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СЕКЦІЯ 7. НОВІТНІ ОСВІТНІ ТЕХНОЛОГІЇ У ПРОФЕСІЙНІЙ ПІДГОТОВЦІ КОНКУРЕНТОСПРОМОЖНИХ МЕДИЧНИХ ТА ФАРМАЦЕВТИЧНИХ ФАХІВЦІВ

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CONTEMPORARY SIMULATION-BASED TEACHING METHODS IN BIOCHEMISTRY EDUCATION: EXPLORING POSSIBILITIES FOR MEDICAL UNIVERSITIES

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Abstract: Modern education faces the challenge of teaching science in a way that students not only acquire theoretical knowledge but also develop practical skills necessary for their future professional endeavors. In medical education, simulation-based teaching methods stand out as an effective tool for achieving these goals. This article delves into contemporary simulation-based teaching methods in biological chemistry and their significance and possibilities for medical universities.

Key words: simulation-based education, biochemistry, medicine, virtual laboratory.

Biological chemistry plays a crucial role in medical education, providing a foundation for understanding the molecular mechanisms underlying various physiological processes and diseases. Traditionally, biochemistry education has relied on didactic lectures and practical classes with oral discussion of the topics and laboratory experiments. However, the integration of simulation-based education methodologies could offer opportunities to enhance the teaching and learning experience in biochemistry. Simulation-based methods of biochemistry study in Bukovinian State Medical University are partially implemented. So, in the article we have tried to explore the possibilities and benefits of simulation-based education in teaching biological chemistry in medical universities for its further implementation.

One of the significant advantages of simulation-based education in teaching biochemistry is its ability to enhance practical skills among students. Traditional laboratory experiments often have limitations in terms of time, resources, and safety concerns. Virtual laboratory could offer a valuable platform for students to gain hands-on experience in conducting biochemical experiments

which allows students to perform a wide range of experiments without the constraints of physical materials or equipment. Students can manipulate variables, observe reactions, and analyze data, thus developing proficiency in laboratory techniques and protocols. Virtual laboratory could provide a safe space for students to make mistakes, learn from them, and refine their skills. They can repeat experiments, increase fidelity of the results, test different hypotheses, and explore the consequences of their actions without any risk [8].

In addition to virtual laboratories, simulators provide realistic, interactive, and immersive experiences that mimic real-world laboratory or clinical settings. Students can practice specific techniques, such as pipetting, photometry, spectrophotometry, polarimetry, refractometry, centrifugation in a controlled virtual environment. Simulators provide real-time feedback, help students understand the principles behind the techniques and refine their motor skills [12].

Simulation could help students to develop proficiency in data analysis and interpretation. They can work with simulated data sets, analyze patterns, explore statistical analyses, extract relevant information, visualize trends, interpret experimental results and communicate their findings effectively [15].

In traditional laboratory settings, students must adhere to strict safety protocols and ethical guidelines, which can sometimes limit their practical experiences. Simulations provide a risk-free environment where students can learn and practice laboratory safety procedures without any potential harm to themselves or others [2].

Simulation-based education offers numerous opportunities to promote active learning in theoretical medicine. Active learning shifts the role of students from passive recipients of information to active participants in the learning process. By engaging students in interactive and practical activities, simulation-based approaches foster critical thinking, problem-solving, and application of knowledge in real-world scenarios [1].

Simulation allows the integration of case studies and interactive scenarios, offering students the opportunity to actively engage in problem-solving activities. Students can work individually or in groups to analyze complex biochemical cases, identify the underlying biochemical processes, and propose appropriate solutions or interventions [3].

Simulation-based education enables students to perform virtual experiments and data analysis, promoting active learning in the context of biochemistry. Students can design and conduct experiments, manipulate variables, collect data, and analyze results within a simulated environment. By actively participating in virtual experiments, students develop a practical understanding of experimental design, data collection, and analysis. They learn to interpret experimental outcomes, and draw conclusions which gives a deeper understanding of pathogenesis of many diseases and

enhances students' ability to think critically about experimental procedures and research methodologies [6].

Simulation-based education encourages collaborative learning and reflection, providing opportunities for students to take part in discussions, share ideas, and learn from each other. Virtual team-based learning allows students to work together on complex biochemical challenges, facilitating peer-to-peer interaction and knowledge exchange [13].

Simulation-based approach facilitates a deeper understanding of biochemical concepts by providing visual and interactive representations which enhance students' ability to grasp abstract concepts, visualize molecular structures, and comprehend dynamic biochemical processes. Computer simulations and modeling tools give visual representations help students comprehend the spatial arrangement of molecules, the interactions between biomolecules, and the dynamics of biochemical reactions. Students can explore the three-dimensional structure of proteins, understand enzyme-substrate interactions, and visualize the flow of metabolites through metabolic pathways. This visual approach promotes a holistic understanding of biochemical concepts, beyond what can be achieved through traditional didactic lectures or textbook illustrations [11].

Interactive simulations enable students to investigate the effects of changing parameters, such as pH, temperature, or substrate concentration, on biochemical reactions. They can observe the impact of these changes on reaction rates, equilibrium positions, and enzymatic activity. By experimenting with these simulations, students develop a more intuitive sense of how biochemical processes respond to different conditions [14].

Dynamic modeling simulates the temporal changes in biochemical systems. Students can observe how concentrations, enzyme activities, and reaction rates vary over time in response to different inputs. This dynamic perspective helps students understand the regulatory mechanisms and feedback loops involved in biochemical pathways. They can explore the relationships between enzyme activity, substrate availability, and product formation. Students could explore the dynamics of enzyme kinetics, metabolic fluxes, and signal transduction pathways. They can observe the effects of feedback inhibition, substrate saturation, and allosteric regulation on biochemical processes [4].

Simulation-based education plays a vital role in preparing medical students for real clinical practice. By simulating clinical scenarios and patient interactions, simulation-based approaches help students develop essential clinical skills, enhance their decision-making abilities, and familiarize them with biochemical disorders and treatments [10].

Virtual patient simulations offer a valuable tool for preparing medical students for clinical practice. These simulations replicate real-life patient encounters, allowing students to practice

history-taking, physical examination, and clinical decision-making. Students can interact with virtual patients, assess their symptoms, determine the list of essential biochemical investigations and avoid unnecessary tests, which will help save patients' money. By practicing laboratory test interpretation in a simulated environment, students become proficient in identifying patterns, understanding the clinical significance of test results, and formulating appropriate diagnostic and treatment plans. This hands-on experience prepares them to interpret laboratory data effectively in real clinical scenarios [1].

Simulation-based education allows students to explore diagnostic algorithms and therapeutic interventions commonly used in clinical practice. Through interactive scenarios and case studies, students can engage in decision-making processes related to biochemical disorders. They learn to apply biochemical knowledge, evaluate clinical information, and make evidence-based decisions regarding diagnostics and treatment options [7].

Thus, the use of simulations in the teaching and learning of biochemistry could enhance practical skills, promote active learning, facilitate conceptual understanding, and prepare students for the challenges of real-world clinical practice. Considering the numerous benefits and advancements in simulation-based education, it is worth to implement these methodologies in the teaching of biological chemistry.

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ЗВОРОТНИЙ ЗВ'ЯЗОК ЛІКАРІВ-ІНТЕРНІВ СПЕЦІАЛЬНОСТІ «ПЕДІАТРІЯ» ЩОДО ВПРОВАДЖЕННЯ В ОСВІТНІЙ ПРОЦЕС МЕТОДИКИ ОБГОВОРЕННЯ КЛІНІЧНИХ ВИПАДКІВ

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Анотація. В статті описано результати опитування лікарів-інтернів спеціальності «Педіатрія» щодо ефективності впровадження в навчальний процес такого активного методу навчання як обговорення клінічних випадків (кейсів). Завдяки активному залученню самих учасників навчального процесу в якості тих, хто готує, презентує клінічний кейс та модерує процес обговорення в групі, істотно поліпшується мотивація та ставлення лікарів до їх освітнього середовища.

Ключові слова: зворотний зв'язок, інтернатура, активне навчання.

Вступ. Інтернатура в Україні має дві складові – теоретичну і клінічну, теоретичне навчання відбувається на базі закладів післядипломної медичної освіти або на базі факультетів післядипломної освіти медичних вишів. Задля забезпечення теоретичного навчання бази інтернатури можуть укладати договори з надавачами освітніх послуг. Клінічна складова інтернатури – це робота на посаді лікаря-інтерна у закладах охорони здоров'я. Співвідношення між теоретичною і практичною частинами інтернатури варіюється залежно від спеціальності. У майбутньому очікується зміщення фокуса з вивчення теоретичного матеріалу на здобуття практичних навичок в процесі професійної діяльності [6]. Безперечно, інтерни також опановують необхідний теоретичний матеріал, але його обсяг залежить від об'єктивних потреб програми. Попри необхідність зміщення наголосу з теоретичної на практичну підготовку в інтернатурі, складова теоретичного навчання повинна залишитись.

Як поліпшити лікарями-інтернами сприйняття освітнього середовища? Сучасний підхід акцентує перехід до активного навчання, що охоплює різні дидактичні методи з