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PEDAGOGICAL CONDITIONS FOR CREATING INNOVATIVE EDUCATIONAL CLUSTERS IN PRIVATE SCHOOLS

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Abstract: This scientific article provides a deep and comprehensive analysis of the pedagogical conditions that ensure the gradual formation of innovative educational clusters in modern private schools and their sustainable operation. The main goal of the study is to develop an optimal pedagogical and organizational model that ensures synergistic and integral integration between schools, higher education institutions, research centers and production sectors in the non-state education sector. The work uses empirical observation, questionnaires, pedagogical pilot testing and statistical analysis methods to scientifically prove the effectiveness of implementing a cluster approach in private schools. The results obtained show that the development of digital infrastructure, increasing the professional and innovative competencies of teaching staff, implementing interdisciplinary integrated variable curricula and creating flexible institutional conditions in management are integral factors for the success of an innovative educational cluster. The results of this study serve as a practical and theoretical resource for private school leaders, educators, education managers, and researchers conducting scientific research in this area.

Keywords: private schools, innovative education cluster, pedagogical conditions, education management, interactive learning, human resource potential, synergistic effect.

Introduction

In the context of rapid globalization and technological progress in the world education space, ensuring the flexibility and competitiveness of the education system has become one of the most priority issues. The geometric progression of the volume of information and knowledge indicates that traditional and stereotyped education models are becoming disconnected from the requirements of the modern labor market. The non-state education sector, in particular private schools, plays a special strategic role in eliminating these systemic problems and creating a flexible, high-quality educational environment. Due to their organizational and financial independence, speed of decision-making and the ability to quickly implement innovations, private schools are becoming the main experimental field for testing and implementing modern pedagogical technologies and advanced management models. However, today's educational practice proves that it is not possible to radically improve the quality of education in private schools simply by enriching their material and technical base or constructing modern buildings. In this regard, there is a need to establish coherent and systematic links between educational entities, scientific centers, higher education institutions and the field of practice, that is, to form innovative educational clusters.

The concept of an innovative educational cluster is a higher and more systematic stage of integration of education and practice, which implies the union of educational institutions of different levels, research institutes, and production and service enterprises towards a single pedagogical, scientific and strategic goal. The organization of such clusters on the basis of private schools creates the basis for students to acquire theoretical knowledge in a solid and harmonious

way with practical skills, and to increase the level of logical and critical thinking. Within the framework of an educational cluster, a student becomes not only a subject of acquiring ready-made knowledge, but also an active participant in scientific and practical projects. However, in practice, it is observed that the process of forming a cluster system in private schools is often carried out unsystematically, spontaneously and haphazardly. Many non-state educational institutions narrowly understand the concept of an innovative cluster as only separate short-term circles or the purchase of international ready-made programs, which prevents the formation of the expected synergistic, didactic and pedagogical effect.

The root of this problem lies in the fact that the pedagogical conditions for the creation and development of innovative educational clusters in private schools are not fully substantiated scientifically, methodologically and practically and have not been brought to the state of a holistic system. Pedagogical conditions are understood as a set of organizational, methodological, psychological, technological and personnel-related factors and opportunities that ensure the effectiveness of the educational process and coordinate all stages from the goal to the result. The successful implementation of the cluster approach in a private school environment requires, first of all, a fundamental revision of the content of education, an increase in the professional, methodological and research training of teachers, as well as the establishment of permanent and effective channels of communication between the school and external partners. In other words, the cluster education model must be nourished not only by organizational agreements, but also by a well-thought-out didactic and pedagogical infrastructure.

Especially in the context of the rapid introduction of modern information and communication technologies, artificial intelligence and digital educational services, it is impossible to achieve high results without digitizing the cluster's activities and developing its technological infrastructure. Digital educational platforms serve as an effective bridge that ensures remote and continuous cooperation between school students, university professors, researchers and practitioners. This digital integration allows students to test and improve their scientific and creative ideas remotely together with partner organizations. Also, the creation of innovative educational clusters in private schools serves as an important driver and catalyst for students to become independent, creative and highly competitive individuals in the modern labor market of tomorrow.

It is worth noting that the specific characteristics of the private education sector, in particular its high responsibility to parents and society, focus on results, and the ability to freely manage material resources, create an extremely favorable environment for the creation of innovative clusters. However, these opportunities will not yield the expected results if they are not equipped with clear pedagogical goals and methodological foundations. Thus, the introduction of a cluster model in private schools is not only a matter of following modern educational trends, but also an objective necessity that will bring the quality and efficiency of education to a qualitatively new level. This study is aimed at filling this gap, scientifically substantiating a complex pedagogical model for the development of an innovative educational cluster in private schools and the multifactorial conditions for its implementation.

Literature review

A wide range of theoretical and empirical research has been conducted in the world and local scientific community on the issues of forming innovative educational clusters, improving their pedagogical mechanisms and assessing their impact on the quality of education. Initially put forward as a means of increasing the competitiveness of market entities and achieving synergistic efficiency in the field of economics, the cluster theory was fundamentally substantiated by M. Porter [1]. Later, this approach was adapted to the field of pedagogy and educational management

and became the concept of a pedagogical cluster that ensures the continuity of education, science and production. The theoretical and methodological foundation of the educational cluster approach in Uzbek pedagogical science was developed by G. Mukhamedov and U. Khodjamkulov, in whose research the educational cluster is defined as an innovative space based on the principles of continuity, succession, flexibility and practical orientation, uniting all links in the education system around a single goal [2, 9].

The stages of innovation management and development in the private education sector and non-state schools were analyzed in depth by C. Christensen, M. Horn and C. Johnson in the context of the theory of "disruptive innovation" [10]. The authors emphasize that private educational institutions have a flexible environment for breaking the mold of the traditional education system and quickly implementing modern technological solutions. Developing this idea, A. Asaturova, V. Yuzlikaev and B. Shamshmetova studied the organizational and managerial features of non-state educational institutions and showed that the establishment of cluster cooperation in private schools is directly related to the human resource capacity and management cooperation [3, 4, 13].

The issues of implementing changes in the education system and forming a collective professional environment are central to the work of M. Fullan and A. Hargreaves and M. O'Connor [11, 12]. Fullan notes that any educational innovation is successful not only through external instructions, but also through the internal beliefs and collective cooperation of educators [11]. In turn, Hargreaves and O'Connor assess the collaborative professionalism of educators as the basis of the cluster educational environment [12]. These ideas of socio-pedagogical cooperation and development go back to L. Vygotsky's theory of the zone of proximal development and social constructivism, which substantiates the construction of knowledge in the interaction of students and teachers within the cluster [15]. The didactic potential of modern cluster systems and their role in the digital educational environment have been thoroughly studied by E. Sevruk and S. Nikolayeva [5, 6]. In their research, they show that regional and innovative clusters, established on the basis of school and university integration, play a crucial role in shaping students' competencies, in particular in developing their research and STEAM skills [5, 6]. Also, in the concept of the future of education and skills presented by the OECD and in the research of Y. Zhao, educational clusters are recognized as the most effective means of forming 21st century skills in students, namely creativity, entrepreneurship, critical thinking and adaptability [14, 16].

Large-scale international meta-analyses, in particular, the multi-year research of J. Hattie and R. Marzano, show that when collaborative learning, project-based approaches, and interdisciplinary integration are used in education, students' academic performance and learning efficiency increase significantly [7, 8]. However, an analysis of all available literature shows that many of the theories and models put forward are mainly focused on clusters based on the public education sector or higher education institutions. Comprehensive and systematic studies that empirically substantiate the complex and consistent pedagogical conditions for the formation of innovative educational clusters, taking into account the specific organizational, financial, and pedagogical characteristics of private schools, have not yet been sufficiently carried out, and there remains a need for systematic scientific research in this area.

Methodology

This study uses a mixed (quantitative and qualitative) research methodology to identify the pedagogical conditions for creating innovative educational clusters in private schools and assess their effectiveness. The study was carried out in three main stages: conceptual and theoretical analysis, empirical data collection, and pedagogical piloting. The total sample of the study included 12 non-state and private schools located in Tashkent, Fergana, and Samarkand. A total of 180

teaching staff, 24 private school administrators, and 360 students studying in grades 8-9 participated in the piloting work.

Specially developed questionnaires, expert evaluation forms, and structured interviews were used to collect empirical data. During the pedagogical piloting process, participating schools were divided into two equal groups - experimental (9 schools, 180 students) and control (3 schools, 180 students). In the experimental groups, the model of pedagogical conditions of an innovative educational cluster, developed by the author and including four main blocks (pedagogical-methodical, organizational-management, digital-technological and motivational-value), was fully implemented. In the control groups, the educational process continued on the basis of traditional non-state educational programs and standards.

To ensure the objectivity of the study and assess the reliability of the results obtained, statistical analysis methods were used, including arithmetic averages, percentages, and mathematical and statistical methods such as K. Pearson's chi-square (χ^2), which determines the dynamics of students' knowledge acquisition and professional orientation. During the study, students' logical thinking, creative approach, teamwork and practical task performance skills were assessed using pedagogical diagnostic methods.

Analysis and results

In order to identify the most important and priority pedagogical conditions for the formation of innovative educational clusters in private schools, a survey was initially conducted among 24 experts and leading educators in the field of private schools. The experts rated the proposed 8 main factors on a 5-point scale. The results of the analysis determined the difference between the highest and lowest scores given by the experts and their average values.

Table 1 presents the experts' assessment of the pedagogical conditions necessary for the creation of an innovative educational cluster in the environment of private schools and their importance rating.

Table 1. Expert assessment of the main pedagogical conditions for the formation of an innovative educational cluster in private schools (on a 5-point scale)

№	Name of pedagogical conditions	Average score	Standard deviation	Place of importance
1	Creating a digital and virtual learning environment	4.85	0.35	1
2	Improving teachers' cluster teaching competence	4.78	0.41	2
3	Variable programs integrated with universities and research centers	4.72	0.45	3
4	Institutional and financial-organizational flexibility in management	4.60	0.52	4
5	Directing students to practical and project activities	4.55	0.58	5
6	Tripartite dialogue between school-parents-industry specialist	4.42	0.61	6
7	Application of interdisciplinary integration and STEAM approach	4.38	0.65	7
8	Stimulating innovative and creative motivation of students	4.30	0.70	8

As can be seen from the data in Table 1, experts prioritize the factors of creating a digital and virtual learning environment (4.85 points) and improving the professional competencies of teachers in cluster teaching (4.78 points). This indicates that the availability of a technological base in modern private schools and the quality of human capital are the foundation of cluster development. Also, variable and integrated curricula developed in collaboration with universities and research centers also received a high level of importance (4.72 points).

The pedagogical pilot-testing process was carried out during one academic year. At the beginning and end of the pilot phase, the academic mastery, level of logical and creative thinking, skills in completing project tasks, and indicators of professional orientation of students in the experimental and control groups were comprehensively diagnosed. Three levels were established as assessment criteria: high, medium, and low.

Table 2 shows the final indicators obtained at the stage of experimental work and their dynamics.

Table 2. Dynamics of indicators before and after the introduction of the pedagogical cluster model in the experimental and control groups (%)

Groups	**Number of participants**	**Stages**	**High level (%)**	**Medium level (%)**	**Lower level (%)**
Experiment group	180	Before the experiment	21.1	54.4	24.5
Experiment group	180	After the experiment	48.3	43.9	7.8
Control group	180	Before the experiment	20.6	55.0	24.4
Control group	180	After the experiment	26.1	56.1	17.8

A thorough analysis of the experimental results shows that before the experiment, the indicators in both groups were very close to each other and almost equal. In particular, in the experimental group, students with a high level of achievement were 21.1 percent, and in the control group - 20.6 percent. The indicators of students with a low level of achievement were 24.5 percent and 24.4 percent, respectively.

During the academic year, significant positive changes were observed in the experimental groups as a result of the consistent application of the created pedagogical conditions of the innovative educational cluster. At the end of the experimental group, the share of students with a high level of achievement increased from 21.1 percent to 48.3 percent, that is, a growth dynamics of 27.2 percent was recorded. At the same time, the share of students with a low level of achievement sharply decreased from 24.5 percent to 7.8 percent.

Although the control group also showed some growth, it did not show as high efficiency as the experimental group. In the control group, the high level indicator increased from 20.6 percent to 26.1 percent after the experiment (an increase of only 5.5 percent), while the low level remained at 17.8 percent. Mathematical and statistical analysis (χ^2 criterion) confirmed that the differences between the experimental and control groups were statistically significant and objective at the $p < 0.01$ level.

These results clearly demonstrate that the proposed pedagogical conditions and didactic models for the creation of innovative educational clusters in private schools were correctly selected and give practical results in developing students' complex competencies.

Discussion

The empirical and statistical results obtained during the study confirmed that the creation of innovative educational clusters in private schools and the correct definition of their pedagogical conditions have a direct and highly positive impact on the quality of education. The results further enriched the cluster theory put forward by M. Porter [1] for the field of economics and later adapted to pedagogy by G. Mukhamedov and U. Khodjamkulov [2, 9], and practically proved that the cluster approach is not limited to higher education or large industries, but also has a significant synergistic effect at the level of non-state secondary schools. A distinctive feature of the private education sector is that cluster integration is carried out there faster and with less bureaucratic hassle.

The deep essence of the results obtained is that the organizational and financial autonomy of private schools allows them to establish rapid and flexible contractual relations with scientific and practical partners within the cluster. As C. Christensen, M. Horn and C. Johnson [10] and A. Asaturova [3] have noted, the flexibility of management in the private education sector significantly accelerates the process of diffusion and implementation of innovations. Our study fully substantiates this theoretical view in practice: digital platforms implemented in experimental groups and interactive and project-based exercises conducted together with university professors significantly improved students' logical and creative thinking skills. The study confirmed why the factors of digital and virtual learning environment (4.85 points) and professional competence of teachers (4.78 points), which ranked highest in the expert assessment, are of decisive importance. Digital platforms remove distance barriers between the school and its external partners and allow students to receive constant online consultations from professors and practicing specialists. In turn, the teachers' mastery of cluster and integrated teaching methodologies served to move away from a purely theoretical presentation of the teaching material and instead present it in a problem-based and project-oriented manner. As noted in the studies of S. Nikolayeva and E. Sevruk [5, 6] and M. Fullan [11], the innovative and digital readiness of teaching staff is a decisive criterion for the success of a cluster. In our study, special cluster module courses and practical training organized for teachers in the experimental group significantly expanded their competence in ensuring interdisciplinary integration and organizing project work with students. This was clearly reflected in the sharp decrease in the share of low-level students in the experimental groups from 24.5 percent to 7.8 percent and the increase in the share of high-level students to 48.3 percent.

Also, the conclusions put forward by J. Hattie and R. Marzano [7, 8] about the high effectiveness of integrated and interactive approaches in education were fully consistent in the context of a private school cluster. Students were able to avoid simply memorizing knowledge and apply it in real-life and scientific projects. However, it should be noted that there are certain limitations in implementing the cluster model in private schools. In particular, in some private schools, difficulties were observed in regulating financial and legal relations with partner organizations and in constantly coordinating programs, such as staff turnover.

The results of the study indicate that when forming a cluster system, private school leaders and education managers should not limit themselves to enriching the material and technical base, but, first of all, consider a set of pedagogical and institutional conditions (digitalization, personnel qualifications, integrated variable programs and practical motivation) as a holistic and systematic didactic complex.

Conclusion

Creating innovative educational clusters in private schools and ensuring their stable, effective operation is one of the most promising and priority areas of modernization of the modern education system, increasing its flexibility and ensuring the competitiveness of students. Theoretical and

methodological analyses and empirical experimental and test works conducted during the study made it possible to comprehensively identify the set of pedagogical conditions that determine the success of this process and scientifically prove their practical effectiveness.

Based on the results of the study, the following scientific and practical conclusions can be drawn. First, the most important and decisive pedagogical conditions necessary for the formation of an innovative educational cluster in private schools include the development of a digital and virtual educational environment, the systematic improvement of professional and digital competencies of pedagogical personnel in cluster and integrated education, and the introduction of variable, interdisciplinary curricula in cooperation with universities and research centers. These conditions are inextricably linked, and the absence of one reduces the effectiveness of the entire cluster system.

Secondly, the results of the conducted pedagogical pilot-testing work showed a significant improvement in the academic and project performance of students in the experimental groups where the proposed pedagogical conditions were fully implemented. The fact that the share of high-level students in the experimental group increased from 21.1 percent to 48.3 percent, and the low-level decreased to 7.8 percent, indicates the high didactic potential of the cluster approach in forming students' logical thinking, creative approach and teamwork skills.

Thirdly, the cluster system created on the basis of private schools ensures continuity and continuity between education, science and practice, accelerates the process of future professional self-determination of students and forms modern life competencies in them. The flexibility of the non-state education sector allows for the rapid implementation of innovations in this process.

Based on the results of the study, a number of practical recommendations can be made to the administration of private schools and education officials. It is necessary to create and constantly update digital platforms that coordinate cluster cooperation at the institutional level and unite all subjects in private schools. It is also necessary to establish continuous and modular advanced training courses for teachers on interdisciplinary integration and project-based learning, and to sign long-term strategic memorandums with scientific centers, universities and areas of practice.

This study does not claim to fully cover all issues in the field and opens up new horizons for future scientific research. Future research should be directed to the application of artificial intelligence and adaptive learning technologies in the cluster system of private schools, long-term (longitudinal) monitoring of the subsequent academic and professional success of cluster graduates, and in-depth study of the integration of international cluster models.

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