

Methodology For Developing Professional Competence Of Medical Higher Education Students In The Process Of Teaching Biochemistry

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Abstract: The article discusses the importance of receiving a quality education from the best universities in the world, not only for our children, but also for adults, and also points out the importance of rankings and education indices for assessing the quality of educational systems in various countries.

The main idea of the article is that in the modern world, with the constant development of science, technology and technology, education should change towards the development of practical skills based on theoretical knowledge. It is important to develop students' competencies and perform tasks based on the knowledge and skills inherent in a particular profession. It is emphasized that modern education should provide preparation for independent decision-making, changes in life and academic activities, as well as contribute to the development of the universality of professional skills and constant changes in society.

Particular attention is paid to the formation of competencies as a new modern method of educational development. It is clarified that assessing the ability of students to solve problems based on knowledge and skills, such as self-education, interconnection of knowledge, information search, decision making, teamwork, helps to develop skills and competencies.

In conclusion, the article emphasizes the importance of developing and cultivating universal competencies necessary for successful activities in the field of vocational education. The need for continuous updating of teaching methodology is discussed, as well as the presence of two categories of competencies for students: general and special.

Thus, the main idea of the article is the need to adapt educational programs to the new requirements of modern society and develop in students the competencies necessary for successful work in the field of their professional activities.

Keywords: Professional education, competence, theoretical knowledge, practical skills, qualifications, professional skills.

INTRODUCTION:

Receiving a high-quality education at the world's leading universities is a guarantee of a successful future not only for our youth, but also for adults. The level of education in different countries can be assessed using various ratings and education indices based on multiple indicators. In 2007, the World Economic Forum published a ranking of the education systems of 125 countries, which reflects a nation's readiness for the future economy, the overall quality of its education system, and the level of instruction in natural sciences.

One of the main reasons for the lag in our education system is the inability to apply the knowledge gained during the study of academic subjects, which manifests as insufficient formation of competencies among students. Transitioning to a competence-based approach in education means acquiring the ability to solve problems based on mastered knowledge and skills; in other words, instead of merely asking "What do you know?", it becomes essential to consistently ask "What do you know and what can you do?". Knowledge becomes not only a

resource, but also an object of management [1].

Today, the development of science, engineering, and technology, along with the changing needs of society, is shifting the educational trajectory in both developed and developing countries toward enhancing practical skills based on theoretical knowledge delivered in the learning process. According to the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 111-F dated February 15, 2016, the existing state educational standards based on a systemic approach do not fully meet the requirements of the country's socio-spiritual and cultural development, nor those of Uzbekistan's Strategy for Sustainable Development until 2030, and therefore require revision.

Taking these aspects into account, paragraph 62 of the State Program "Year of Healthy Mother and Child" defines the task of introducing a fundamentally new methodology for teaching academic subjects – particularly exact and natural sciences – at all stages of compulsory general education [2]. Traditional education, as a new reform direction, proposed modifying curricula and adding new academic subjects. These measures were primarily aimed at broadening academic coverage, increasing the volume of material studied, and expanding instructional time; however, they did not sufficiently create conditions for developing essential qualities such as professional universalism, preparedness for life in a rapidly changing society, or the ability to adapt methods and directions of activity [3–4].

The formation of competencies is another modern approach to improving education. The presence of competencies in a specialist can be assessed through their ability to organize self-learning, integrate knowledge, acquire new information, use modern technologies, make decisions, collaborate in groups, solve problems, and participate in innovative projects [5–6].

METHODOLOGY

According to the qualification requirements for the undergraduate program 60910200 – General Medicine, approved by the Order of the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan No. 344 dated August 7, 2023, professional competencies are divided into two groups: general competencies and professional competencies.

General Competencies

- possessing a broad worldview and modern, systematic knowledge;
- having scientific understanding and

conviction regarding a healthy lifestyle, as well as skills and habits of physical self-training;

- understanding the fundamentals of humanitarian and socio-economic sciences, being aware of current issues of state policy, and being able to independently analyze social problems and processes;
- being able to express and scientifically justify personal opinions on matters of spiritual, national, and universal values, and having an active life stance based on the idea of national independence;
- having a holistic understanding of natural and social processes and phenomena, mastering knowledge about the development of nature and society, and applying this knowledge in life and in professional practice on a modern scientific basis;
- understanding the legal and moral standards that regulate human relations with other people, society, and the environment, and being able to apply these standards in professional activities;
- mastering methods of collecting, storing, processing, and using information, and being able to make independent, well-grounded decisions in professional practice;
- possessing competitive general professional training within the relevant bachelor's program;
- being able to acquire new knowledge independently, engage in self-development, and organize work activities on a scientific basis;
- being prepared to work independently in positions requiring higher education within the relevant field of study;
- being prepared to continue higher education at the master's level within the chosen specialization of the corresponding bachelor's program;
- being prepared to receive additional professional education within retraining and advanced training systems.

Professional Competencies

- understanding how to apply ethical and deontological principles in professional activities;
- knowing the rules for maintaining medical documentation;
- assessing morphological, functional, physiological conditions and pathological processes in the human body to solve professional problems;
- possessing skills in using medical instruments and equipment required for medical care;
- being prepared to implement a range of measures aimed at preserving and strengthening the health of children and adults, including promoting healthy

lifestyles, preventing the occurrence and/or spread of diseases, performing early diagnosis, identifying causes and conditions of diseases, as well as eliminating environmental factors harmful to children's and adults' health;

- being prepared to conduct preventive medical examinations, clinical check-ups, and dispensary follow-up of healthy children and adults as well as patients with chronic diseases;

- participating in anti-epidemic measures, and organizing the protection of the population in situations of deteriorated radiation conditions, natural disasters, other emergency situations, and centers of highly dangerous infectious diseases;

- using social and hygienic methods to collect information on the health indicators of children and adults and perform medical-statistical analysis;

- collecting and analyzing patients' complaints, medical history, examination findings, laboratory, instrumental, pathological, and other research results to determine the condition or identify the presence or absence of disease;

- identifying major pathological conditions, symptoms, syndromes, and nosological forms according to the International Statistical Classification (approved by the 43rd World Health Assembly, 10th revision, Geneva, 1989) and relevant health issues;

- participating in temporary disability assessment and medical-social expertise, as well as determining biological death;

- determining the management tactics for patients with various nosological forms;

- managing and treating patients with various nosological forms in outpatient and day-hospital settings;

- providing primary medical care for sudden acute illnesses, exacerbations of chronic conditions not posing an immediate threat to life, and cases not requiring emergency intervention;

- participating in the provision of emergency medical care to patients requiring urgent medical intervention;

- managing physiological pregnancy and childbirth;

- participating in medical care in emergency situations, including medical evacuation;

- determining the necessity of using natural therapeutic factors, medications, non-pharmacological therapies, and other methods for patients requiring medical rehabilitation and sanatorium-resort treatment;

- teaching children and their parents (or legal representatives), as well as adults, basic hygiene measures, principles of maintaining and strengthening health, and skills for self-monitoring key physiological indicators contributing to disease prevention;

- participating in the assessment of medical service quality for patients using basic medical-statistical indicators;

- analyzing medical data and presenting them in accordance with evidence-based medicine;

- participating in scientific research;

- participating in the implementation of new methods and techniques aimed at protecting public health.

RESULTS

Students acquire general and professional competencies, knowledge, and skills through mastering compulsory and elective courses introduced into the curriculum in logical sequence, completing practical training, and fulfilling other learning activities and academic tasks.

Compulsory subjects are a set of courses aimed directly at developing general and professional competencies within the undergraduate program and ensuring the acquisition of essential foundational knowledge and skills.

Elective subjects are a set of courses that, based on the specialization within the field of study, provide in-depth and additional knowledge, contribute to expanding competencies necessary for the chosen specialty, and support students' personal interests, creativity, and abilities.

The following type of practical training is conducted within the educational program:

Qualification practice—aimed at strengthening theoretical knowledge gained from general professional and specialized subjects, integrating them with practical (production) processes, and developing relevant practical skills, competencies, and qualifications.

Within the undergraduate program 60910200 – General Medicine, the subject Biochemistry is included in the list of compulsory disciplines under the qualification code BK 13–408. The total workload is 240 hours, equal to 8 credits, and it is taught during the 3rd and 4th semesters.

In forming general and professional competencies and managing the acquired knowledge, we distinguish four levels representing the objects of a physician's biochemical understanding: molecular–

genetic, cellular, organism, and ontogenetic levels. Cognition includes two interrelated directions—empirical and theoretical—which follow and complement each other and must be integrated within the learning process.

At the empirical stage of studying biochemistry, observation plays a key role: conducting independent enzymological studies; analyzing the final results of biochemical indicators of carbohydrate, lipid, protein, and mineral metabolism in peripheral blood and other biological fluids that characterize the state of cells, organs, and the organism as a whole. To solve these tasks, students must develop knowledge and skills in using data obtained through complex laboratory equipment.

The experimental method involves forming the ability to conduct research under the influence of extreme external and internal environmental factors—such as varying temperatures, oxygen concentration in inhaled air, physical exertion, toxicity, etc.—and allows students to identify hidden properties, capacities, and adaptive limits of cells, organs, and organisms. The process of teaching biochemistry must develop the skills required in professional practice for making preliminary diagnoses based on biochemical test results.

In accordance with the new educational standards of qualification requirements in biochemistry, we plan to organize the learning process in a way that gradually increases the complexity of the structure of knowledge, skills, and competencies. Initially, a discrete approach is applied—deepening the study of the structure and functions of individual components of the system (inside the cell, inside the organism), followed by the study of the integrated properties of the entire system (cells, organs, and organisms). These principles are reflected in the design of disciplinary modules and the sequence of study in the biochemistry curriculum.

During the first three semesters, six modules are planned, aimed at forming knowledge, skills, and competencies regarding the main metabolic pathways in human body cells under normal physiological conditions (including ontogenesis) and in pathological biochemical processes:

1. Introduction to Metabolism. Biological Membranes
2. Biological Oxidation. General Pathways of Catabolism
3. Energy and Biosynthetic Pathways of Carbohydrate Metabolism in the Human Body
4. Energy and Biosynthetic Pathways of Lipid

Metabolism in the Human Body. Metabolism of Cholesterol and Complex Lipids

5. Protein Digestion in the Human Body. General Pathways of Amino Acid Metabolism. Specific Pathways of Amino Acid Metabolism. Ammonia Detoxification. Nucleotide Metabolism

6. Molecular Biology. Protein Biosynthesis, Protein Polymorphism, Genetic Engineering. Mutations and Carcinogenesis

During the 4th semester, Modules 7 and 8 focus on forming knowledge, skills, and competencies related to assessing (or designing) metabolic states of body systems and organs under normal physiological conditions, including ontogenesis, and the mechanisms of integration during typical disturbances of homeostasis:

7. Biochemical Systems for Maintaining Homeostasis (Endocrine System, Blood, Kidneys, Liver, Acid–Base Balance)

8. Biochemistry of Human Tissues and Organs (Connective, Bone, Nervous, Muscle Tissues)

CONCLUSION

Only new pedagogical technologies—particularly interactive teaching methods that ensure purposefulness, consistency, effectiveness, and repeatability of education and upbringing—can meet the requirements for developing competencies that determine the ability to solve professional problems at a high level.

Therefore, the main objective of the Department of Biochemistry is to form knowledge, skills, and competencies during classroom and extracurricular independent learning through a set of tasks aimed at organizing and implementing interactive learning methods: conducting master classes on solving situational problems, analyzing metabolic situations (designing and applying solution algorithms), discussions, lectures, presentations, and supervising students' academic and research activities. These measures ensure the assessment of educational quality, students' self-monitoring of their knowledge and abilities, improvement of the credit-rating system, and further implementation of the quality management system.

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