



CLUSTER TECHNOLOGIES IN ORGANIZING INNOVATIVE DEVELOPMENT OF EDUCATION SYSTEMS

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Annotation: In order to deepen the ongoing reforms in the field of education, to organize the activities of educational organizations based on best foreign practices, to improve the training system: to integrate educational programs of the higher education system with the curricula of professional educational institutions; to further expand the opportunities for continuing higher education after professional; The issues of psychological and pedagogical diagnostics of the development of future specialists, the introduction of modern methods and technologies for identifying their abilities and inclinations, as well as improving the professional competence of future specialists are highlighted.

Key words: the basic principles of the organization of education, mechanisms and types of training, continuity, cluster technologies and technologies.

In developed countries around the world, the issue of training comprehensively developed specialists has become one of the most urgent requirements of the present day. This is because the revolutionary changes taking place in society cannot be implemented without transforming the individual. The dynamics of information development impose new and higher demands on education as a social institution. It is necessary to ensure the teaching, development, and upbringing of individuals in a rapidly changing world, as well as to form specialists' holistic worldview and attitude, functional literacy, and creative professional competence.

In order to deepen the reforms being carried out in the field of education, organize the activities of educational institutions on the basis of advanced foreign practices, and improve the system of training pedagogical personnel, a number of important tasks have been defined. These include the systematic development of higher education institutions and the improvement of their management activities; ensuring the continuity of their educational programs with the curricula of professional educational institutions; further expanding opportunities for continuing higher education after professional education; introducing modern methods and technologies for the psychological and pedagogical diagnosis of future specialists'



development, identifying their abilities and inclinations, and improving their professional activity. In addition, it is no coincidence that tasks have been set to transfer certain functions of state administration bodies in the field of education, such as determining the ranking of educational institutions and creating the necessary conditions for further increasing the share of the private sector in education, including the introduction of effective mechanisms for its financial support [1].

At the present stage, the introduction of cluster technologies is of particular relevance in ensuring the continuity between professional and higher education in technical fields.

In education based on cluster technologies, the effectiveness of education can be observed as a result of the integration of several types of education. In this process, a parallel form of learning is applied. Stakeholders use, in the prescribed manner, regulatory documents based on coordinated legal norms for organizing and implementing practical activities, such as state educational standards, qualification requirements, curricula, syllabi, and other relevant documents, as well as contracts reflecting the requirements of enterprises.

As a result, the practical implementation of cluster technologies leads to the formation of new and effective relationships between the systems of professional and higher education and manufacturing enterprises, creating a productive model for new types of education.

When we consider the practical expression of cluster technologies in dual education, it becomes evident that the future specialist, the educational institution, and the manufacturing enterprise can all derive significant benefits. For example, the future specialist benefits through the improvement of knowledge, skills, and qualifications; the development of creativity, independence at work, the ability to solve problems independently, project design skills, teamwork, foreign language proficiency, professional skills, and a culture of professional communication, all of which contribute to the formation of professional competence. The manufacturing enterprise benefits by gaining a graduate who is well-prepared and suitable for employment. The benefit for the educational institution is reflected in the introduction of a genuinely effective, accessible, and attractive educational technology, as well as in the training of competitive personnel [2].

In order to develop educational systems while taking into account the regional characteristics of the country, it is necessary to develop educational mechanisms,



properly select a system of educational goals mediated by regional interests, analyze the current state of educational systems and emerging problems, and identify ways to solve them.

Educational mechanisms are regulatory documents, methods, tools, and technologies used to achieve educational goals. These include state educational standards, qualification requirements, curricula, syllabi, and other relevant documents. They are aimed at developing the knowledge, skills, and competencies of future specialists. Educational mechanisms may be classified into the following types:

1. Individualized educational mechanisms

This mechanism aims to provide education to each future specialist according to their personal needs and abilities. For example, individual learning goals, accelerated learning methods, or structured teaching methods may serve as clear examples of this approach.

2. Interactive-participatory educational mechanisms

In this approach, future specialists actively participate in the learning process. Group work, discussions and debates, start-up projects, and similar activities may be included. This educational process develops future specialists' creative and critical thinking abilities.

3. Technology-enhanced interactive educational mechanisms

This mechanism involves the use of modern technologies, electronic learning platforms, and online teaching. It helps ensure active communication and cooperation between future specialists and teachers.

4. Mechanisms based on independent learning

These mechanisms are aimed at developing future specialists' ability to work on a specific topic and independently solve problems. This approach is practice-oriented and focused on finding solutions to real-life problems.

5. International educational mechanisms

These mechanisms are formed on the basis of the experience and methods of different countries. They provide future specialists with opportunities to study in various languages and become familiar with the educational systems of different countries.

6. Assessment mechanisms:

Assessment is an important component of the educational mechanism. A unified assessment system or various assessment methods, such as formative



assessment and advanced evaluation systems, are aimed at evaluating and summarizing the learning outcomes of future specialists.

Each mechanism may have its own advantages and disadvantages, or effective and ineffective aspects. Therefore, it is important for teachers to select the most effective and reliable mechanism for each future specialist [3].

In determining the ways of developing regional educational systems, it is advisable to link this process with an understanding of which social outcomes should be prioritized in relation to the content, methods, and tools of educational activity in the region. On the other hand, under conditions of development, there is a growing role of the human factor, which necessitates changes in the organization of methodological, professional, and other forms of support for pedagogical initiatives in education.

Comprehensive support for innovative education, including cluster technologies, is required to address the problems of improving the education management system in different regions, enhancing teachers' professional qualifications, and developing scientific and methodological resources to improve the work of methodological services at the district, regional, and institutional levels. An important task is to organize scientific-methodological, informational, methodological, expert, and organizational support for the innovative activities of professional and higher education institutions in the region, as well as to create favorable conditions for the implementation of pedagogical and managerial initiatives.

Professional and higher education institutions with a technical orientation, methodological centers, testing centers, monitoring centers, resource centers, and organizations or their structural divisions whose activities are aimed at the development of education interact with one another in specific areas and fields of activity. Based on a symbiosis of competition and cooperation, they unite to implement the common goals and objectives of the education system and form educational clusters that operate according to the logic of the synergetic approach. Thus, a new management technology with an innovative orientation emerges in the education system, making it possible to increase the competitiveness of both individual institutions and the system as a whole [4].

The creation of educational clusters makes it possible to connect the most developed forms of network interaction in order to support educational institutions, methodological or professional associations, resource centers, business structures,



and interested enterprises. In other words, an educational cluster is understood as a set of interrelated professional communities, subjects of the educational process, initiative groups, and innovators united by a common problem field, shared tasks, or joint activity in a particular field.

The formation of cluster technologies is aimed at creating an infrastructure for human self-realization within the sphere of cluster activity, ensuring the effective dissemination of new knowledge, and integrating human, material and technical, financial, informational, labor, and other resources. As an educational and organizational infrastructure, an educational cluster brings together active elements of network interaction, including technical schools and higher education institutions operating on innovative platforms, initiative-oriented teachers, and organizations and institutions acting as social partners. Each of these participants is, in fact, an independent organization.

The main principles of organizing the formation of cluster technologies are as follows:

The main principles of organizing the formation of cluster technologies are as follows:

- ensuring the continuity of comprehensive theoretical and practical knowledge, skills, and competencies;
- ensuring that the educational processes of education systems based on cluster technology correspond to the age-related developmental patterns of future specialists;
- ensuring the integrity of the educational, upbringing, and developmental functions of teaching within the network cluster of cluster technology;
- organizing motivation and encouragement for future specialists to acquire knowledge on the basis of self-management;
- ensuring interdisciplinary continuity;
- combining an individual approach to each future specialist's learning with the organization of collective education;
- paying special attention to the personal innovative potential of future specialists;
- ensuring that the educational and information base corresponds to the content of education and the didactic system [5].

From the perspective of the mechanism for developing innovative education, the interaction of the subjects of cluster technologies is carried out through



educational institutions and production sectors. Their formation and activation contribute to the implementation of educational ideas in the interests of the sustainable development of the region. In cluster technologies, the integrated network clusters of the innovation process not only unite various participants around innovative activity, but also create and strengthen their interaction within network clusters. Integrated network clusters are characterized by ensuring the continuity between production and education systems, properly organizing a flexible organizational structure, forming effective mechanisms for developing the professional skills of future specialists, and selecting appropriate mechanisms for measurement and management.

Under the conditions of interaction among education systems based on cluster technology, the subjects of education form complexes with close connections aimed at jointly solving educational tasks. In this regard, the structural components of cluster technology include professional organizations and communities, expert councils, coordinating councils, educational institutions such as technical schools, institutes for educational development and universities, professionally mature teachers, manufacturing enterprises and their managers, business structures, public organizations, and other stakeholders.

For the sustainable development of our country, it is not sufficient merely to demonstrate initiative in implementing educational practice. It is also important for the participants in these processes to possess the necessary authority and competencies to bring their ideas to life. This can be supported by a special system of teaching integrated disciplines connected by a common task within innovative and educational systems based on cluster technologies. The initiative center for creating cluster technologies may consist of resource centers where human and material resources are concentrated, as well as advanced educational management technologies designed to unite educational institutions in the region.

For the sustainable development of Namangan, Andijan, and Tashkent regions, an important factor will be the creation of a program that implements such areas of activity as developing a system of social partnership based on the cluster technologies of a cooperative educational network, shaping the socio-cultural environment of the regions, and organizing the integrated activity of regional education systems with manufacturing enterprises. Participants of the initiative center of cluster technology operate in any region, establish their own educational clusters, and improve themselves by educating others through the organization of



training courses for interested subjects of the educational process.

In Namangan region, together with teachers and students from the Turaqo‘rg‘on and Uchqo‘rg‘on districts; in Andijan region, from the Shahrikhon and Marhamat districts; in Tashkent region, from the Angren district; as well as from Namangan Engineering and Construction Institute, Andijan Machine-Building Institute, and Tashkent State Technical University, we identified a range of current tasks awaiting solutions within the sustainable development movement of our local community and determined the problems existing in the educational processes of professional and higher education institutions. Afterwards, we developed our proposals concerning the shortcomings in the education of future specialists in professional and higher education.

In our opinion, if educational mechanisms are developed to implement officially approved cluster technologies for the development of education aimed at professional activity, and if the educational regulatory documents of professional and higher education systems in all regions—namely educational goals and educational content—are harmonized, the quality and effectiveness of education will increase. In the interests of developing professional competence, it is advisable to transform qualitative changes in educational systems not only through external interaction, but also by changing internal educational processes aimed at solving internal problems. In these educational processes, cluster technologies serve as a dynamic self-developing structure that creates conditions for systemic changes aimed at improving the quality indicators of education.

In ensuring economically sustainable growth in the regions of the Republic, cluster technologies are considered a key mechanism for comprehensively supporting the organizers of educational practice and various types of education in order to ensure the sustainable development of professional competence in technical fields. If continuity between production and different types of education is ensured in the implementation of this technology, and if the participants of the educational process are active and organize their qualification-based practical training in a subjectively meaningful way, the intended goal will be achieved.

The experience of creating educational clusters in the regions of Uzbekistan has made it possible to identify the factors that contribute to the formation of future specialists’ professional competence:



1. Formation of a system of departments responsible for ensuring or coordinating continuity among different types of education at the district, regional, and national levels.

2. Development of jointly designed program projects aimed at bringing together initiative-oriented individuals working in technical fields in order to implement the goals of ensuring continuity in educational systems on the basis of cluster technologies.

3. Establishment of cooperation agreements focused on mutual relations between the customer, namely the manufacturing enterprise, and the consumer of services, namely educational institutions.

4. Ensuring organizational, scientific, educational, methodological, and informational interaction among all participants of the educational cluster, taking into account the equality of all interests.

5. State funding of selected “Cluster Technologies” projects on a competitive basis, including the establishment of grants that support individual professional development and are aimed at strengthening interaction among education, production, and economic sector structures.

In our opinion, the implementation of the above-mentioned factors represents a process that includes practical training for specialists and future specialists in technical fields; methodological and theoretical-technological services for the activities of various educational entities; coordination of innovative developments; support for teachers and future specialists of educational institutions; and the modeling of problem-based education [6].

All these measures enable teachers in the region to analyze problems, identify their hierarchy and complex problem areas, master cluster technologies in the process of setting goals and objectives for professional development, and develop their professional skills. In addition, they contribute to the development of teachers’ innovative and creative thinking skills.

On the other hand, based on the conditions of sustainable regional development, such as social partnership, professional activity, and regional characteristics of the formation of cluster technologies, other institutions may also serve as a core that ensures this development by integrating the interests not only of one education system, but also of other educational systems. The structures that have a certain impact on the development of the country are, above all, educational institutions.



References

1. Resolution No. PQ-54 of the President of the Republic of Uzbekistan Sh. Mirziyoyev dated February 2, 2024, “On Additional Measures to Accelerate Reforms in the Field of Education.”
2. Usmonov, B. “Dual Education Encourages Students to Act Purposefully with Knowledge and Skills for a Bright Future.” Xalq So‘zi newspaper, November 22, 2024, No. 241 (8864).
3. Germanov, I. A. Regional Education System and Social Problems of Implementing Regional Interests: Dissertation for the degree of Candidate of Sociological Sciences: 22.00.04 / I. A. Germanov. Perm, 1999. 171 p.: ill. Russian State Library Dissertation Department // Electronic Library of Dissertations dslib.net [Electronic resource]. 2007–2015. Available at: <http://www.dslib.net/soc-struktura/regionalnaja-sistema-obrazovanija-i-socialnye-problemy-realizacii-regionalnyh.html>. Accessed: March 28, 2015.
4. Larina, V. P. Scientific and Methodological Support of Innovative Activities of General Educational Institutions as a Means of Developing the Regional Education System: Abstract of the dissertation for the degree of Doctor of Pedagogical Sciences: 13.00.01 — General Pedagogy, History of Pedagogy and Education. Samara, 2008. V. P. Larina // DuGendocs [Electronic resource]. 2000–2014. Available at: <http://do.gendocs.ru/docs/index-202875.html>. Accessed: November 1, 2013.
5. Gorsheneva, O. V. “Clusters: Essence, Types, Principles of Organization and Creation in Regions” / O. V. Gorsheneva // Economic Bulletin. Rostov, 2006. Part 2, No. 4.
6. Zhuk, A. I. Theoretical Foundations of the Activity of the Institute for Advanced Training: Abstract of the dissertation for the degree of Doctor of Pedagogical Sciences / A. I. Zhuk; Belarusian Center for the Development of Educational Practice. State University. Minsk: [s.n.], 1998. 35 p.
7. Rakhmonova, V. K. “Ensuring Continuity in the System of Continuous Professional Education.” Young Scientist Scientific Journal. Moscow, 2013, No. 3 (50), pp. 494–495.
8. Rakhmonova, V. K. “A Model for Ensuring the Continuity of Professional Knowledge, Skills, and Abilities in the System of Professional and Higher



Education.” *Young Scientist Scientific Journal*. Moscow, 2014, No. 2 (61), pp. 847–849.

9. Rakhmonova, V. Q. “The Role of Cluster Technologies in Providing Continuity in the System of Professional and Higher Education.” *European Journal of Research and Reflection in Educational Sciences*, Vol. 9, No. 2, 2021, ISSN 2056-5852. Progressive Academic Publishing, UK, pp. 9–14.

10. Negmatullayev, S., and Rakhmonova, V. “Features of Metrological Support for Technological Processes in Mechanical Engineering.” *Scientific Impulse: International Modern Scientific and Practical Journal*. Moscow, No. 28 (100), Part 1, December 2024.