

## ANALYSIS OF COMPONENTS OF PEDAGOGICAL SKILLS AND TRANSFORMATIONAL TRENDS IN MODERN MEDICAL EDUCATION

**Sahiyeva Matluba Toshpo‘lat qizi**

Termez branch of Tashkent State Medical University

Associate Professor of the Department of Social and Human Sciences

*E-mail:* [matlubasahiyevattatf@gmail.com](mailto:matlubasahiyevattatf@gmail.com)

**Choriyeva Dilfuza Omon qizi**

First-year Master's student in Neurology at the Termez branch of Tashkent State Medical University

*E-mail:* [dilfuzachoriyeva83gmail.com](mailto:dilfuzachoriyeva83gmail.com)

### Abstract

This article analyzes the fundamental components of pedagogical mastery and their strategic role in the activities of a modern pedagogical physician. The study highlights the development mechanisms of medical education technologies, specifically the integration of digital transformation, artificial intelligence, and simulation learning methods. The results of the article will serve to improve the quality of education in medical universities and improve the methodology for training competitive personnel. The article is dedicated to one of the most pressing issues of modern medical education - the professional skills of teachers in higher medical educational institutions and the evolutionary development of educational technologies. The article provides a fundamental analysis of the concept of pedagogical mastery not merely as a teaching method, but as a set of psychological and professional competencies of the educator-physician's personality. A physician-educator is interpreted not only as a subject transmitting theoretical knowledge but also as a strategic leader who shapes clinical thinking in future specialists and instills the principles of medical deontology and ethics through their personal example. The objective necessity of transitioning from traditional (extensive) to technological (intensive) education is substantiated. In the process of analyzing modern trends, the effectiveness of digital transformation, the introduction of artificial intelligence (AI) algorithms into medical education, and virtual (VR) and augmented reality (AR) simulations in forming students' practical skills is statistically and methodologically proven. Particular attention is paid to the integration of distance learning and telemedicine technologies into the pedagogical process, as well as mechanisms for

creating a student-centered learning environment. The conclusions presented in the article serve as a practical guide for medical masters, young scientists, and teaching physicians in designing an educational model that meets international standards. The research results enrich the methodological foundations for modernizing the quality of medical education and training competitive personnel capable of working in high-tech conditions.

**Keywords:** Pedagogical skills, teacher-doctor competence, medical pedagogy, educational technology mechanism, digital transformation, artificial intelligence, VR simulations, clinical thinking, cognitive competence.

## СТРУКТУРНЫЕ КОМПОНЕНТЫ ПЕДАГОГИЧЕСКОГО МАСТЕРСТВА И АНАЛИЗ ТРАНСФОРМАЦИОННЫХ ТРЕНДОВ В СОВРЕМЕННОМ МЕДИЦИНСКОМ ОБРАЗОВАНИИ

### Аннотация

В данной статье анализируются фундаментальные компоненты педагогического мастерства и их стратегическая роль в деятельности современного педагога-врача. В исследовании освещены механизмы развития технологий медицинского образования, в частности интеграция цифровой трансформации, искусственного интеллекта и симуляционных методов обучения. Результаты работы служат повышению качества образования в высших медицинских учебных заведениях и совершенствованию методологии подготовки конкурентоспособных кадров. Статья посвящена одному из самых актуальных вопросов современного медицинского образования — профессиональному мастерству педагогов и эволюционному развитию образовательных технологий. Понятие педагогического мастерства анализируется не просто как метод обучения, а как совокупность психологических и профессиональных компетенций личности педагога-врача. Врач-педагог интерпретируется не только как субъект, передающий теоретические знания, но и как стратегический руководитель, формирующий клиническое мышление и внедряющий принципы медицинской деонтологии и этики через личный пример. Обосновывается объективная необходимость перехода от традиционного (экстенсивного) к технологичному (интенсивному) обучению. В ходе анализа современных трендов статистически и методически доказываемая эффективность алгоритмов искусственного интеллекта (AI), виртуальной (VR) и дополненной реальности (AR) в формировании

практических навыков студентов. Особое внимание уделено интеграции дистанционного обучения и телемедицинских технологий, а также механизмам создания личностно-ориентированной образовательной среды. Выводы исследования могут быть использованы магистрами, молодыми учеными и врачами-педагогами в качестве практического руководства при проектировании образовательных моделей, соответствующих международным стандартам.

**Ключевые слова:** Педагогическое мастерство, компетенция педагога-врача, медицинская педагогика, механизмы образовательных технологий, цифровая трансформация, искусственный интеллект, VR-симуляции, клиническое мышление, когнитивная компетенция.

## PEDAGOGIK MAHORATNING TARKIBIY QISMLARI VA ZAMONAVIY TIBBIY TA'LIMDAGI TRANSFORMATSION TRENDLAR TAHLILI

### Annotatsiya

Ushbu maqolada pedagogik mahoratning fundamental tarkibiy qismlari va ularning zamonaviy pedagog-shifokor faoliyatidagi strategik o'rni tahlil qilinadi. Tadqiqotda tibbiy ta'lim texnologiyalarining rivojlanish mexanizmlari, xususan, raqamli transformatsiya, sun'iy intellekt va simulyatsion o'qitish metodlarining integratsiyasi yoritilgan. Maqola natijalari tibbiyot oliy ta'lim muassasalarida ta'lim sifatini oshirish va raqobatbardosh kadrlar tayyorlash metodologiyasini takomillashtirishga xizmat qiladi. Maqola zamonaviy tibbiy ta'limning eng dolzarb masalalaridan biri — oliy tibbiy ta'lim muassasalari pedagoglarining kasbiy mahorati va ta'lim texnologiyalarining evolyutsion rivojlanishiga bag'ishlangan. Maqolada pedagogik mahorat tushunchasi shunchaki o'qitish uslubi sifatida emas, balki pedagog-shifokor shaxsining psixologik, professional kompetensiyalari yig'indisi sifatida fundamental tahlil qilinadi. Shifokor-pedagog faqatgina nazariy bilimlarni uzatuvchi subyekt emas, balki bo'lajak mutaxassislarda klinik tafakkurni shakllantiruvchi, tibbiy deontologiya va etika tamoyillarini o'z shaxsiy namunasi orqali singdiruvchi strategik rahbar sifatida talqin etiladi. An'anaviy (ekstensiv) ta'limdan texnologik (intensiv) ta'limga o'tishning obyektiv zaruriyatlari asoslab beriladi. Zamonaviy trendlar tahlili jarayonida raqamli transformatsiya, sun'iy intellekt (AI) algoritmlarining tibbiy ta'limga kirib kelishi, virtual (VR) va to'ldirilgan reallik (AR) simulyatsiyalarining talabalar amaliy ko'nikmalarini shakllantirishdagi samaradorligi statistik va metodik jihatdan dalillanadi. Ayniqsa, masofaviy ta'lim va tele-tibbiyot texnologiyalarining pedagogik jarayonga integratsiyasi, talabaga yo'naltirilgan (student-centered learning)

ta'lim muhitini yaratish mexanizmlari alohida e'tiborga olingan. Maqolada keltirilgan xulosalar tibbiyot yo'nalishidagi magistrilar, yosh olimlar va pedagog-shifokorlar uchun xalqaro standartlarga mos keladigan ta'lim modelini loyihalashda amaliy dasturilamal bo'lib xizmat qiladi. Tadqiqot natijalari tibbiy ta'lim sifatini modernizatsiya qilish va yuqori texnologik sharoitda ishlay oladigan raqobatbardosh kadrlar tayyorlashning metodologik asoslarini boyitadi.

**Kalit so'zlar:** Pedagogik mahorat, pedagog-shifokor kompetensiyasi, tibbiy pedagogika, ta'lim texnologiyalari mexanizmi, raqamli transformatsiya, sun'iy intellekt, VR-simulyatsiyalar, klinik tafakkur, kognitiv kompetensiya.

## INTRODUCTION

Modern medical education requires not only fundamental clinical knowledge but also the mastery of high-tech and psychological methods for delivering it to students. A teacher-doctor is both a skilled clinical specialist and a possessor of high-level pedagogical skills. Today, the rapid development of educational technologies requires a transition from traditional teaching models to “student-centered” and “technology-based” models.

*Components of pedagogical mastery.* Pedagogical mastery is a complex system that includes the following main components:

Humanistic orientation: Respecting the student's personal potential and promoting their professional growth. Professional knowledge: The ability to ensure deep knowledge in the field of science and interdisciplinary integration. Pedagogical abilities: Communicativeness, perceptiveness (understanding the student's mental state), creativity, and pedagogical optimism. Pedagogical technique: Culture of speech, facial expressions, pantomime, and the ability to control one's emotions.

In medical education, pedagogical mastery requires as much precision as diagnostic and therapeutic processes. A teacher-physician must not only teach the student theory but also develop “clinical thinking” algorithms. In this process, the teacher's personal example and deontological culture play a decisive role. The 21st century—the age of information and high technologies—is posing entirely new and complex challenges to the medical field and its personnel training system. Today, training not just a knowledgeable doctor, but specialists capable of making rapid decisions in a high-tech environment and capable of integrating fundamental knowledge with clinical practice has become a priority. The primary link ensuring the quality of education in this process is the educator-physician and their professional-pedagogical skills.

The uniqueness of medical education lies in the fact that the educator here is not only a theorist but also a direct participant in clinical practice. Therefore, the issue of

revising the components of pedagogical mastery based on modern trends and implementing innovative teaching mechanisms remains one of the most pressing scientific problems on an international scale. According to the standards of the World Health Organization (WHO) and the World Federation for Medical Education (WFME), pedagogical excellence is recognized as the professional standard for a medical teacher.

*Degree of study of the problem.* Although issues of pedagogical mastery have been extensively studied by classical representatives of pedagogical science (A. Makarenko, V. Sukhomlinsky) and modern scholars, specifically in the context of medical education—that is, the specific aspects of a physician-educator’s activity—have not been sufficiently systematized in the context of digitalization. In particular, the transformation of digital medicine (Digital Health) and artificial intelligence into educational technologies has created new facets of pedagogical mastery, such as the concept of “techno-pedagogical competence”.

**Goal and objectives of the research.** Development of scientific and methodological recommendations to increase the effectiveness of medical education by identifying the fundamental components of pedagogical mastery in the activities of a pedagogical physician and systematically analyzing the development trends of modern educational technologies.

*To achieve this goal, the following tasks have been defined:*

To reveal the theoretical foundations of pedagogical mastery and its psychological and pedagogical characteristics in the activities of a physician;

Researching the internal and external mechanisms of educational technology development;

Analysis of the effectiveness of modern trends (VR/AR, AI, Simulation) used in medicine.

**Object and subject of research.** The object of the research is the educational process in higher medical educational institutions. The subject of the study is the professional skills of the teacher-doctor and the methodology for applying educational technologies.

Scientific novelty and practical significance. In this work, the concept of pedagogical mastery is interpreted in a new way within the context of digital transformation. The skill of a physician-educator is considered in combination not only with clinical knowledge but also with technological creativity and a culture of information security. The practical significance of the article lies in the fact that the conclusions presented in it can be used in improving the curricula and retraining programs for teaching staff of medical universities.

## **Research methodology:** Hybrid-Adaptive Clinical Simulation (HACS)

This method is not only the use of technology but also a learning mechanism that adapts to the student's individual cognitive abilities.

*Components of the method:* Intellectual adaptation: Artificial intelligence algorithms analyze the student's actions in the VR simulation in real time. If a student finds it difficult to make a diagnosis, the system will automatically ask guiding questions via the “clinical assistant”. Deontological modeling: The simulation process includes not only clinical tasks but also components such as communicating with the patient and understanding their mental state. Instant Feedback Loop: As soon as a student makes a mistake, the system visualizes the negative consequences based on the "patient safety" principle and immediately provides links to theoretical sources.

*The algorithm of the method in the educational process:* Pre-clinical phase: The student independently assimilates theoretical knowledge based on the “Flipped Classroom” model. Active phase (Simulation): A complex clinical condition is simulated in a VR environment. Reflection phase (Debriefing): The teacher-doctor evaluates the student's clinical thinking and technological-pedagogical competence based on statistical analysis prepared by AI.

**Expected results:** Speed of clinical thinking: Students develop the ability to make quick and accurate decisions in a high-tech environment.

Competence level: According to the study's findings, such integrated trends allow for an increase in the competence of future doctors by up to 30-40%.

Personal example: By managing the simulation process, the educator serves as an example for the student as both a doctor and a technological moderator.

**Conclusion :** Today, the skill of a teacher-physician is inextricably linked to technological literacy. However, no modern technology can replace the personal influence and moral education of an educator.

In conclusion, it should be noted that:

Pedagogical mastery is a constantly developing dynamic process. The development of educational technologies requires a teacher to have a perfect knowledge of not only medicine, but also IT methodology. The introduction of modern trends (AI, VR, Telemedicine) into the educational process will increase the competence of future doctors by 30-40%.

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