

COMPETENCE- BASED APPROACH IN TEACHING BIOCHEMISTRY TO FOREIGN STUDENTS

G.M. Abdullina, N.T. Karyagina, Sh.N. Galimov
Bashkir State Medical University
Department of Biochemistry

Abstract: The Article deals with problems facing educators when implementing the competence-based biochemistry training, and methodical approaches to assessing the development of competences in students.

Keywords: *medical education, biochemistry, competence-based leaning, assessment of the development of competences.*

Introduction. "Medical Biochemistry in Era of Competences: is the time for the Krebs Cycle to go?" - is the title of one of the articles published by our foreign colleagues [1]. What and, most importantly, how to teach? What should be the content of educational programmes and what are the main methodological methods of teaching within the competence-based approach? The title of the article briefly and figuratively formulates the most urgent and complex tasks facing medical educators today. According to modern requirements, from the very initial stages, already when studying theoretical preclinical disciplines, the content of the educational material should be strictly utilitarian and professionally oriented. Not knowledge for the sake of knowledge, not simple memorization of cumbersome formulas, names of enzymes and the scheme of metabolic pathways, but the formation of students' ability to apply biochemical principles to solve clinical problems. This is the task of a modern biochemistry course at a medical education today. Thus, it is not the Krebs cycle as such, but its universal integrating role that determines the metabolic rates of amino acids, fats and carbohydrates, the role in the development of metabolic diseases, hypoxia, manifestations of hypovitaminosis, the contribution of gene mutations of the tricarboxylic acid cycle to tumor processes - this should be emphasized when studying this topic in the framework of competence-oriented training.

With the competence approach, the final result of the educational process is established as the sum of competences that graduates must develop during the training period. The list of competences defined by the Federal State Educational Standard is the basis for the development of educational programmes, curricula, and syllabi of disciplines, modules and practices. The competence-base medical education ensures that the graduates attain competences to discharge their professional duties as a healthcare personnel.

The implementation of the competence model needs close cooperation and communication between specialists of different profiles involved in the training of students in the frame-work of educational programmes, since the formation of competences occurs consistently during the mastering of a number of disciplines.

Being a basic subject in the medical curriculum Biochemistry contributes in the development of a number universal (UC), general professional and professional competences (GPC, PC). The list of GPC and PC, the formation of which biochemistry is aimed at, in accordance with the work programme for the Specialty 31.05.01 General medicine compiled at the Department of Biochemistry of the BSMU of the Ministry of Healthcare of the Russian Federation, is given below (Table 1).

Table 1

Competencies developed during the study of Biochemistry

Competence index number with content of competence	Competence achievement indicators
GPC-5. Ability to evaluate morphological, functional, physio-	GPC-5.3. Be able to evaluate morphological, functional and physiological indicators of laboratory and instrumental examination of the patient

logical states and pathological processes in the human body to solve professional problems	GPC-5.4. Be able to Take into account morphological and functional features, physiological conditions and pathological processes in the human body when making a diagnosis and prescribing treatment to a patient
PC-5. Ability to collect and analyze the patient's complaints, history, the results of the examination, laboratory, instrumental, pathological-anatomical and other studies in order to recognize the state or establish the presence or absence of the disease	<p>PC-5.3. Be able to draw up a plan of laboratory and instrumental methods of examination and substantiate their need and scope taking into account medical indications and counter-indications and in accordance with the current procedures for providing medical care, clinical recommendations (treatment protocols) on the provision of medical care taking into account medical care standards.</p> <p>PC-5.4. Be able to evaluate results of physical, laboratory and instrumental methods of patient examination and their validity.</p> <p>PC-5.5. Be able to interpret the results of examinations of a patient with a degree of morphological and functional, physiological and pathological processes in the body and dynamic changes in the clinical picture, assesses their prognostic significance</p> <p>PC-5.6. Be able to draw up the results of a survey, physical and laboratory-instrumental examination of the patient in accordance with the rules for issuing a medical document (medical record of the patient)</p>

For comparison, we present the competences developed by the Biochemistry curriculum in accordance with the National Medical Commission of India (2020)[2]:

Table 2

**Competences developed by Biochemistry curriculum
(The National Medical Commission of India)**

Competences
Be able to interpret to laboratory results and correlate with clinical conditions. Describe clinical importance of various serum enzymes as markers of pathological conditions;
Be able to discuss the regulation, function and integration of carbohydrate, lipid and protein metabolism along with associated disorders.
• Be able to interpret results of various lab analytes associated with disorders of carbohydrate, lipid and protein metabolism.
• Be able to discuss digestion, absorption and importance of nutrients and disorders associated with nutrition like Protein Energy Malnutrition and obesity.
• Be able to describe biochemical role of vitamins and minerals in the body and explain the manifestations of their deficiency and toxicity.
• Be able to describe the processes involved in maintenance of normal pH and electrolyte balance and interpret the Arterial Blood Gas (ABG) Analysis in various disorders.
• Be able to describe processes involved in genetics.
• Be able to describe the various tumor markers and biochemical basis of cancer therapy. • Be able to perform and interpret biochemical analysis of urine
• Be able to describe processes involved in vaccine

It should be noted, on the one hand, the similarity in content, and on the other, the more detailed development of the biochemical aspects of competencies by our Indian colleagues, which reflects the important contribution of molecular methods and approaches to modern clinical medicine.

The introduction of the competence model has restructured the entire educational process. There is a need to create a system of detailed accounting and monitoring of the devel-

opment of competences during the mastering disciplines and the educational programme as a whole. The task may seem metaphysical, but it is necessary to create a continuous longitudinal system for assessing the dynamic process of competence formation. One of the possible approaches is the creation of the Competence development maps as indicators of the achievement of learning outcomes with clear measurable criteria (descriptors) [3]. An example of the development of such a map for one of the general professional competencies (GPC-5), to the formation of which in students of the Specialty 31.05.01 General medicine the discipline Biochemistry contributes, is given below (tables 3,4).

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Table 3

GPC-5 development card (Discipline “Biochemistry”)		
Competence development card		
Specialty 31.05.01 General Medicine		
Discipline Biochemistry		
Competence index number with content of competence	Competence achievement indicators	
GPC-5. Ability to evaluate morphological, functional and physiological states and pathological processes in the human body to solve professional problems	GPC-5.3. Be able to evaluate morphological, functional and physiological indicators of laboratory and instrumental examination of the patient GPC-5.4. Be able to take into account morphological and functional features, physiological conditions and pathological processes in the human body when making a diagnosis and prescribing treatment to a patient	
Levels of competence development		
Threshold I	Basic	Advanced
The student has a general idea of the basic biochemical tests, used in clinical diagnostics, can work with the equipment used in clinical and physicochemical laboratories	The student has a knowledge of metabolism, the laws of the functioning of the body, biochemical indicators used for diagnostic purposes, and the ability to interpret their deviations make it possible to solve professional problems according to well-known algorithms, rules and techniques	The student assumes the presence of deep theoretical knowledge of metabolism and laws of the functioning of the body, biochemical indicators used for diagnostic purposes and the ability on the basis of this knowledge to solve professional tasks of increased complexity, atypical tasks, to make professional and managerial decisions in conditions of incomplete certainty, with insufficient documentary and normative methodological support

Table 4

Planned learning outcomes (advanced level of development of the GPC-5, Discipline “Biochemistry”)	
The level of the development of the competence	Planned learning outcomes
Advanced level: assumes readiness to solve prac-	to have a knowledge: the structure, physical, chemical properties and functions of biologically important sub-

tical tasks of increased complexity, atypical tasks, to make professional and managerial decisions in conditions of incomplete certainty, with insufficient documentary and regulatory methodological support	stances, the main metabolic pathways of metabolism and their regulation, chemical processes underlying vital activity, physical and chemical and methods of analyzing the biological environment of the body
	be able to: -independently work with educational and reference literature; -use measuring equipment when performing biochemical studies; -determine the indicators of components of protein, carbohydrate, lipid metabolism in blood and biochemical fluids; -determine the amount of protein fractions in the blood; -evaluate the value of various biochemical tests of blood and urine analysis in certain pathological conditions (diabetes mellitus, pathology of the liver, kidneys, heart), -determine by the content of xenobiotic metabolism products in biological fluids the transformation of this medicinal substance in the body
	to have practical skills: conducting laboratory biochemical studies, determining some metabolic parameters; evaluation biochemical parameters in pathological conditions.

Table 5

Criteria for evaluating learning outcomes

Criteria for evaluating learning outcomes (descriptors)				
1	2	3	4	5
<p>The lack of knowledge of the chemical composition of living organisms, metabolism and chemical processes underlying life activity.</p> <p>The lack of ability to determine the basic biochemical parameters in the biological environment of the body</p> <p>The lack of skills of biochemical analysis and inability to interpret deviations of biochemical parameters.</p>	<p>The insufficient knowledge about the chemical composition of organisms, metabolism and chemical processes underlying vital activity.</p> <p>In most cases inability to determine the basic biochemical parameters in the biological environment of the body and interpret deviations from the norm.</p>	<p>Mistakes are allowed in determining the biological role of biologically important compounds and reproducing the main pathways of metabolism and energy.</p> <p>The ability to correctly determine only the basic biochemical parameters and knowledge about the basic biochemical constants of</p>	<p>In most cases, ability to characterize the structural features, the biological role of biogenic compounds, the main metabolic pathways and the chemical foundations of the functioning of the body.</p> <p>Only single mistakes are allowed when working with biochemical equipment when determining some biochemical tests. Difficulties in explanation the deviations of biochemical test.</p>	<p>Free and confident operations with biochemical terms and concepts, excellent skills in collecting, analyzing and synthesis of information.</p> <p>Knowledge of the basic methods of physical and chemical and biochemical analysis, skills to work with biochemical equipment to determine the basic biochemical parameters and correct interpretation of their deviations in various pathological condi-</p>

		the body, allowing errors in the interpretation of deviations Ability to solve typical tasks.		tions. Knowledge of typical mistakes and possible difficulties in solving a particular problem and ability to choose and effectively apply an adequate method for solving a specific problem.
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The main stages of assessing the development of competences are intermediate certification in disciplines and, ultimately, the Final State Certification of graduates. The state final exam determines the development of all competences provided for by the Federal State Educational Standard of the Specialty and Specialist's programme. In this regard, evaluation materials compiled specifically and purposefully to determine the level of development of a particular competence are of great importance. Professionally-oriented assessment materials, including test tasks, questions, situational tasks, scenarios, simulations are developed for each discipline, module, practice, allow you to monitor the level of competence development during the entire period of mastering the educational programme.

Conclusions. Methodical support for assessing the development of competences is the least developed aspect in the implementation of the competence-based education. This issue requires detailed methodological development and joint integrated work and communication of interdisciplinary councils and all specialists involved in the implementation of the educational programmes.

Literature

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INTERNSHIP ON OBTAINING PROFESSIONAL SKILLS AND EXPERIENCE IN PROFESSIONAL ACTIVITIES, INCLUDING SCIENTIFIC RESEARCH WORK WITH INTERNATIONAL STUDENTS OF THE DENTISTRY FACULTY AS AN INTEGRAL PART OF THE EDUCATIONAL PROCESS

G.R. Aflakhanova, S.V. Chuikin, N.V. Makusheva., R.A. Ganieva

Bashkir State Medical University

Department of Pediatric Dentistry and Orthodontics with the course of PGE

Relevance: Industrial practice for obtaining professional skills and professional experience in a medical university plays an indispensable role in the training of future healthcare professionals [1]. Every year, students, depending on the direction of training, undergo practical training in different statuses [2].

For international students of the 3rd year of the Faculty of Dentistry, studying in English, there is a practice "Production practice for obtaining professional skills and professional