічна база та складнощі з фінансуванням державних навчальних закладів; цифрова нерівність; невисокий середній рівень інфокомунікаційної грамотності населення; втрата довіри до навчальних закладів тощо. Запропоновано низку напрямків трансформації підходів до навчання, зокрема: упровадження підготовки за принципом «повного циклу» із залученням роботодавців до навчального процесу; загальнодержавний моніторинг працевлаштування випускників з визначенням найбільш затребуваних спеціальностей і компетенцій; розвиток системи індивідуальної та дуальної освіти для опанування практичних навичок на потенційному робочому місці; розвиток

«університетів третього віку» для пролонгації соціальної та трудової активності громадян; упровадження креативного підходу до навчання з метою розвитку інтелектуального і творчого потенціалу студентів; упровадження освітніх кластерів для інтеграції та сумісного використання ресурсів учасників кластера в навчальному процесі. Висловлено думку, що освітні кластери повинні містити в собі: навчальні заклади всіх рівнів, роботодавців, інвесторів, інформаційні та наукові центри, телекомунікаційні підприємства, органи державної влади, закордонних партнерів.

Запропоновані підходи здатні стимулювати розвиток національної освіти, інтегрованої зі світовим освітньо-науковим простором з метою формування висококваліфікованих трудових ресурсів. У подальших дослідженнях планується розробка імітаційної моделі визначення пріоритетних напрямів наукових розробок залежно від соціально-економічних векторів розвитку країни.

Ключові слова: *цифрова економіка і суспільство, навчальний процес, навчальні заклади, цифрові сервіси, трансформація підходів, кластеризація, компетенції, розвиток.*

The educational process in higher educational institutions (HEI) is in the stage of transforming the approaches to teaching students as well as the requirements to the quality of training. The previous education reforms and the transition to the principles recorded in the Bologna declaration have led to the harmonization of the educational process with the European educational space. The new Law of Ukraine "On Higher Education" is aimed at further integration of the national education with European standards. Adoption of the Concept of Development of Digital Economy and Society in Ukraine for 2018–2020 (9, 2019), which stipulates "the implementation of the measures to introduce the appropriate incentives for the digitalization of the economy, social spheres, the acquisition of digital competencies by the citizens" leads to a clear need to review principles, methods and approaches to teaching students considering the fact that they must work in the new socio-economic and technological environment of the digital society. Under these conditions, traditional teaching in a classroom and independent work are already insufficient. Every graduate must have both professional competencies in the chosen specialty, and a number of digital competencies, the lack of which makes it virtually impossible to work effectively in the new business environment.

In addition, the present realities require both the HEI and the students to take into account not only global educational trends, but also the national peculiarities. The issue is not only the need to develop educational programs, but the approaches to teaching, taking into account the employers' requirements as to the qualifications, competencies and skills of the graduates and their social qualities (emotional intelligence, socialization), the level of infocommunication awareness (use of information and communication technologies (ICT), information retrieval skills on the Internet, etc.), financial literacy (ability to use online financial instruments) and the fundamentals of law (personal data protection, cybersecurity basics and the Internet safety for children), etc.

Therefore, there is a new scientific and practical task to form the approaches to teaching students, which would be able to meet the employers' demands, the students' requirements to obtain a popular specialty, the national educational standards, the global trends and the digital society needs.

Numerous scientific works focus on the issue of improving both the form and the content of the educational process. Thus, P. Vorobienko raises the question of changing the essence of education under the new economic conditions (Vorobienko, 2015, pp. 5–6).

O. Hrinkevych studies the problems of educational migration (Hrinkevych, 2017, pp. 28–29). The conceptual model of the impact of the digital transformation of the economy and society on the quality of life and education is proposed by (Boronos, Plikus, Aleksandrov, Antoniuk, 2018, pp. 40–42). T. Khlebnikova analyses modern methods of improving the quality of education (Khlebnikova, 2011). O. Ivanova considers the impact of ICT development on the educational process and the students' acquisition of professional competence (Ivanova, 2014, pp. 21–29).

However, the available scientific achievements do not fully take into account the changes, which happen in the educational space in the period of the formation of the digital economy and society. Therefore, the **aim of the work** is to develop new approaches to teaching students taking into account the process of the digitalization of the society and the educational space as its component.

The following methods were used in the research:

- *theoretical method* was applied for systematization and analysis of the scientific literature on the researched issues;
- *generalization* helped systematize modern problems of education; *empirical method* was utilized for the analysis of the statistical information;
- *integration* and *clustering* justified the components of the educational cluster;
- *induction* was used to form the results and conclusions.

The Concept of the Development of the Digital Economy and Society in Ukraine for 2018–2020 defines that digitalization is "the saturation of the physical world with electronic-digital devices, means, systems and establishment of the electronic-communication exchange between them, which actually enables integrated interaction of the virtual and physical spaces, in other words, creates cyber physical space". In the scientists' works, the digital economy and society are considered to be based on the use of information computer technology (Koliadenko, 2016, 107) for the implementation of socio-economic processes.

Of course, one of the important processes is education. Therefore, the current trends that are taking place in modern society and the educational space should be considered.

Since the leading means of the digitization processes development is the Internet, we will first consider the development trends of this network. According to the statistics, the number of Internet users allow us to state the galloping development of this service (Table 1).

Table 1

The number of the Internet users in the country

Regions	**Total, thousands of users**			**Density, users, %**
	2016 year	**2017 year**	**2018 year**	
Centre	598,2	833,6	968,9	53,1
West	1094,1	1410,3	1663,5	55,8
South	2267,7	2537,0	2710,6	106,6
East	953,5	1377,8	1582,5	51,3
Transcarpathia	205,0	365,5	414,6	40,0
North	438,5	599,2	676,2	59,1
The city of Kyiv	2694,1	3120,4	3434,8	106,2

Source: (10, 2019) the authors' own calculations

On average, almost half of the country's population are not active Internet users, i.e. they do not have constant access to digital services, in particular, educational ones. There is also a significant inequality in the development of the network in different geographical areas, which leads to unequal access of the young people (as potential consumers of educational services) to the information space, resulting, among other things, in the limited access to the quality educational services and the information about the HEI activities.

The analysis of the statistical data on the HEI activities and the labor market in the country (Table 2) shows a decrease in the number of HEI graduates, and, as a consequence, the number of postgraduate students and doctoral students, i.e. the scientific and educational level of the population declines.

Table 2

Data on the HEI activities and the labor market

Indexes	2014 year	2015 year	2016 year	2017 year
The number of graduates (Institutions of III–IV level of accreditation), thousands persons	405,4	374,0	318,7	359,9
The number of postgraduate students, persons	27622	28487	25963	24786
The number of doctoral students, persons	1759	1821	1762	1646
The number of profitable enterprises, %	63,5	70,4	73,0	69,7
Employment rate, %	56,6	56,7	56,3	56,1
The need for personnel, thousands persons	35,3	25,9	36,0	50,4
External migration of the population, thousands persons	22,5	21,41	24,2	430,3*
Average salary, UAH per month	3480	4195	5183	7104
Population, millions, persons	42,7	42,7	42,5	42,4

Source: (10, 2019)

** the significant increase in external migration in 2017 as compared to 2014–2016 is due to the introduction of a visa-free regime with the EU*

At the same time, the number of profitable enterprises and the level of employment are declining due to the complex socio-economic crisis in the country. It should be noted that the need for personnel is growing (by 38 %). At first glance, this contradicts the previous statement, but if we consider the data on migration, in particular, labor one, it becomes clear that there are active processes of departure of the working population, which leads to increasing need for personnel. Also, most potential employees, in particular, HEI graduates, are not satisfied with the salaries offered by most domestic employers, which also affects the growth of migration and the reduction of the general level of qualification.

The causes for these trends are the following:

1. The permanent increase in the cost of the contract education. Thus, the cost of the contract in different institutions can vary almost ten times within one specialty and reach more than 40,000 UAH for a year (11, 2018), which at a relatively low average salary is quite high. Furthermore, the reduction of the state order, constant changes in the conditions of admission and the lack of confidence in successful employment lead to the implosion of the number of people obtaining higher education, in particular, contract one.

2. The active departure of prospect students to study in foreign HEI. According to the statistics, about 18–20 thousands of potential students of the domestic universities go

abroad every year, which certainly has a negative impact on the activities of the domestic educational institutions. In addition, foreign HEI do not require documents on external independent testing, offer further employment, admission to graduate school, etc. These opportunities and prospects, along with instability in Ukraine, lead to a steady increase in educational migration of young people.

3. The rate of employment is declining while the demand for personnel is increasing. This contradictory trend is due to the fact that the labor market is not balanced, i.e. the companies need specialists which the labor market and HEI are not able to provide. Also, in terms of employment, the amendment to the Law of Ukraine "On Higher Education", according to which "Higher education institutions are not obliged to provide employment to graduates" (1, 2019), is negative. So, there is no mechanism for tracking the actual place of employment of the graduates to determine the demands of the employers for the most popular specialties, qualifications and necessary competencies.

4. Outdated material and technical equipment a number of HEI. As most universities are state-owned, their material and technical equipment is quite poor due to the lack of budget funds. Funding for the development of material and technical equipment at the expense of the special fund (i.e. from the funds received from the payment for contract education and other activities) is sometimes insufficient because of the mentioned above cause – reduction of the number of students obtaining contract education. The situation in the HEI of the I and II levels of accreditation, which were transferred to funding from local budgets, is much worse. These institutions do not even have enough funds to pay scholarships. It leads to the fact that the students have to work with outdated equipment that is no longer used in the real economy and does not meet the realities and requirements of the digital society. As a result, the students do not acquire the necessary practical skills to work in modern manufacturing.

5. The significant differences between the level of general and, in particular, digital training of the prospect students in cities and villages. This situation is directly related to the existing problem of the digital gap, i.e. the described above difference between the level of provision with the modern digital technologies and services in cities and villages. Thus, the statistics on the availability of the communications in cities and villages (Table 3) demonstrates that there is a significant difference between the availability of digital services between the rural and urban residents, which forms a "digital discrimination".

This is, among other things, the reason why the youth want to leave the villages for studying or working and do not return.

Table 3

Provision of communication in cities and villages

Indexes	**City**			**Village**		
	2016	***2017***	***2018***	***2016***	***2017***	***2018***
Telephone density, telephones per 100 residents	25,5	20,1	19,1	7,1	6,1	5,4
The Internet subscribers, millions	16277,0	23046,4	25382,9	446,0	585,8	631,7

Source: (10, 2019)

6. The loss of trust in educational institutions starting with preschool ones. It happens for a number of causes, among the main ones there are the following factors (by the levels of educational institutions):

- great difficulties with the child's entry into a preschool institution due to their lack, opacity of the electronic queue, etc.;
- changes in the rules of admission to junior school, according to which enrollment takes place at the place of registration of the child. This restricts the rights of temporarily displaced persons, citizens wishing to study in specialized schools, etc.;
- the introduction of a provision according to which the possibilities of the education of a child without vaccination in an educational institution are limited by transferring him/her to distance learning. On the one hand, it helps reduce the incidence rate, and on the other hand, it worsens the process of socialization of the child and, in some cases, the quality of education;
- signs of bullying in both junior-middle and senior classes. This leads to a number of negative consequences, from psychological trauma to the opening of criminal proceedings;
- hidden payments in educational institutions, when illegitimate fundraising from parents for various activities are conducted. In this case, the children whose parents refuse to make these payments may experience bullying;
- annual changes in the rules of admission to higher education institutions at all educational levels, which leads to growing distrust and insecurity of the prospective students. It also negatively affects the level of preparation and the results of the external independent testing (EIT), as changes in the admission rules lead to urgent changes in students' plans to prepare for EIT;
- changes in the rules of scholarships for students significantly reduce the motivation to study and force students to combine study with work, which reduces the quality of studying;
- sometimes outdated material and technical equipment and methodological framework (especially in institutions of I–II levels of accreditation);
- imperfect normative-legal framework for postgraduate education, functioning in parallel of two resolutions on preparation of candidates of sciences and doctors of philosophy;
- relatively low salaries of higher-education teaching personnel reduce the motivation for permanent training, the introduction of new teaching methods and tools force teachers to look for additional income sources. It also leads to corruption at almost all levels of education;
- new requirements for the professional activity of higher-education teaching personnel, especially in the award of degrees and academic titles, where the mandatory condition is a publication of articles in a periodical, which is included in the scientometric databases "Scopus" or "Web of Science Core Collection". Of course, it helps increase the level of scientific research and the quality of the staff of higher education institutions. However, domestic and some foreign publishers set prices, too high for publishing the article, which does not correspond to the level of the lecturers' salaries.

All of the above leads to the need to review the basic principles of teaching in HEI. In our opinion, it is advisable to stick to the following approaches:

1. Training on the principle of the "full cycle". According to it, HEI form plans as to the number of admitted students for each specialty, based not only on their own license and

government orders, but also on the requirements of the labor market (potential employers). Here it becomes necessary to make agreements with the enterprises as to provide the relevant information. On the other hand, the enterprises form their requests based on their own development prospects, which, according to the country's medium-term planning and budgeting, should contain development plans for three years.

Within this approach, the interaction with the prospective students begins at the senior school. The prospective students get acquainted with the state of the labor market, the list of the most popular specialties, the fundamentals of the future specialty. In the time following, the students are trained in their chosen specialty, working closely with the potential employers through the internships and other activities. During the period of training, the student's competency map is formed, which, unlike the academic record book, does not contain educational assessments, but acquired competencies according to the list that is agreed with the employers for each specialty.

It is advisable to involve these employers in the educational process (conducting practical and laboratory classes) and the state certification (defense of final qualification works). In the future, the graduate is employed by the enterprise, where he develops his own career map in accordance with his wishes and conditions of the company.

To prevent the cases when for some reason a company does not accept a graduate (mismatch of the acquired competencies or a crisis in the company), backup employment options are developed with the similar companies.

2. Development of the system of the national monitoring of the employment of the HEI graduates. Until recently, the information on the employment of the graduates was provided directly by the HEI through the certificates of employment from the graduates. However, the data manifest (10, 2019) that the third of the working population in Ukraine work off the books or migrate abroad. Of course, this is a negative phenomenon, which, among other things, does not allow the graduates to document their own employment. Therefore, along with the measures to fight against the shadow economy, it is necessary to take action to obtain the information on the most popular specialties.

3. Formation of the mechanism for the further development of the system of individualization of education through the introduction of individual educational programs (within professional and practical training on the student's choice in extracurricular study time), mentoring, counseling, etc. An important role in this can be played by dual education aimed at combining studying and practical training in the workplace. However, dual education is not an innovation in Ukraine. It is known that in the first years of Soviet power there were peculiar forms of integration of science, higher education and manufacturing, where a student was considered as a full participant in the manufacturing process. For two days a student studied at the educational institution for about ten hours a day, the last days of the week he worked at the factory, consolidating theoretical knowledge and practical skills. Exams were taken immediately after the completion of the topic or the course. In addition to the education effect, this system had economic consequences, as the students actually paid for training through the creation of material values working in manufacturing. Taking into account the existing and global evidence, the transition to dual education is justified for most technical specialties, as well as for pedagogical, medical and other ones.

4. Continuation of the development of "universities of the third age" in order to

prolong the age of social and labor activity of the citizens. It will enable all age groups to integrate into the digital society by acquiring the necessary digital competencies, remote work opportunities and communication through the social services of the digital society. Moreover, it will facilitate the transition to the concept of "active ageing", which correlates with the current reforms in the country, within which a number of social services (medical, social, financial and public services, etc.) can be obtained mainly through the Internet.

5. Changing the methodological framework of teaching, the transition from the system of mastering the content of the discipline as a certain amount of educational information to a creative approach to learning through the formation of skills and competencies to solve certain theoretical and applied problems in accordance with the specialty. Of course, it is necessary to acquire the core of the course, without which it is impossible to obtain a certain qualification. However, the purpose of this approach is to form and develop skills for creative and original solutions of current production tasks. The expediency of applying a creative approach is due to the following prerequisites:

- the galloping development of scientific and technological progress, which requires constant updating of knowledge and skills, rapid response to change by generating new approaches to production tasks;
- increasing the role of intelligence and knowledge under conditions of the formation of the digital economy and society, where preference is given not to the employee's theoretical knowledge, but to opportunities to search, process and use existing information, in particular in databases and the Internet;
- further development of globalization and integration of national economies, expansion of educational space, other international processes lead to the need for rapid adaptation to the requirements of working in the international teams, where creative approaches and flexibility of thinking are, among other things, the key to achieving a positive result.

Within the transition to creative learning, it is advisable to use known teaching methods, in particular (Kolpakov, 2014, pp. 62–67):

- the method of synectics, which is aimed at going beyond the narrow capabilities of the chosen specialty by involving the information from different fields of science in solving the problem. It allows you to broaden your professional horizons and to form creative ways to solve tasks by comparing different approaches and opinions.
- the method of multidimensional matrices, which allows to form new approaches to solving the problem through a number of new combinations of system elements by constructing a matrix of features of the studied object (processes, parameters, etc.). It leads to the emergence of fundamentally new approaches to solving production tasks.
- the method of inversion, the purpose of which is to form the approaches to solving a problem which are a priori opposite to traditional ones. The method is actually based on the method "by contradiction" and allows students to show creativity and prove the viability (or vice versa) of their own views on solving the problem.
- the project method, which allows students through a creative view on the problem to construct independently a list of necessary knowledge, skills, teaching aids and

obtain the necessary information to solve it. It allows you to integrate knowledge and competencies from different fields of science and technology in order to maximize the effect.

6. The application of the cluster approach to the educational process. The issue of formation of educational clusters has already been considered in the works of scientists, resulting in an association of the type "science-technology-business" (Sibircev, 2016, pp. 282–292), within which the educational institutions integrate with the authorities at various levels and other institutions. However, in our opinion, under modern conditions it is not enough for the full development of the educational process and training of specialists whose qualities correspond to the realities of today. Therefore, taking into account the given the above trends and problems of the education sector, we substantiate the components of the cluster, which are relevant in the present context:

– the educational institutions of I–IV levels of accreditation, which should be consolidated on the principle of related specialties and areas of training. The expediency of consolidation is connected with a number of reasons, including the reduction of the number of students, difficulties in updating the material, technical and educational equipment, the decline in the professional activity of the teaching staff, etc. Combining their efforts integrated educational structures are able to improve the quality of teaching and learning, share and update their equipment, and save money by reducing management costs. For institutions of I–II levels it is a way to improve the quality of the educational process, and for institutions of III–IV levels it is a means of increasing the number of potential students:

– the secondary schools, which are able to improve career guidance and quality of education through specialization starting in the fifth grade due to participation in the cluster. Communicating with the representatives of the higher educational institutions the pupils and their parents are able to determine the future professional orientation in advance and decide on entering a particular institution of I–II or III–IV level of accreditation;

– the employers and the representatives of the employment centres. These members of the cluster, as well as the HEI, are the key ones, as the list of specialties and the number of graduates depend on their availability and need for employees. Moreover, the employers must identify a set of professional and other qualities of the prospective employees (intellectual and emotional potential, acquiring modern ICT, financial and legal literacy, tolerance, gender equality, etc.), which are necessary to work in a modern enterprise. At the same time, the presence of enterprises in the cluster allows school leavers who do not wish to continue their studies to find jobs;

– the investors and other financing objects (financial institutions, funds, etc.) that will be interested in the development of the cluster from different points of view. It can be personnel training, orders for the manufacture of scientific products, charity, social development of the region or the sphere of economic activity. Such institutions are able to finance educational institutions through direct support, individual or collective grants, etc., receiving personnel, social and image effects;

– the information centres, which include libraries, museums, service and administrative centres, as well as research institutes. As the own material and technical equipment of a number of HEI is rather outdated and its updating requires considerable financing, it is expedient to use external sources of information resources and educational and

scientific framework in the educational process. At the same time, the students will have free or preferential access not only to common resources, but also to assets and storage (according to the training profile), laboratories, equipment, etc., which will increase both the interest in learning and its effectiveness;

– the telecommunication enterprises, which undertake the function of providing educational institutions with modern means of access to the information, as well as the network communication between cluster members. As already mentioned, there is a large inequality in the country between access to information and telecommunications resources in cities and villages. There have been cases when the school leavers were not able to register for an external independent testing or obtain a certificate. It negatively affects the image of the education system, leaving the HEI without some prospective students, the population – without appropriate education, enterprises – without qualified personnel. Therefore, it is necessary to ensure the equal access to cluster resources for all its members, regardless of the place of their residence. It should be provided by telecommunications companies participating in the cluster. They can also undertake the function of information support and advertising through their own networks and information services;

– the foreign higher education institutions or foreign educational representations. At first glance, the presence of these participants is inappropriate, as they are able to distract the prospective students from entering the domestic HEI. However, the practice of studying abroad already exists and is widespread. Therefore, the participation of the foreign HEI in the cluster can prevent the departure of the prospective students due to the possibility of close cooperation between HEI. Thus, it is expedient to form «visiting sessions» or to study in two HEIs, etc. It will provide academic mobility, allow students to compare methods, quality of education and social infrastructure in different HEIs, promote international communication and increase confidence in domestic education. As a result, the graduates who will remain in the country will be more qualified and in demand;

– the representatives of the National Agency for Higher Education Quality Assurance (since it has started operating). The purpose for including the members of this organization in the cluster is not to control the quality of the cluster, but to provide the agency with the information on the needs of employers regarding the quality of knowledge of the graduates, required specialties, business needs for highly qualified personnel (doctors of philosophy and doctors of sciences). This information will contribute to the modification of the regulatory framework and the demands advanced by the agency in relation to the HEI accreditation, as well as the training of highly qualified personnel.

The core of the cluster should be a kind of a coordination centre, which will undertake the functions of a founder, a coordinator, a regulator and an arbiter in the relations within the cluster. We believe that establishing a separate organization is inappropriate from many points of view (increase in financial costs, complexity of the management system, etc.). Therefore, the functions of the core can be transferred either to the large higher educational institutions or to the existing organizations that regulate the activities of educational bodies at the regional level, namely the Departments of Education and Science at local authorities.

The proposed approaches to the transformation of the basic teaching principles in the HEI in the time of transition of most socio-economic processes to digital format will give a new impetus to the development of the national educational sector, as well as its integration

with the world educational and scientific space, will help increase the competitiveness of HEI graduates in the domestic and global labor market.

The reforms and transformations taking place in the country should be aimed at creating conditions for the development of its own scientific and educational system, which would meet modern requirements and realities and would be competitive in the global educational space. Only high-quality education, accessible to the majority of the country's population, can prevent its transformation into a raw material base and a labor resources supplier for developed countries. Realizing the importance of this issue, as well as shaping the modern approach to education at all levels using the capabilities and resources of digital services will provide an impetus to the development of the modern highly competitive educational space capable of forming and developing intellectual potential and highly skilled labor resources.

In further research, we plan to form scientific bases and applied mechanisms for clustering the educational space, also, to construct a model for defining the priority directions of scientific developments in terms of social and economic development of the country.

СПИСОК ВИКОРИСТАНИХ ДЖЕРЕЛ

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