FORMATION OF CRITICAL THINKING OF MEDICAL STUDENTS AS A COMPONENT OF THE EDUCATIONAL PROCESS IN A HIGHER EDUCATION INSTITUTION

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In the global practice of critical thinking development, many techniques, methods, and programs have been developed, each of which leads to the desired result. When using different techniques for developing critical thinking, teachers face a number of difficulties in specific situations, including the age of the subjects of the learning process, the academic discipline in which critical thinking is being formed, the psychological climate within the collective, and the form of organizing the learning process. Therefore, for each case, the techniques will represent a set of tasks (techniques, methods) that are part of a specific criterion for developing critical thinking. The methods of developing critical thinking include the following: technology for developing critical thinking through reading and writing, insert, cluster, mind map, fish-bone technique, question cube, question daisy, cinquain, «thick» and «thin» question technique, «Six Thinking Hats», «Lotus Flower», «Predictions Tree (Decisions)», creating problematic situations, case studies, essay writing, incomplete sentence technique, knowledge building technique, etc. This article will focus on the most commonly used techniques for developing critical thinking in medical students studying the subject of pathomorphology at the Department of Pathological Anatomy of Bukovinian State Medical University.

The aim *– to justify the appropriateness of using different methods of developing critical thinking in a higher education medical institution, as well as their implementation in the educational process of students studying the discipline «pathomorphology».*

Conclusions. *Critical thinking is a crucial factor for success in the XXIst century. It is the art of analysis, scientific thinking, and making well-thought-out and independent decisions. Critical thinking represents a distinct type of thinking characterised by activity, purposefulness, independence, discipline, and reflection. In the process of educating medical students, it involves the development of the ability to identify problems, analyse, synthesise, assimilate information from any source, propose alternatives and evaluate them, choose the method of problem-solving or their own position and justify their views, make conscious choices and take action. A future doctor should possess critical thinking skills in order to quickly develop a treatment strategy in emergency situations. It is important introducing education that fosters the development of critical thinking (solving real problems and students making decisions in various situations) and provide sound reasons for choosing the most appropriate methods, techniques, forms, and means of teaching.*

ФОРМУВАННЯ КРИТИЧНОГО МИСЛЕННЯ СТУДЕНТІВ-МЕДИКІВ ЯК СКЛАДОВА НАВЧАЛЬНОГО ПРОЦЕСУ У ЗАКЛАДІ ВИЩОЇ ОСВІТИ

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У світовій практиці формування критичного мислення (КМ) розроблено багато методик, способів та програм, кожна з яких приводить до бажаного результату. Використовуючи різні методики формування критичного мислення, у конкретній ситуації педагоги стикаються з низкою особливостей: вік суб'єктів навчального процесу, навчальна дисципліна, на базі якої відбувається формування критичного мислення, психологічний клімат у колективі та форма організації процесу навчання. Тому для кожного випадку різні методики пропонують набір завдань (прийомів, методів), що є частиною певного критерію формування критичного мислення. До способів формування КМ відносять такі: технологія розвитку КМ через читання і писання, інсерт, кластер, розумова картка, прийом Фішбоун, кубик питань, ромашка питань, сінквейн, прийом «товсті» та «тонкі» питання, прийом «Шість капелюхів мислення», «Квітка лотоса», «Дерево передбачень (рішень)», створення проблемних ситуацій, кейсів, написання есе, прийом незакінченого речення, прийом нарощування знань та ін. У цій статті увага буде зосереджена на найбільш поширених прийомах розвитку КМ у студентів-медиків при вивченні предмету «патоморфологія» на кафедрі патологічної анатомії Буковинського державного медичного університету.

Мета роботи – обґрунтувати доцільність використання різних способів формування критичного мислення у медичному закладі вищої освіти, а також їх впровадження в навчальний процес студентів, які вивчають дисципліну «патоморфологія».

Висновки. Критичне мислення є надважливою запорукою досягнення життєвого успіху у XXI столітті. Критичне мислення – це мистецтво аналізувати, наукове мислення, ухвалення ретельно обмаркованих та незалежних рішень. Критичне мислення є окремим типом мислення, який характеризується активністю, цілеспрямованістю, самостійністю, дисциплінованістю та рефлективністю. У процесі навчання студентів-медиків воно передбачає розвиток здатності: визначати проблеми, аналізувати, синтезувати, осягнути інформацію з будь-яких джерел, висувати альтернативи й оцінити їх, обирати спосіб розв'язання проблеми чи власну позицію щодо неї й обґрунтувати свої погляди, зробити свідомий вибір і діяти. Майбутній лікар повинен володіти критичним мисленням задля швидкого прийняття тактики лікування при невідкладному стані пацієнта. Важливо запроваджувати навчання щодо розвитку критичного мислення (розв'язання реальних проблем і прийняття здобувачами освіти рішень у різноманітних ситуаціях), створювати обґрунтовані підстави для вибору найбільш адекватних методів, прийомів, форм і засобів навчання.

Introduction

In the world practice of critical thinking (CT) development, many methods, techniques and programmes have been developed, each of which leads to the desired result [1]. When using different methods of developing critical thinking, in a particular situation, teachers face a number of difficulties, including the age of the subjects of the educational process, the specific discipline in which the formation of critical thinking takes place, the psychological climate in the team and the form of organisation of the learning process. Thus, for each case, the methods will represent a set of tasks (techniques, methods) that are part of a certain criterion for the formation of CT [1-2].

The aim of the study

To substantiate the feasibility of using different methods of forming critical thinking in a medical institution of higher education, as well as their implementation in the educational process of students studying the discipline of pathomorphology.

Main part

The concept of «critique» (from the Greek word «kritike») refers to the art of analysing and judging. Matthew Lipman (1923-2010), the founder of the Institute for Critical Thinking (1987-1997) and a distinguished professor of philosophy, defined critical thinking as a qualified and responsible form of thinking that reaches correct judgments based on criteria, self-improvement, and consideration of context. The words «Education has always had two fundamentally important goals – the transmission of knowledge and the cultivation of wisdom» belong to Matthew Lipman. Philosopher Richard Paul (1937-2015) defined critical thinking as thinking about thinking, in which individuals reflect in order to improve their thinking. Thus, critical thinking is not a singular skill or ability, but a combination of various skills. According to other scholars, critical thinking is a way of thinking that helps individuals navigate the informational environment for self-knowledge and understanding of the world. It controls both subject-specific and general thinking and is considered to be a higher order of thinking. Some researchers also emphasize the emotional and evaluative component of critical thinking, which involves a thoughtful consideration of a problem, openness to the thoughts, feelings, and arguments of others, recognition of one's own mistakes, ability to let go of incorrect assertions, beliefs, and convictions, perseverance in the search for reasoning and responsibility for the outcomes of thinking.

The main characteristic of CT, which is defined by most researchers, is shown in Table 1. The main condition for the development of CT is problematic. CT allows, on the one hand, to formulate assessments (interpretations), and on the other hand, to apply the results obtained to situations and problems correctly.

Table 1

Main characteristics of critical thinking

Main characteristics of critical thinking:	
1	Active thinking, its reflective nature
2	Logic (compliance with criteria, skill, discipline, balance)
3	Independence (self-regulation, self-control, self-correction)
4	Focus on solving life or educational problems
5	University space creates conditions for the formation of KM

The process of developing students' CT should solve the tasks listed in Table 2.

Individuals who possess CT are tolerant of different points of view, open to new ideas, inquisitive, and often ask questions. CT formation is based on three main components – cognitive, communicative, and reflexive. Let's consider each of these components. The cognitive component (development of mental levels) determines a set of mental operations for identifying essential connections in the researched fact (phenomena, events) [3-4]. Educators rely on the taxonomy of cognitive levels by B. Bloom. The communicative component (development of interactions) implements a social mechanism for searching for contradictions in arguments and justifications that help understand the researched event or fact. This mechanism involves considering

different perspectives, arguments, and justifications that help identify these contradictions. To ensure this actually happens, it is necessary to consistently introduce interactive methods into the teaching process.

The reflexive component (development of pedagogical reflection) helps to comprehend the researched phenomenon through reflections on one's own cognitive process [5].

Table 2

Tasks to be solved through CT development

	The CT development process solves the following tasks:
1	Teach how to solve situational problems
2	Be persistent in solving problems
3	Have flexible communication skills in teamwork
4	Learn to listen to the interlocutor
5	Be able to consider problems from different points of view
6	Be able to consider multiple relationships between phenomena
7	Be able to draw logical conclusions, reflect on their feelings (thoughts), and evaluate them
8	Be able to make forecasts, justify them, set goals and achieve them
9	Be able to apply the acquired skills and knowledge in different situations

The following methods are used to develop critical thinking skills: technology of developing critical thinking through reading and writing, insert, cluster, mind map, Fish bone technique, question cube, question flower, cinquain, fat and thin question technique, Six Thinking Hats technique, Lotus flower technique, Tree of Predictions (Decisions), creating problem situations, cases, essay writing, incomplete sentence technique, knowledge building technique, etc. [6-7]. This article focuses on the most commonly used techniques for developing critical thinking skills in medical students studying the subject of «pathomorphology» at the Department of Pathological Anatomy of Bukovinian State Medical University.

The «Reading and Writing for Critical Development» technology (from English reading and writing for critical) is considered to have been developed by Jenny D. Still, Curtis C. Meredith, Charles Temple, and Scott Walter. Let's consider the structure of this technology. It is presented in the form of three consecutive stages – evocation, realization, and reflection. During the evocation stage, previously acquired knowledge is activated, interest in the subject or topic as a whole is sparked, learning objectives are determined, and a conflict-free exchange of ideas takes place. At this stage, motivation for learning is elicited through familiar material, which leads students to develop their own interest in further study. During the realisation stage, students encounter new information, which is organized and integrated through working with various texts (written text, lecture, explanations, video materials, etc.). The reflection stage focuses on the development of a personal attitude towards the learning material, which is then captured either through the creation of one's own text or through personal positions in discussions. Active reevaluation of one's own concepts

takes place, taking into account the newly acquired knowledge. In this way, students are motivated to further expand their own field of information.

Insert (insertion) is a marking of text in the margins with symbols («V» – already knew, «+» – new, «-» – thought differently, «?» – did not understand, have questions). In translation from English, «insert» is an interactive note-taking system for efficient reading and reflection. The process is carried out in several stages and is characterised by the marking of the text. The stages of this process correspond to three stages: invocation, comprehension, reflection. This technique is mainly used in working with popular science texts with a large amount of facts and information, laboratory work texts when the work is filled with unfamiliar terms encountered for the first time, understanding of which directly depends on the comprehension of the work's meaning. In general, insert is considered a simple technique to use and promotes the development of analytical thinking [8].

The cluster («group», «constellation») is the highlighting of content units in the text and their graphic representation in the form of a cluster or constellation. This method of concept mapping includes ideas and keywords. The method allows for presenting a large amount of information in a structured (systematised) form, identifying keywords (Table 3). The cluster enables the development of concept mapping, making it flexible and getting rid of stereotypes.

The cluster can be applied at all stages of a practical session. In the invocation stage, it is used for systematising what students already know. In the comprehension stage, the cluster allows for capturing fragments of new information, and in the reflection stage, concepts are grouped and logical connections are established between them.

Table 3

Rules for creating clusters

	Rules for creating clusters
1	Enter a keyword (sentence) in the middle of a blank sheet (Word document)
2	Around the keyword – additional words or sentences that complement the topic
3	«Auxiliary meanings» appear around the written words and new logical connections are established. A structure appears that graphically displays the sequence of the thought process and defines the information field of a given topic.

Mind maps (mental maps, intelligence maps, mind maps, «mind maps», memory maps) are a method of recording information based on visualisation of thinking,

which allows you to absorb a significant amount of information. It is a common way of visualising structured material. This way of presenting any structured

information allows you to better absorb a significant amount of material. The peculiarities of using mind maps are the use of both hemispheres of the brain [9].

The Fish bone technique was proposed by Professor Kauro Ishikawa (1915-1989). In the «head» of the fish bone, students mark the topic (problem, situation). On the upper bones, the causes of the problem under study are noted. On the lower bones, in the course of reading (studying the topic of the lesson, research), they write down facts confirming the existence of the formulated reasons. The notes should be short and contain key words or phrases. The «tail» contains a conclusion on the issue under study [10].

The question cube (Bloom's cube, cubing technique) is a versatile teaching method that facilitates consideration of various aspects of a practical training topic. This approach involves the use of a cube with instructions written on each side to guide thinking or writing. Each side of the cube has an instruction – describe; compare; differentiate; analyse; find application; offer arguments for or against. The instructions on the cube faces may differ from the information in the textbook, and the learner does not need to know or be prepared in advance for the specific instructions. Thus, the student can assume or synthesise the material covered, comprehend it and come to a certain conclusion on their own [11-12].

It is easy to see that the questions reflect Bloom's taxonomy. Bloom's taxonomy and ensure the transition of students from one level to another in the study of the topic. Higher education teachers need to keep in mind that questions are more important than answers. Today it is much easier to find information than to ask questions that will help solve a problem. It is important that the questions address different aspects. Instead of standard questions, you can use cognitive questions that begin with verbs: name (shape, size, colour); explain (tell, clarify, give your own definition); apply (give examples); analyse (tell what it consists of, compare an object or phenomenon with similar ones, indicate similarities and differences); suggest (can it be combined with another, how can you change something and get something new); evaluate (indicate pros and cons) [12].

«The Bloom's Daisy of Questions» is a methodology (system of questions) developed by the famous American psychologist and educator Benjamin Bloom, which is quite popular in the world of modern education. So, six petals – six types of questions [13].

1. Simple (knowledge) questions – when answering them, you need to name facts, recall and reproduce certain information. Such questions are often used in traditional forms of control.

2. Clarifying (comprehension) questions – the purpose of these questions is to provide the student with an opportunity for feedback on what they have said. Sometimes such questions are asked to check the student's perception of the information that he or she provided in the oral response or to obtain information that was not in the message.

3. Interpretive (explanatory, synthesising) questions – begin with the word: «Why?» and are aimed at establishing cause and effect relationships.

4. Creative questions – contain elements of convention, assumption or forecast. Such questions begin with the words: «What will happen if…?», «What do you think will happen if…?».

5. Practical questions – aimed at establishing links between theoretical and practical training of the student. Usually the questions begin with the words: «How can you apply…», «What can you do with…?».

6. Evaluative questions – aimed at finding out the criteria for assessing certain phenomena.

A syncope is a methodological technique that is a five-line poem, an analysis and synthesis of information, a play on words. At the same time, the writing of each of the lines is subject to certain rules (Table 4) [14-15]. A synopsis summarises information, expresses complex ideas; it provides a desire to contain in a short form the knowledge, thoughts, feelings, emotions, associations; it is an opportunity to express one's opinion in a unique (original) expression, and relates to the main topic of the work (question, subject, event, phenomenon). This technique is universal. It can be applied to texts on any subject when it is necessary to deeply understand and comprehend its content. It is in this way that a brief summary is made, summing up the material studied [16]. Writing a synopsis is a free work that requires the student to find and highlight the most significant elements in the topic under study, analyse them and draw conclusions. A synopsis can be useful for the student as a tool for synthesising complex information, and for the teacher as a way to assess the degree of learning. Individual work, rather than group work, is considered to be the most effective. The advantages of using the methodology are shown in Table 5.

Table 4

Rules for building a sync-wire

Poem's line	Description of information in a line of verse
First	This is the topic of the sync-wire. The line is represented by just one word and must be a noun (for example: necrosis, bleeding, inflammation, neoplasia).
Second	It consists of two words that reveal the main topic. They must be adjectives. The use of participles is allowed (reversible, internal, exudative, benign, malignant).
Third	Using verbs or adverbs, describe the actions that relate to the topic of the synopsis (first line). The third line should contain three words (complicates, spreads, occupies, crushes).
Fourth	This is a phrase (a saying, proverb, proverb, quotation, aphorism, always in the context of the topic of the synopsis), with the help of which the student expresses his or her attitude to the topic (intracellular and extracellular accumulation of proteins, fats, carbohydrates).
Fifth	Just one word that represents a certain summary (summary). Most often, it is simply a synonym for the theme of the poem (death, haemorrhage, swelling, tumour).

Table 5

Advantages of using sync-wire in the educational process

	Advantages of using sync-wires in the educational process
1	Ease of construction
2	Improving the ability to express your thoughts accurately and concisely
3	Development of analytical and creative skills
4	Increase in vocabulary
5	Increase interest in the material
6	Variability

For a teacher, a sync-wire is a way to diversify the learning process and make it more interesting, because a sync-wire is also a game activity. In this case, this technique is a change of activity that contributes to some emotional relief for students.

«Thick» and «thin» questions – the level of questions determines the level of thinking. Thus, at the challenge stage, mostly «thin» questions are asked, responsible questions: Who? What? When? Can? At the stage of comprehension (again, «thin questions»), students' attention is focused and their understanding of the subject of discussion is recorded [17-18]. «Thick questions» are intended for reflection, the answers demonstrate understanding of the material covered.

One of the methods of developing CT is the «six hats of thinking» methodology, which is an opportunity to express one's assumptions independently of the assumptions of others: all points of view will be different, since the roles of the process distributed among the participants are obviously different [19]. This approach provides an opportunity to form alternative views on the situation, discuss different points of view, and if any assumption is challenged, the student will not feel that he or she is wrong, because he or she only played a specific role. This technique is suitable for the initial stage of reflection.

The «Six Hats of Thinking» methodology is based on the theory of parallel (lateral, non-template) thinking and can be used in the training of future medical professionals. By parallel (lateral) thinking, Edward de Bono (the founder of this methodology for the development of CT) meant the process of information processing that contributes to changing the existing model of stereotypical perception of the surrounding reality and creating alternative (innovative and illogical) ways to solve a problem. The essence of the methodology is that each hat has its own colour and meaning [20].

The metaphorical meaning of the «white hat» is focusing on information (analysing known facts and figures), as well as assessing what information is missing and from which sources it can be obtained. Questions in this section: What information is available? What information is needed? How and where can I get the missing information?

The «red hat' technique is symbolically associated with the colour of fire; it draws attention to emotions, intuition and sensations. Without going into details and reasoning, all intuitive guesses are expressed at this stage. Red hat thinking is not only about emotions, but also about irrational aspects of thinking (premonition). This section allows you to understand: What I feel now; What my intuition tells me; What my «inner voice» tells me.

The «black hat» technique involves assessing the situation in terms of the presence (absence) of shortcomings, risks and threats to its development, highlighting negative aspects, protecting against ill-considered and reckless actions, and pointing out possible pitfalls. Questions under this hat: What are the possible problems? What are the likely difficulties? What should I pay attention to?

The «yellow hat» technique is aimed at exploring possible successes, looking for advantages and an optimistic outlook on the event (idea, situation, phenomenon) under consideration; it helps to reveal resources and positive aspects. Questions under the yellow hat: What are the benefits? What are the positive aspects? What is the value? What is the attractive concept of this proposal?

The «green hat» technique provides an opportunity to modify existing ideas and generate new ones, look for alternatives, explore opportunities, and improve existing developments. It is a manifestation of creativity and innovation. Questions in this section: What creative ideas do you have? What are the possible alternatives? How can you overcome the difficulties found under the black hat?

The blue hat technique is a special hat that focuses on managing the discussion process, summarising and discussing the effectiveness of the method. It encourages reflective thinking or thinking about thinking. Here we manage the process of perception and processing of information, make generalisations and conclusions (observation and review; comments; summing up; conclusions). Focusing is one of the key roles of the blue hat. Blue hat questions: Where to start? What is on the agenda? What are the goals? Which hats to use? How to summarise the results? What to do next? [21].

«The Lotus Flower» – this technique involves finding a solution to a problem in eight directions. Even if all eight ways are not reflected in the text provided for analysis, the student needs to propose them himself. The methodology for developing the Lotus Flower CT originated in Eastern religious studies (spiritual practices) [4, 22]. It is known that the lotus in the East is considered a magical flower – contemplation of which leads to reflection, stimulates the formation of an expanded worldview. In practical pedagogy, this technique is an example of figurative structuring of the material.

«The tree of predictions (decisions)» – the rules for working with this technique stipulate that the trunk of the tree is the topic, the branches are assumptions (predictions), which are made in two main directions – «possible» and «probable» and begin with the words (I think that…; it is likely that it will be so…), the number of «branches» is not limited, the «leaves» are the justification of these assumptions, arguments in favour of a particular opinion. This technique is suitable for topics that contain an element of anticipatory forecasting or discussions about

the development of a phenomenon in the future [23]. Students voice their own ideas and jointly create a «the tree of predictions (decisions)».

Conclusions

Critical thinking is a crucial prerequisite for life success in the XXI century. Critical thinking is the art of analysing, scientific thinking, making carefully considered and independent decisions. It is a separate type of thinking characterized by activity, purposefulness, independence, discipline, and reflexivity. It involves the development of human abilities during the learning process: identifying problems, analysing, synthesising, comprehending information from any source, generating alternatives, evaluating them, choosing a problem-solving method or one's own position on it, and justifying one's views, making an informed choice, and taking action. It is important introducing education aimed at developing critical thinking (solving real problems and making educational recipients' decisions in various situations) as well as creating reasoned grounds for selecting the most appropriate methods, techniques, forms, and means of learning.

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