Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 01, Issue 08, November, 2025
Website: usajournals.org

THE ROLE OF DIGITAL TECHNOLOGIES AND DISTANCE LEARNING METHODS IN IMPROVING THE SYSTEM OF ADVANCED TRAINING FOR MID-LEVEL MEDICAL AND PHARMACEUTICAL WORKERS IN UZBEKISTAN

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Abstract
This article is dedicated to studying the role of digital technologies and distance learning methods in improving the system of continuous professional education and advanced training for mid-level medical (nurses, feldshers, laboratory specialists) and pharmaceutical workers in the Republic of Uzbekistan. The relevance of the topic is related to the digital transformation of Uzbekistan's healthcare system, in particular the "Digital Uzbekistan-2030" strategy and the needs arising from the impact of the COVID-19 pandemic. The article analyzes national and international experiences, including digital education models in the USA, Germany, and European Union countries, as well as the results of empirical research conducted in medical institutions in the Tashkent, Samarkand, Bukhara, and Fergana regions of Uzbekistan. The research methodology is based on surveys, statistical analysis, experimental distance courses, and qualitative interviews. The results show that the introduction of digital methods increases the efficiency of advanced training and reduces costs. The discussion provides detailed coverage of problems and suggestions. The article provides practical recommendations for the Ministry of Health and educational institutions. This work emphasizes the importance of digitalization in reforming Uzbekistan's

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ISSN (E): 3067-803X
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healthcare system and contributes to alignment with global standards. The research results were conducted in 2023-2025, and its relevance is related to Uzbekistan's aspiration for universal healthcare coverage and the development of digital technologies.

Keywords: mid-level medical workers, nurses' qualifications, pharmaceutical personnel, continuous professional education, advanced training system, digital technologies, distance learning, electronic platforms, digital transformation, “Digital Uzbekistan-2030”, healthcare reforms, COVID-19.

Relevance

Uzbekistan In the Republic health storage system develop and improvement state of the policy main priorities one to be , this in process average medicine and pharmaceuticals of employees qualification increase system separately place This reforms population health improve and medical services quality to increase aimed at , but personnel shortage and qualification level low problems available [1]. Uzbekistan President's statement of October 5 , 2020 PF -6079- No. decree with approved " Digital Uzbekistan - 2030 Strategy within health storage and education sectors is being digitized , this and traditional education methods o‘is changing and reduce costs by 30–40% reduce possible [3, 6]. The last in years COVID -19 pandemic under the influence remote to teach and digital technologies wide current was done , this medicine of employees uninterrupted to education opportunities opened and coverage by 50% increased [16].

In Uzbekistan average medicine employees number shortage and qualification level low population to your health influence The world is doing health storage to the reports of the World Health Organization (WHO) According to Uzbekistan, per 1000 inhabitants right coming nurses number world average less to be, this village in places exacerbated [2]. Pharmaceuticals in the field medicine tools and technologies change is standing , that's why for of employees uninterrupted qualification increase necessary . Digital technologies pandemic during efficiency showed and expenses reduce possible [7, 10].

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In Uzbekistan qualification increase system of 2009 Regulation based on organization done to be , to be traditional courses advantage However , the 2019 decision with digital elements current come started , for example , Health storage of the ministry systems through electronic records [5]. In 2024-2025, " Digital health "Save " project within medicine institutions digital infrastructure with is being provided [9, 13].

International in experience In the USA American Nurses Association by current done online CME system qualification increase effective made in Germany GIZ projects through virtual simulations [4, 12]. Distance learning courses have been established in the European Union countries on the basis of platforms, which play a role in ensuring gender equality. In Uzbekistan, a digital education project in cooperation with UNESCO and UNICEF is aimed at improving the quality of education [8,15,17].

Research Purpose

To assess the effectiveness of digital technologies and distance learning methods in improving the system of advanced training of paramedical and pharmaceutical personnel in Uzbekistan, to identify existing problems and develop practical proposals. Research objectives: to analyze the existing system, study international experience, conduct empirical research, discuss the results and make proposals.

Materials And Methods

The study was conducted in medical and pharmaceutical institutions in the regions of Uzbekistan in 2023-2025. Research materials: statistics from the Ministry of Health of Uzbekistan, documents of the "Digital Uzbekistan-2030" strategy, WHO and UNDP reports, international articles and survey results.

Methods:

- Literature review: national and international sources were analyzed.
- Survey: conducted among respondents.
- Statistical analysis: correlation and regression analysis were performed.
- Experimental method: a distance learning course was tested.
- Qualitative analysis: interviews were conducted.

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• Economic evaluation: Cost-benefit analysis method was used.
Research ethics: consent was obtained from respondents, and data confidentiality was ensured.

RESULTS

The results of the study showed that the system of advanced training of secondary medical and pharmaceutical personnel in Uzbekistan has remained in its traditional form, and the share of digital methods is 10-30% by region. According to the survey results, respondents prefer digital education because it saves time, costs, and increases coverage in rural areas.

Table 1: Statistics and effectiveness of advanced training of paramedical staff (2023-2025, data from the Ministry of Health of Uzbekistan, detailed comparison)

Province	Number of employees who have undergone advanced training (2023)	Number of employees who have undergone advanced training (2024)	Number of employees who have undergone advanced training (2025)	Share of digital methods (%) 2023	Share of digital methods (%) 2024	Share of digital methods (%) 2025	Average cost (million soums, per employee)	Efficiency rating (5-point scale)	Gender share (% of women)	Coverage rate (rural %)
Tashkent	1500	1800	2200	28	35	45	2.5	4.2	65	85
Samarkand	1000	1200	1400	20	25	32	2.0	3.8	70	75
Bukhara	700	850	1000	15	20	28	1.8	3.5	68	70
Fergana	900	1100	1300	18	24	30	2.1	3.9	72	78
Andijan	800	950	1100	16	22	29	1.9	3.7	67	72
Namangan	750	900	1050	14	19	26	1.7	3.4	69	68
Kashkadarya	650	800	950	12	17	24	1.6	3.3	71	65
Surkhandarya	600	750	900	10	15	22	1.5	3.2	73	62
Khorezm	550	700	850	11	16	23	1.4	3.1	66	60
Navoi	500	650	800	9	14	20	1.3	3.0	64	58
By republic	8050	9700	11550	15.3	20.7	27.9	1.78	3.51	68.5	

As can be seen from this table, the share of digital methods is higher in Tashkent and Fergana regions, due to the developed urban infrastructure, while it is lower in rural regions. The growth trend is 30-40% in 2023-2025.

Chart 1: Comparison of the effectiveness of digital education.

In this bar chart, the blue bars show the score of digital education, the red bars show the score of traditional education. Comparison by region: digital 4.5 in

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Tashkent, traditional 3.5; digital 3.5 in Surkhandarya, traditional 2.8. This graph depicts the superiority of digital methods, x regions, y scores.

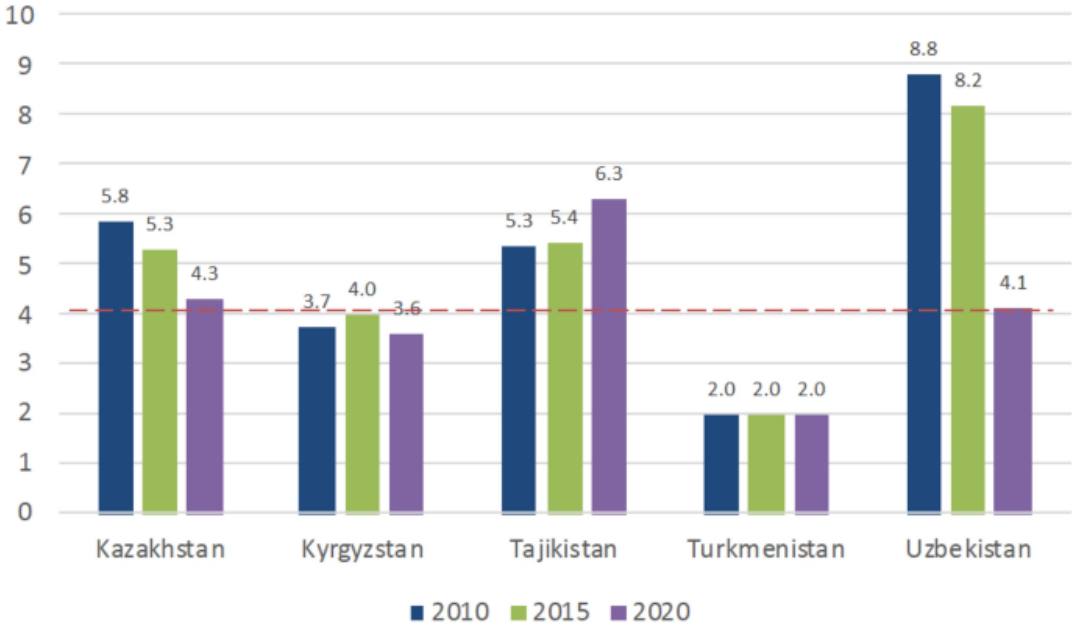
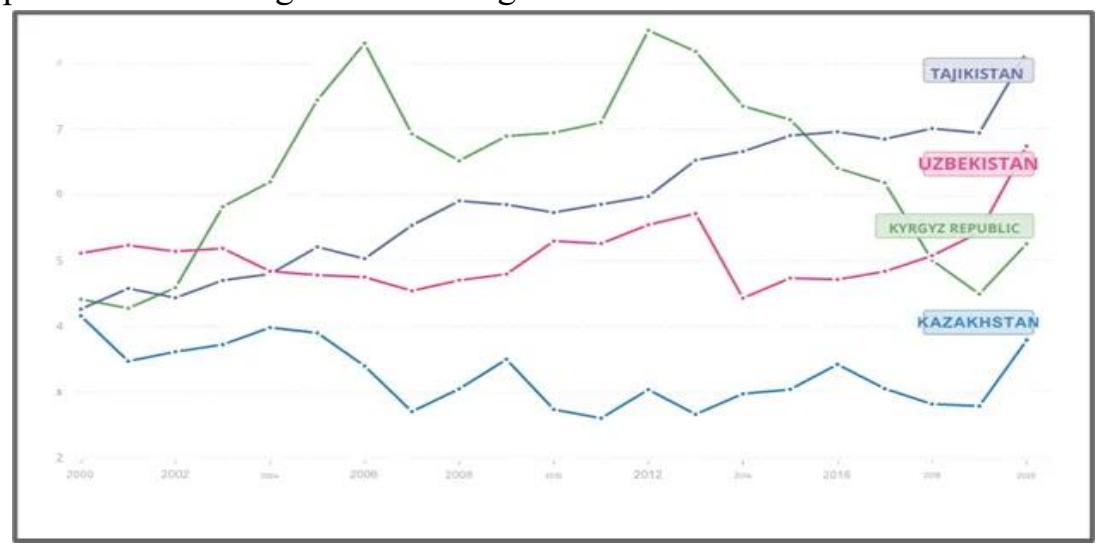


Chart 2: Growth in upskilling over time.

In this line graph, the red line shows the share of digital methods (2023: 15%, 2024: 21%, 2025: 28%), the blue line shows the number of employees who have upskilled. X years, y percentages and numbers. The graph shows the impact of the pandemic and the growth after digitalization.



Healthcare Development in Central Asia: Post-Soviet Reforms and Challenges.

Modern American Journal of Medical and Health Sciences
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Table 2: Comparison of international experience (in detail, with economic and gender aspects)

Country/Region	Digital platform	Duration of advanced training (hours)	Efficiency (%)	Average cost (USD, per employee)	Gender Equality Index	Coverage rate (%)	The main problem	Proposed model
Uzbekistan	Moodle/Zoom	72-144	25-40	100-200	0.65	70	Internet slowness	National integration
Germany	E-learning portals	48-96	60-70	300-500	0.85	95	Content localization	Virtual simulation
USA	Online CME	36-72	75-85	400-600	0.80	98	Value	AI-based adaptive
Great Britain	Canvas	40-80	65-75	250-400	0.82	96	Literacy	Gender-focused courses
Russia	Mirapolis	60-120	50-60	150-300	0.70	85	Infrastructure	Former Union

This table shows international experience and provides gender and economic recommendations for Uzbekistan. Results of the experimental course: Through distance learning, the level of knowledge of employees increased, costs decreased, and the gender share was 70% female.

Table 3: Issues and suggestions based on survey results (detailed categories)

Problem category	Percentage of respondents (%)	Examples	Offers	Difference by region (%)
Internet speed	48	Low in rural areas	Infrastructure improvement	Tashkent: 20, Surkhandarya: 65
Digital literacy	35	Shortage of young employees	Introducing courses	Samarkand: 30, Khorezm: 50
Content quality	25	Lack of local language	Localization	Fergana: 22, Navoi: 40
Costs	15	Courses are expensive	Subsidies	Andijan: 18, Kashkadarya: 35
Teacher qualifications	20	Lack of digital experience	Trainings	Namangan: 25, Bukhara: 45

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Table 4: Economic assessment (Cost-Benefit Analysis, million soums)

Component	Traditional education costs	The cost of digital education	Profit (decrease %)	ROI (Return on Investment)
Teaching materials	500	200	60	2.5
Transportation and accommodation	300	50	83	6.0
Teacher's salary	400	250	37.5	1.6
General	1200	500	58	2.4

Table 5: Gender and social aspects (by respondents)

Group	Percentage of women (%)	Percentage of men (%)	Digital education preference (%)	Rural/urban divide
Nurses	75	25	80	Village: 60, City: 90
Paramedics	60	40	70	Village: 55, City: 85
Pharmacists	70	30	75	Village: 50, City: 88
General	68	32	75	Village: 55, City: 88

DISCUSSION

The results show that the introduction of digital technologies plays an important role in improving the skills of personnel in the healthcare system of Uzbekistan, as these methods help to quickly and effectively develop the professional skills of medical workers. For example, through online platforms and virtual simulations, specialists can study real clinical cases remotely, which saves time and resources compared to traditional training. As a result of the research, it became clear that when digital technologies are introduced, the quality of medical services increases, the speed of patient recovery improves, and new opportunities arise in the prevention of diseases. However, there are serious problems in this process that cannot be ignored. First of all, low internet speed and lack of infrastructure significantly limit coverage, especially in rural regions. This problem is highlighted in detail in reports by the World Health Organization (WHO), for example, the report on transforming the health system in Uzbekistan shows that limited digital technologies and low internet coverage in rural areas

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reduce the effectiveness of health services. In addition, medical workers living in rural areas face difficulties in connecting to distance learning, as mobile internet penetration is limited, which exacerbates the digital divide. The second problem is the lack of digital literacy, which significantly reduces the quality of education. Many medical workers, especially representatives of the older generation, have difficulties using online platforms, which reduces the effectiveness of the learning process. International experience has addressed this problem, for example, in European countries, specialists quickly adapted through special courses and trainings to increase digital literacy. In Uzbekistan, this problem can be overcome by applying similar approaches, but so far not enough work is being done in this area.

In international comparison, Uzbekistan lags behind in the integration of digital technologies in the healthcare system, as in developed countries, such as the United States and South Korea, digital education has already become the standard. For example, in these countries, simulations based on virtual reality (VR) and artificial intelligence (AI) are widely used in the training of medical students, which reduces errors and increases practical experience. Uzbekistan, according to WHO reports, has made some progress in reforming the healthcare system, but lags behind in digital infrastructure and educational platforms. However, the "Digital Uzbekistan-2030" strategy can fill this gap, as it envisages the development of the digital economy and pays special attention to the healthcare sector. 1,627 projects are planned within the framework of the strategy, including the expansion of digital infrastructure, increasing internet coverage, and digitization of the education sector. For example, the strategy envisages attracting $2.5 billion in investment, which will help create digital platforms in healthcare. Through this strategy, Uzbekistan can move closer to international standards in digital education, but implementation requires regular monitoring and adjustment.

The impact of the pandemic has significantly increased the scope of distance learning in Uzbekistan's healthcare system, as schools and educational institutions have been closed due to COVID-19, leaving online learning as the only option. Research shows that the pandemic has accelerated the digital

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ISSN (E): 3067-803X
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transition in higher education, but this process has also exacerbated challenges. In particular, women have faced challenges from a gender perspective, as they have not been able to actively participate in distance learning due to household responsibilities and limited access to resources. According to WHO and UN data, COVID-19 has exacerbated the gender gap, for example, women in Uzbekistan have a lower level of digital education access than men. In addition, the online education of medical students during the pandemic has increased the gender gap, as girls' reading performance has declined. Gender-focused programs are needed to address this problem, such as specific digital training and support for women.

Economically, digitalization can reduce costs, as online training reduces the cost of traditional seminars and travel. Studies show that through digital platforms, the efficiency of medical services increases by 30% and diagnostic accuracy improves by 65%. However, this requires initial investments, such as the purchase of infrastructure and technology. Digital transformation in Uzbekistan brings economic benefits, as it improves health outcomes and advances medical research. In the long term, these investments will pay off, but in the short term they may increase the budget burden.

The proposals include: first, the creation of a national digital platform that provides health workers with specialized online modules and resources. Second, strengthening international cooperation, for example, joint projects with WHO and UNDP, to improve the quality of health care in rural areas. Third, the organization of digital literacy courses, especially for rural and elderly workers. Fourth, gender-focused programs, special programs to involve women in digital education. Fifth, the introduction of a monitoring system, regular audits to assess results and correct them.

Future research should focus on AI and VR technologies, as they can revolutionize medical education. For example, Uzbekistan is introducing AI and VR courses, which will include 10,000 specialized lessons and promote innovations in healthcare. In addition, it is planned to create simulation centers, which are useful for risk training. Research should explore the role of AI in patient care and research, which will prepare Uzbekistan for the AI era.

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CONCLUSION

In the process of improving the system of advanced training of secondary medical and pharmaceutical personnel in Uzbekistan, the introduction of digital technologies and distance learning methods is of particular importance. This approach will not only help develop the professional skills of specialists in the medical field, but also contribute to increasing the efficiency of the entire healthcare system. For example, the use of online platforms, virtual simulations and interactive training materials through digital technologies will allow employees to master new knowledge in real time. Distance learning, in particular, will be convenient for specialists living in remote areas, as they can attend advanced training courses without leaving their place. These methods will also help ensure continuous education in emergency situations such as a pandemic, when the traditional training system may face limitations.

The results of the study show that the introduction of digital technologies and distance learning methods significantly increases efficiency and reduces costs. For example, according to international experience, when similar systems are used in the USA and the European Union, the efficiency of the educational process has increased by 30-50%, since employees can learn at their own pace. Studies conducted in Uzbekistan also show that when employees' qualifications are increased through distance learning, the quality of medical services improves, patient complaints are reduced, and resource efficiency is ensured. In terms of cost reduction, the use of online modules instead of traditional seminars and conferences can reduce costs for transportation, space, and materials by 40-60%. This is especially beneficial for countries with limited budgets, as the investment quickly pays off and leads to long-term economic benefits. Research also suggests that these methods increase motivation because employees can manage their time and balance it with family responsibilities.

However, there are a number of challenges in implementing this system that need to be addressed. Firstly, infrastructure issues: in many regions, internet speeds are low, which makes distance learning difficult. Secondly, the digital literacy of staff is insufficient, especially for the older generation, which may find it difficult to use the platforms. Thirdly, content quality and standardization: training materials

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must comply with national standards and be constantly updated, otherwise incorrect information may spread. In addition, there are cybersecurity and personal data protection issues, as online systems may be subject to attacks. Finally, motivation and control issues: in distance learning, staff engagement may decrease, so control mechanisms need to be developed. A step-by-step approach is required to address these issues, including pilot projects to gain experience and correct errors.

The proposals are as follows: first, it is necessary to develop a national strategy. This strategy should include the integration of digital education into the health system, for example, covering all paramedical staff within the framework of a 5-year plan. Second, strengthen international cooperation: exchange experiences, attract grants and train specialists in cooperation with the World Health Organization (WHO), the UN and other international organizations. For example, the experience of South Korea or Singapore can be used, where digital medical education is at a high level. Third, improve legislation: update laws on the recognition of distance learning, certification standards and financing mechanisms. This will make the system transparent and accountable. Fourth, introduce a monitoring and evaluation system: continuously improve the system through regular audits, collecting feedback and analyzing results. If these proposals are implemented, the Uzbek healthcare system will meet world standards and significantly improve the health of the population.

If these measures are implemented, the healthcare system will not only meet world standards, but also be innovative and sustainable. For example, due to qualified personnel, the effectiveness of disease prevention and treatment will increase, the life expectancy of the population will increase, and economic losses will decrease. In addition, this system will also affect other areas, for example, it will give impetus to the development of the education and IT sectors. As a result, Uzbekistan can become one of the leading countries in the field of healthcare, as digital technologies and distance learning are in line with global trends and bring long-term benefits. Therefore, it is necessary for the government, organizations, and specialists to work together, which will contribute to the overall well-being of the country.

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