EduVision: Journal of Innovations in Pedagogy and Educational Advancements
Volume 01, Issue 07, July, 2025
brightmindpublishing.com
ISSN (E): 3061-6972

METHODOLOGICAL ISSUES IN DEVELOPING CRITICAL-OPERATIONAL COMMUNICATION IN THE TEACHING OF "MEDICAL RADIOLOGY"

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Abstract
This article explores the issues of developing students' skills in critical-operational communication during the teaching of the "Medical Radiology" discipline through pedagogical dialogue. Modern medical education requires students not only to possess theoretical knowledge but also to make prompt decisions in clinical situations, engage in professional communication, and think critically. From this perspective, fostering critical-operational communication through meaningful and interactive forms of pedagogical dialogue is considered an important methodological task. The article analyzes the methodological foundations of this process, identifies existing challenges, and proposes innovative approaches to address them.

Keywords: Pedagogical dialogue, critical-operational communication, medical radiology, methodological problem, clinical thinking, case scenario, professional interaction, interactive learning, educational technologies.

Introduction

The rapid pace of information updating in the context of modern medical education, the complexity of diagnostic and clinical decision-making processes require specialists to possess not only theoretical knowledge, but also critical and operational communication skills. In particular, in the process of teaching the discipline of "Medical Radiology", students' abilities to analyze information, interpret visual information, take a critical approach in urgent situations, and express their thoughts briefly and clearly are of great importance. Of course, the role of pedagogical communication in this process is invaluable. Pedagogical communication forms and develops educational relationships between the teacher

EduVision: Journal of Innovations in Pedagogy and Educational Advancements
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brightmindpublishing.com
ISSN (E): 3061-6972

and the student based on mutual trust, cooperation, exchange of ideas, and reflection.

LITERATURE REVIEW

Critical-operational communication is a form of communication based on critical analysis of knowledge, quick thinking, and quick decision-making, which is especially relevant in medical education. Scientists such as P. Freire, M. Buber, J. Meziroud have emphasized active, departmental and interpersonal forms of communication in education. In particular, in Buber's dialogic pedagogy, the creation of meaning through critical thinking and interaction plays a key role [1]. As Slastyonin V.A. noted, pedagogical communication is not only an exchange of information, but also a means of personal development, harmonization of activities [2]. Communication in modern medical education is not only a flow of information between teachers and students, but also a process of personal, professional and cognitive transformation.

Foreign researchers (Schön D., Harden R.M., Irby D.M.) [3-5] support such approaches as "reflective practice" and "situational communication" in the educational process, identifying rapid response and thoughtful communication in a clinical environment as the main criteria for training specialists.

Case scenarios, structured debates and simulation technologies form the ability of students to quickly respond to clinical situations, provide evidence and conduct professional communication.

A number of studies have also been conducted in Uzbekistan on the formation of critical thinking and communication competencies. In particular, N.A. Khasanova methodologically substantiates the development of critical-communicative skills through practical exercises in medical education [6]

As can be seen from the analysis of the literature, the methodological problem of developing critical-operational communication requires taking into account not only methodological methods, but also the philosophical, psychodidactic and clinical foundations of communication. In disciplines such as medical radiology, which require accurate diagnosis and rapid decision-making, research in this area is a must.

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METHOD AND METHODOLOGY

The methodology of this article is based on modern pedagogical research and is based on the cognitive-pedagogical approach, dialogic learning theory, and interactive learning technologies. The main goal is to identify and model effective pedagogical conditions that serve to develop critical-operative communication in the process of teaching medical radiology.

The following approaches were chosen as the methodological basis:

• Cognitive-pedagogical approach - aims to form students' intellectual activity, critical and rapid thinking skills;

• Interactive teaching methods - case technologies, problem situations, role-playing games, debates, and the "Socratic conversation" method;

• Dialogic pedagogy - an equal and meaningful pedagogical dialogue based on the teachings of Buber and Freire.

The following specific pedagogical methods were used in the study:

Analytical-structural method - the content and functions of the concept of critical-operative communication were analyzed based on foreign and domestic literature.

Educational case study - the process of communication and thinking of students was observed through special case scenarios in the subject of medical radiology.

Pedagogical expertise and expert evaluation - the effectiveness of the proposed methods was assessed with the participation of teachers and methodologists.

Student questionnaire and reflexive essay analysis - the level of mastery of critical-operative communication skills was determined.

Comparative analysis - the impact of traditional and interactive teaching methods was comparatively studied.

RESEARCH RESULTS

Within the framework of this study, a pedagogical intervention aimed at developing critical-operative communication in teaching the subject of medical radiology was piloted. The experiment was conducted in the 2024–2025 academic year with the participation of 3rd-year students of the Bukhara State Medical Institute. The groups were divided into experimental (n=32) and control (n=30) groups. Interactive educational technologies, including case scenarios, simulation tasks, and debate elements, were introduced in the experimental group. Traditional

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brightmindpublishing.com
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teaching methods in the form of lectures and seminars were used in the control group.

During the experiment, the following indicators were assessed:

– level of critical thinking (diagnostic analysis, ability to argue);

– activity in participating in professional dialogue;

– quick decision-making skills (in simulated situations);

– ability to self-assess through reflective essays.

The results were analyzed comparatively as follows:

The critical thinking index in the experimental group increased from 38% to 71% ($p<0.01$); the level of participation in professional communication improved from 25% to 68%; the ability to quickly respond in simulation exercises increased from 2.4 points to 4.1 points (on a 5-point scale); the growth indicators in the control group did not differ significantly ($p>0.05$).

These results confirm the importance of special pedagogical conditions in the development of critical-operative communication.

DISCUSSION

Currently, the issue of developing critical-operative communication through pedagogical communication is emerging as one of the important methodological problems in the methodology of medical education. This problem is associated, on the one hand, with the technological nature of radiology and its basis in visual thinking, and, on the other hand, with the lack of sufficient opportunities for students' communicative activity in traditional lecture-practical training forms. Therefore, one of the urgent methodological tasks is the development of special methodological approaches aimed at the formation of critical-operative communication through pedagogical communication, its implementation in practice and analysis of its effectiveness.

The methodological problem of developing critical-operative communication through pedagogical dialogue in the teaching of medical radiology is a set of urgent and demanding methodological issues related to the formation of students' professional judgment, quick conclusions, clinical speech and reactive thinking skills in the educational process. These methodological problems can be described in terms of main areas and problems. First, there are methodological problems, in the teaching of medical radiology, theoretical knowledge is prioritized, and critical

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brightmindpublishing.com
ISSN (E): 3061-6972

analysis and practice-oriented communication are rarely used. There is a lack of materials that develop speech activity in the educational process, such as verbal thinking, verbal explanation, and logical substantiation of medical arguments. The educational format does not pay enough attention to the use of interactive methods based on questions and answers, arguments and debates. Secondly, there are problems of didactic organization. There is no systematic strategy for preparing students to independently analyze and make quick conclusions based on clinical scenarios. In addition, pedagogical communication is conducted more in a monological form. Interdisciplinary integration, in particular, is paid little attention to the formation of a critical view by linking radiology with therapy, anatomy, and pathology.

Thirdly, there are cognitive-psychological problems, in which students have insufficient skills in acting in ambiguous situations, making multidirectional assumptions, and making scenario-based decisions. Elements of critical thinking (justification, argumentation, refutation) are poorly expressed in the speech process.

The ability to think actively in conditions of cognitive pressure (limited time, with conflicting information) is not developed.

Fourthly, there are problems in the development of communicative speech, in which the skills of expressing radiological conclusions in a clear, concise, and professional language are insufficient. There are no exercises in the educational process such as developing multiple-choice clinical conclusions and answering quick questions. Reflective thinking, that is, reasoning "Why did I come to such a conclusion?" is rarely studied.

Fifthly, there is a lack of an interdisciplinary approach. The issues of ethical, humanitarian and speech culture necessary for the development of critical-operative communication have not been integrated into the main training modules. Activity-based learning forms (simulation, case interpretation, debate) have not been sufficiently implemented.

It is appropriate to analyze the methodological problem of developing critical-operative communication through pedagogical communication as follows:

The need to organize a dialogical, not monological, learning environment;

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brightmindpublishing.com
ISSN (E): 3061-6972

The absence of a special strategy for the formation of students' skills in medical-theoretical analysis, interdisciplinary reasoning, and evidence-based expression of opinions;

The lack of the use of cognitive activity and rapid speech comprehension mechanisms in medical radiology education.

It is appropriate to develop innovative approaches to solving these methodological problems. This includes a dialogical approach aimed at forming opinions through verbal communication; case interpretation aimed at developing medical critical analysis; rapid thinking training aimed at forming reactive and evidence-based speech; reflexive pedagogy aimed at self-assessment and perception of the thinking process; digitalization, which serves to improve communication skills in new environments; and integration aimed at fostering interdisciplinary reflection and broad thinking.

In the process of teaching medical radiology, students are taught to analyze, interpret, and draw clinical conclusions based on images. This process requires not only the acquisition of knowledge, but also cognitive activity such as critical thinking, quick decision-making, and professional judgment. Therefore, the formation of critical-operative communication is one of the main tasks in teaching this discipline. However, it is worth noting that the formation of this communication in a methodologically effective manner, in turn, raises theoretical and practical problems. The types, forms, and content of pedagogical communication are not always effective in ensuring critical thinking, independent thinking, and didactic promptness in students. This problem has also been reflected in the scientific research of foreign and domestic researchers.

According to the concept of the “zone of proximal development” of Russian scientist L.S. Vygotsky, the higher cognitive functions of a student develop only through communication and interaction. “Communicative education” in medical radiology implements such a zone of development.

As noted by local researcher N.A. Khasanova, in order to form a critical-operative dialogue, methods such as case scenarios with an uncertain outcome, structured debates, and “first definition, then conclusion” should be used. This, in turn, turns pedagogical dialogue into a professional dialogue, not just an exchange of information. It is worth noting that the development of critical-operative dialogue in medical radiology is an important didactic task that has not yet been completely

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brightmindpublishing.com
ISSN (E): 3061-6972

solved methodologically. The development of critical-operative dialogue in medical radiology can be achieved, first of all, by organizing a qualitative, systematic, and cognitively loaded pedagogical dialogue, not a quantitative one.

CONCLUSION

Based on the theoretical and practical analysis conducted in this article, the following conclusions were drawn:

Firstly, the formation of critical-operative communication in the teaching of medical radiology is of crucial importance not only for the acquisition of knowledge, but also for the development of effective response skills in clinical situations, rapid decision-making, and professional communication skills.

Secondly, to develop critical-operative communication, it is necessary to introduce meaningful, interactive, and subject-subject forms of pedagogical communication. For this, the use of case scenarios, problem questions, debates, and simulation exercises is effective.

Thirdly, the empirical results showed that a significant increase in critical thinking, professional communication, and rapid feedback skills was observed in the experimental group where interactive methods were introduced. This justifies the creation of special pedagogical conditions as a methodological necessity.

Fourth, the existing methodological problems - the formal organization of pedagogical communication, the insufficient use of interactive approaches, the lack of a collaborative environment - should be systematically eliminated.

Fifth, the methodological solutions described in the article can serve as a basis for ensuring the development of active communication, critical thinking and professional departmental competencies in the medical education system

This communication develops not only the ability to provide information, but also the ability to reason, analyze, formulate thinking, justify and express a professional attitude. Methodologically, it is these aspects that need to be reconsidered and integrated through pedagogical technologies. This idea can be described as follows:

Firstly, the transformative nature of communication is not quantity, but quality. An increase in pedagogical communication (i.e., quantity - S.Sh.) does not always ensure the cognitive activity of the student. Qualitative communication, in turn, stimulates critical thinking, teaches quick reactions to events, requires speech activity, argumentation and interpretation. In particular, an increase in the number

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ISSN (E): 3061-6972

of questions asked by the teacher (quantitative communication) can provoke an automatic response reflex in the student, but asking questions through cases based on incorrect, contradictory information (qualitative, systematic communication) develops the student's ability to reason.

Secondly, systematicity turns communication into a didactic strategy.

Qualitative pedagogical communication is not accidental. It should include the following as a planned, interactive part of the learning process:

• gradual increase in the complexity of communication;

• role alternation in diagnostic situations (student - analyst, defender, critic);

• planned introduction of argumentation and debate formats;

• students' ability to prepare reflexive reports to illustrate the results.

Thus, systematicity is the main condition for the development of intellectual activity, critical and creative approaches.

Thirdly, cognitive load forms intellectual endurance in communication, that is, the mental endurance, intellectual flexibility and critical attitude of the participants in the communication.

The communication formats given to students are often aimed at repeating information; finding the correct answer; memorizing. This, in turn, means a low level of cognitive load. If the communication requires drawing conclusions based on incorrect information, evaluating several possible diagnoses, refuting or supporting the opinion of a colleague, and giving a quick and substantiated answer, then such communication has a high cognitive load. This forms the student's ability to critically-operative thinking, emotional tolerance, professional speech and quick decision-making. The table below reflects the fact that communication formats provide high quality, systematicity and cognitive load:

Form Result	**Form Result**
Case scenarios based on incorrect data	Encourages quick and creative thinking in unfamiliar situations.
"One image – two analyses"	It allows for comparison and critical evaluation of different perspectives.
Debate and mock discussions	Develops the ability to present arguments in oral speech and respond to conflicting opinions.
Writing a reflective - diagnostic reflection	It allows for a new analysis of the student's independent thinking process.

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In our opinion, critical-operative communication is one of the main conditions for the formation of a clinically mature doctor with a high speech culture and analytical skills in modern medical education. In particular, this task is of particular importance in teaching such disciplines as medical radiology. A doctor in this field works mainly with indirect (visual) information. In this case, he must quickly and accurately interpret the data, as well as quickly and accurately present clinically significant information, be able to substantiate the diagnosis, and also be able to actively participate in collective decision-making with colleagues. It is worth noting that pedagogical communication in medical education should not be considered only as an auxiliary form of communication. It is advisable to reconsider it as a purposeful and systematic method aimed at forming critical-operative communication in future doctors. From this point of view, the methodological problem is that traditional forms of teaching, including lectures, presentations, monological explanations, do not allow young students to develop the ability to freely express their opinions, argue, and conduct professional reasoning in ambiguous clinical situations.

In our opinion, critical-operative speech potential develops only in a pedagogical environment built on dialogue. Because in this environment, the student is created with the opportunity to analyze ambiguous clinical situations, freely express his point of view, as well as defend and discuss alternative approaches. In such a situation, the teacher does not participate as a source of truth. He acts as a facilitator who directly directs students to discussion and organizes intellectual interaction. In this case, the main task of the teacher is to develop analytical thinking, evidence-based speech, and the ability to operationally reason in future doctors.

During the study, the theoretical and methodological basis of our point of view was as follows:

First, M.M. Bakhtin and M. Buber's concept of communication-based education, which reveals the system of knowledge and meaning created in the process of dialogue.

Secondly, A.A. Leontiev and T.V. Arutyunova's psycholinguistic concept of professional speech, in which speech activity is considered as an expression and development of professional thinking.

Thirdly, the concepts of problem-oriented education and clinical communication of foreign scientists such as H.S. Barrows, D. Schön, C. van der Vleuten, O. ten Cate

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brightmindpublishing.com
ISSN (E): 3061-6972

are considered, which emphasize the need for decision-making in an emergency situation and the construction of a model of professional communication.

In our opinion, it is necessary to design special pedagogical conditions for the development of critical-operative communication in future doctors. The following are proposed as these conditions:

• Integrating interactive case scenarios with uncertain outcomes into the course of Medical Radiology in order to stimulate interpretive discussions;

• Using structured diagnostic debates and exercises that require students to justify different diagnostic points of view;

• Using tasks for the oral interpretation of visual material, including the practice of "description before diagnosis";

• Developing reflexive and rapid speech skills through step-by-step feedback, mutual explanation, and dialogic assessment formats.

During the study, pedagogical dialogue is considered not only as a means of interaction between the teacher and the student. It is studied as a fundamental methodological category that serves to develop the critical-operative communication of the future doctor. Solving the methodological problem will not consist only in introducing innovative teaching forms, that is, updating the content of training courses. It requires reconsidering the role of the teacher. In this case, it is advisable to consider him not as a transmitter of information, but as an organizer who forms professional speech thinking in the educational process.

It is worth noting that the renewal of lesson forms is not enough to solve the methodological problem. In order for these renewals to awaken the student's thinking activity, the role of the teacher must change from a transmitter of information to an organizer of communication and a person who stimulates thinking. This is a methodological condition for innovative teaching methods to be effective.

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