

Developing Students Clinical Thinking Through The Implementation Of Modern Educational Technologies

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Abstract: This article discusses the reforms being implemented in the higher education system of the Republic of Uzbekistan, particularly focusing on improving the quality of education and training of specialists through modern approaches and interactive teaching methods. Special attention is given to the integration of technologies into the educational process at the Department of Pharmacology of Samarkand State Medical University to enhance the effectiveness of lessons. The practical application of pharmaceuticals is described in detail using the example of a nebulizer in pharmacology teaching, specifically the effectiveness of glucocorticoids in treating respiratory diseases and their use in educational practice. The article holds significant theoretical and practical value for the development of practical skills, the implementation of modern educational approaches, and the improvement of students' clinical training in medical universities.

Keywords: Pharmacocompetence, pedagogical technology, information society, nebulizer, glucocorticoids.

Introduction: The Republic of Uzbekistan is paying great attention to improving the quality of higher education, enhancing professional training, updating the scientific and methodological foundations of education, and introducing modern teaching methods. In this regard, reducing the gap between employers' demands and the level of education, ensuring continuous learning, and studying foreign experience are of great importance. At the Department of Pharmacology of Samarkand State Medical University, various interactive methods are widely used to make lessons more interesting and effective. In the current stage of rapid development of higher education, pharmacology occupies an important place in the modular system of medical higher education institutions. This subject studies how drugs are administered, absorbed, metabolized, transported, distributed, and bound to receptors — that is, their pharmacokinetics — as well as their positive and negative effects on the body, such as agonism,

antagonism, tolerance, tachyphylaxis, and idiosyncrasy, which relate to pharmacodynamics. It also aims to develop the necessary knowledge and skills for the correct and effective use of drugs in practice. The importance of pharmacology is particularly high for students specializing in General Medicine, Pediatrics, and Pharmacy. A deep understanding of pharmacology is crucial, as it helps future professionals provide safe and high-quality drug therapy for patients.

The Concept of Pharmacocompetence and Its Components

In medicine, pharmacocompetence refers to a student's ability to apply theoretical knowledge and practical skills in real clinical situations. It includes: Correct selection of drugs; Determining dosage, method, and duration of administration; Identifying and preventing adverse effects; Developing individualized pharmacotherapy plans based on a

patient's age, gender, and physiological state; Applying pharmacological knowledge consciously in clinical decision-making. Thus, pharmacocompetence is considered one of the key indicators defining a student's professional competence.

Modern Teaching Methods and Approaches

Modern pedagogical technologies and methodological approaches in pharmacology education must be continuously updated and improved. In addition to traditional lectures and practical classes, the following interactive methods are considered effective: Clinical case analysis and crossword exercises; Role-playing and problem-solving discussions; Online learning through electronic education platforms; Use of the mt.sammu.uz platform and modular learning systems; Simulation training to strengthen practical skills; Application of nebulizer devices and physiotherapy equipment for hands-on pharmacological practice. Through methodological improvements, students can enhance their professional skills, develop independent clinical thinking, and become better prepared for real medical practice.

Student Knowledge Assessment System: Legal and Practical Basis

To reform the higher education system in Uzbekistan, improve its quality, and ensure the training of modern, competitive specialists, several regulatory documents have been adopted.

Legal framework for student assessment includes: The Law "On Education" — the main document regulating the education sector, defining standards for quality, content, and organization of education; Presidential decrees: PQ-60 (December 24, 2021) — ensuring academic and administrative independence of higher education institutions; PQ-61 (December 24, 2021) — granting financial autonomy to universities; PQ-188 (April 1, 2022) — establishing Samarkand State Medical University and improving the medical education system; Ministerial orders: Order № 19-2018 (August 9, 2018) of the Ministry of Higher and Secondary Specialized Education — approving the regulation on student assessment (registered by the Ministry of Justice under No. 3069 on September 26, 2018); Order № 820 (September 9, 2018) — on implementation of assessment mechanisms; Order № 236 (September 8, 2020) of the Ministry of Health — regulating medical and pharmaceutical education. Based on these documents, a unified and transparent assessment system is being applied to ensure fair evaluation, identify students' learning achievements, analyze teacher performance, and enhance the overall quality of education. Samarkand State Medical University implements these legal and normative frameworks to

guarantee effective and result-oriented education.

The Concept of "Technology" and Pedagogical Innovation

The term technology originates from ancient Greece, combining "techne" (art) and "logos" (study). It originally referred to the art of craftsmanship, achieved under the guidance of a master through diligence and natural talent.

Pedagogical technology refers to the creation of a purposeful, manageable, and reproducible educational process that guarantees planned outcomes under conditions of mass education. Implementing the principles of pedagogical technology ensures systematic achievement of results, while applying problem-based learning principles gives the process a research-oriented and creative nature.

The Information Society and Its Educational Role

An information society is characterized by the production, storage, processing, and application of high-level knowledge. Information culture implies the ability of individuals to use, process, and transmit information purposefully, employing modern technical and organizational tools. Such a society is defined by: Proficiency in technical devices; Active use of computer and information technologies; Ability to obtain and effectively use data from various sources; Skills in analytical information processing and management. Integrating these two concepts — pedagogical technology and information culture — within lessons significantly enhances their effectiveness. Currently, modular and credit-based systems are being widely implemented in medical higher education institutions across Uzbekistan. This approach ensures quality, transparency, efficiency, and outcome-based learning, laying a strong foundation for the comprehensive development of students. Furthermore, the use of simulation equipment and devices in pharmacology classes provides practical, hands-on learning experiences. For instance, when teaching drugs affecting the respiratory system, lessons conducted using nebulizer devices bring innovative value.

The Role of Nebulizer Therapy in Pharmacology Education

A nebulizer is a special medical device that converts liquid medications into fine aerosol particles, allowing them to be inhaled directly into the respiratory tract. This method is particularly effective in treating pulmonary diseases such as asthma and bronchitis. Inhalation therapy plays an essential role in managing respiratory conditions. Glucocorticoids (GCs) — powerful anti-inflammatory agents — are widely used in chronic respiratory diseases. Using nebulizers allows

for local drug delivery to the lungs, reducing systemic side effects.

Commonly used inhaled GCs include: Budesonide (Pulmicort), Beclometasone, Fluticasone, Dexamethasone (in select cases, under medical supervision), Prednisolone (limited nebulizer formulations, used in emergencies).

Indications for nebulized GC therapy: Bronchial asthma — to reduce inflammation and prevent attacks, Obstructive bronchitis — particularly viral or allergic types in children, Chronic Obstructive Pulmonary Disease (COPD) — to ease breathing and reduce swelling, Laryngitis or laryngotracheitis — especially with stridor in children, Severe allergic reactions — with respiratory distress, Post-COVID syndrome — during pulmonary rehabilitation.

Dosage example (Budesonide/Pulmicort) Children: 0.25–0.5 mg once or twice daily; Adults: 0.5–1 mg once or twice daily

Mixed with 0.9% NaCl (saline solution) and administered over 5–10 minutes.

Advantages: Localized effect (fewer systemic side effects); Direct delivery to the lungs; Suitable for children and elderly patients; Rapid symptom relief (especially in bronchial obstruction)

Nebulizer Administration Steps: Wash hands thoroughly, Prepare the prescribed medication dose, Set up the nebulizer device and connect it to power, Attach the mask or mouthpiece properly, Instruct the patient to inhale deeply and slowly, Continue inhalation until the medication is finished (5–10 minutes), Clean and dry the nebulizer parts after use, Student Practice Exercise: Students are divided into groups to assemble the nebulizer and practice administering glucocorticoid therapy. Each student performs breathing exercises using the mask or mouthpiece and learns to calculate medication dosage and duration.

CONCLUSION

The introduction of modern pedagogical technologies and the use of interactive methods in teaching pharmacology play a crucial role in developing students' clinical thinking, enhancing their ability to make independent decisions, and improving their professional competence. The use of a nebulizer device in the study of glucocorticoids helps bring the learning process closer to real clinical practice.

The legal framework aimed at improving the quality of education and the assessment system in the Republic of Uzbekistan provides a solid foundation for training highly qualified professionals in the fields of pharmacy and medicine. In the future, deepening these

approaches and organizing the educational process in a more interactive and practice-oriented manner will remain among the key priorities.

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