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DEVELOPING CRITICAL THINKING OF STUDENTS IN THE PROCESS OF LEARNING

Abstract. Global integration processes, changing market relations, ever-increasing intellectualization of labor and digitalization of society require graduates of higher education institutions to possess certain personal qualities, high intellectual development, a new type of mental activity, a critical style of thinking alongside with an appropriate level of basic knowledge and professional competence. Relevance of critical thinking development is due to the fact that modern dynamics of technological and social progress requires specialists to possess skills to adapt quickly to professional activity, accommodate and improve it to obtain information independently, find ways to solve professional and social tasks in various situations.

The aim of the research is to substantiate a model of developing critical thinking of future teachers and prove experimentally effectiveness of its implementation in the educational process of higher education.

The research employs theoretical methods: system analysis of psychological, pedagogical and methodical literature to define and substantiate theoretically development of critical thinking of future teachers of elementary school; methods of empirical research: observation, conversation, questionnaire survey, pedagogical experiment in order to identify optimal ways of developing critical thinking of students of specialty «Primary Education»; methods of processing results of experimental work and their interpretation.

Diagnosing the levels of critical thinking formation at the summative, formative and control stages of research and experimental work confirmed the effectiveness of the chosen model of developing students' critical thinking in the process of educational activity. The analysis of experimental data has established the fact that due to systematic and integrated work in the process of organization of the formative stage of research, the students of the experimental group displayed positive progress, in particular, the number of students with high and medium levels of development of critical thinking has increased due to the reduction of respondents with low level. Implemented methods and techniques to develop critical thinking of future specialists in the educational process of the higher educational institution ensured achieving goals and solving tasks of the pedagogical research.

Keywords: critical thinking, educational activity, technology, methods and techniques, pedagogical experiment, higher educational institution.

РОЗВИТОК КРИТИЧНОГО МИСЛЕННЯ СТУДЕНТІВ У ПРОЦЕСІ НАВЧАЛЬНОЇ ДІЯЛЬНОСТІ

Анотація. Глобальні процеси інтеграції, мінливі умови ринкових відносин, все більша інтелектуалізація праці та інформатизація суспільства вимагають від випускників вищих навчальних закладів не тільки відповідного обсягу фундаментальних знань і професійної компетентності, але й високого інтелектуального розвитку, певних особистісних якостей, нового типу розумової діяльності, критичного стилю мислення. Актуальність проблеми розвитку критичного мислення зумовлена тим, що притаманна нашому часу динаміка технологічного і соціального прогресу вимагає від фахівців умінь швидко адаптуватися до професійної діяльності, змінювати і вдосконалювати її на основі самостійного набуття знань, знаходити шляхи розв'язання професійних і соціальних завдань у будь-яких нестандартних ситуаціях.

Мета дослідження – теоретично обґрунтувати модель розвитку критичного мислення майбутніх учителів та експериментально перевірити ефективність її впровадження в освітній процес вищої школи.

У процесі дослідження використано теоретичні методи: аналіз і систематизація психолого-педагогічної та навчально-методичної літератури з метою визначення і теоретичного обґрунтування проблеми розвитку критичного мислення майбутніх учителів початкових класів; методи емпіричного дослідження: спостереження, бесіда, анкетування, педагогічний експеримент задля виявлення оптимальних шляхів розвитку критичного мислення студентів спеціальності «Початкова освіта»; методи обробки результатів експериментальної роботи та їх інтерпретація.



Діагностування рівнів сформованості критичного мислення на констатувальному, формувальному та контрольному етапах дослідно-експериментальної роботи підтвердило ефективність обраної моделі розвитку критичного мислення студентів у процесі навчальної діяльності. За результатами аналізу експериментальних даних встановлено, що завдяки планомірній, системній та інтегрованій роботі у процесі організації формувального етапу дослідження у студентів експериментальної групи відбулися позитивні зрушення, зокрема збільшилася кількість студентів у групах з високим і середнім рівнями розвитку критичного мислення за рахунок зменшення респондентів із низьким рівнем. Впроваджені технології, методи і прийоми розвитку критичного мислення майбутніх фахівців у навчальному процесі ВНЗ забезпечили досягнення мети і вирішення завдань педагогічного дослідження.

Ключові слова: критичне мислення, навчальна діяльність, технологія, методи і прийоми, педагогічний експеримент, вищий навчальний заклад.

INTRODUCTION

The formation of a new civilization requires a constant updating of knowledge, forming new skills and developing critical thinking. The significance of critical thinking for a successful modern teacher in the conditions of information society is argued by international and national researchers, the importance of its formation is emphasized in domestic and international conceptual documents that outline prospects for the development of higher professional education. The need in the development of critical thinking today is not explained solely by the peculiarities of information society characterized by rapid changes in all spheres of human activity. The ability for thinking critically is a significant factor in the existence and formation of democratic society as the ability and readiness to assess the situation critically comes to the fore there. Since an argument dispute is a natural way of relations between two or more free individuals concerning interference of their interests – critical thinking is essential for success in free and democratic society [5, p. 22].

The phenomenon of thinking is studied by many sciences, each of them defines its essence, peculiarities of development and functioning from different positions depending on the subject of their research. The analysis of psychological and pedagogical literature made it possible to conclude that criticality of thinking is considered by researchers as a manifestation of thinking (quality of mind) and in a broader aspect – as characteristic features of personality. At the same time, most authors who consider critical thinking as a quality, at the same time see it as personal characteristic.

1. Representatives of the former approach consider critical thinking an essential feature of the mature mind (S. Rubinstein), an indicator of productive thinking, flexibility (G. Lypkina, L. Rybak), an ability to assess an action of thought (S. Veksler), an activity of the mind aimed at discovery and correction of errors (O. Tyaglo, T. Voropay), one of the components of a structure of a thought act (S. Korol).

2. Critical thinking as a characteristic of a personality, according to representatives of the latter approach, is expressed in the ability and constant desire for an objective assessment of actions of other people, in correction of their actions according to objective conditions (T. Bizenkov), a tendency to analyze errors as the criteria of intellectual activity of a person (V. Lozova). In this context, critical thinking is seen as a property that is meaningfully associated with an initiative of an individual and largely is determined by his/her character and will (B. Bogdanov), as a result of a generalized personal experience (successes and especially failures) and mastery of certain skills (to evaluate, control, speculate, suggest), as a condition for independent creative activity, as an ability to cognitive search for a task solution (V. Koneva).

The existence of different approaches to the definition of the essence of critical thinking shows the complexity and versatility of this concept. In our research, we relied on the works of T. Voropay, O. Tyaglo, S. Terno, D. Halpern, T. Khachumyan. Thus, O. Tyaglo and T. Voropay interpret critical thinking as the activity of the mind, aimed at detecting and correcting mistakes; as a peculiar way of thinking that aims to assess ideas and is defined by verification of the accuracy of allegations, validity of reasoning; as a systematic assessment of arguments based on clear rational criteria [7, p. 11]. D. Halpern defines critical thinking as a set of different qualities, cognitive skills and techniques that increases the likelihood of obtaining the desired result and allows the use of previously acquired knowledge to create new one. Knowledge and practiced skills of thinking are liable base on which critical thinking is built. Providing a critical thinking habit is as important as developing thinking skills. Critical thinking takes into account connection of thought and feeling, its components are emotionality, creative imagination, value systems [9, p. 40].

Sharing the same viewpoint, T. Khachumyan developed the structure of critical thinking in a unity of several interrelated components: a motivational component that provides understanding of need for certain knowledge, skills and abilities, a conscious interest in their acquisition, willingness of an individual to use the acquired knowledge and skills in cognitive and professional activities; a content component - a certain set of knowledge of those subject areas in which activities are carried out, knowledge of the methods and techniques of the implementation of actions, techniques of self-control and self-correction activities; intellectual-procedural component – a set of specific skills and techniques mastering which ensures the actions characteristic of critical thinking; emotionally-volitional – positive attitude towards a task, persistence, purposefulness, willingness to make efforts to solve the problem [10, p. 39].

The general level of development of critical thinking of students depends on the degree of formation of each of its components. In this context, we share the viewpoint of S. Terno on the fact that the emergence and development of critical thinking is contributed by a number of factors, each of them can be a trigger, but the full process is accommodated by a set of conditions that include: objectives of learning (creating a problem situation); means of



learning (contains rules of critical thinking); content of learning (represented by a system of problem tasks that gradually become more complex); method of learning (involves systematic creation situations of choosing); form of learning (provides a dialogue in the process of solving the situations of choosing); the method of control (involves the solution of tasks and the subsequent group and individual reflection, style of learning (offers the right to error, simulates a situation of errors correction) [5, p. 63-64].

The dynamics of technological and social progress inherent in our time requires graduates of higher educational institutions to develop abilities to adapt quickly to professional activity, to alter and improve it on the basis of independent knowledge acquisition, to find ways to solve professional and social problems in any non-standard situations. However, the study of existing pedagogical theory and practice suggests the contradictions between social demand in individuals who can think critically and the lack of focus of educational institutions on the solution of the identified problem; between the availability of scientific research of the problem of critical thinking and the lack of development of pedagogical tools for its formation, in particular, in students of higher educational institutions.

AIM AND TASKS RESEARCH

The aim of the research is to provide theoretical substantiation of a model of critical thinking development of pre-service teachers and to prove experimentally the effectiveness of its implementation in higher education institutions.

Tasks of the study:

1. On the basis of studying psychological and pedagogical sources, to characterize the essence, structure and main components of the development of critical thinking of future elementary schoolteachers.
2. To substantiate theoretically methods and techniques of forming critical thinking in students and prove experimentally the effectiveness of their application in higher education.
3. To develop a methodology for diagnosing levels of critical thinking development of future specialists in the process of research and experimental work.

RESEARCH METHODS

Research and experimental work on the development of critical thinking of prospective teachers was conducted at pedagogical faculty of Vasyl Stefanyk Precarpathian national university. Students of the 4th year of study, specialty Primary Education took part in the research. Generally, the experiment involved 68 students, who were divided into experimental (EG) and control (CG) groups.

Research tasks solving used theoretical methods: analysis and systematization of psychological, pedagogical and methodical literature to determine the state and theoretical substantiation of developing critical thinking of pre-service teachers of elementary school; methods of empirical research: observation, conversation, questionnaire survey, pedagogical experiment in order to identify optimal ways of developing critical thinking of students of the specialty «Primary Education»; methods of processing the results of experimental work and their interpretation.

Experimental research was carried out under the conditions of normal educational process. Students of the experimental group who were instructed according to the suggested technologies, methods and techniques of developing critical thinking, and students of the control group who studied according to traditional methods were involved in it.

RESEARCH RESULTS

Based on the results of the theoretical analysis of the ways and methods of developing critical thinking in students we proceeded from the assertion that the purposeful formation of critical thinking in the process of learning is possible by means of any academic subjects under conditions for specially organized educational activities. In this context, the acquisition of critical thinking skills and experience of their use was happening while studying the university discipline «Organization and management in primary school» and did not require additional training. Students were able to apply the acquired critical thinking skills performing practical actions to solve subject tasks, making sure they are necessary. A model for developing critical thinking, which was applied in an experimental study is based on creative collaboration of a teacher and students, a development of analytical and creative approaches to the study in future professionals. This method is based on the key provisions of technology of developing critical thinking after S. Terno that offers certain methods, techniques and strategies combining a learning process by educational activities in the progressive implementation of each stage of a lesson. The method adapted by us is aimed at the problem setting and solving rather than at memorizing data and facts. Classes with students of the experimental group were organized in following stages:

- I. Evocation (a phase of actualization, a challenge).
- II. Comprehension (a phase of analysis and understanding of information).
- III. Reflection (a phase of thinking).

1. The first stage provided for actualization of existing knowledge of students, motivation for their educational activities. At this stage, future professionals were able to think and tell others, in particular, through individual, pair or group work, brainstorming, predictions, naming problematic issues, etc. what they know on the chosen topic for discussion, so that the previously acquired knowledge was comprehended and became a basis for assimilation of new one. The task of a teacher at this stage was to summarize the students' knowledge, help each one in defining «his/her personal knowledge» and the main goals for obtaining new information. Based on the objectives of the study, we will give examples of some of our methods and techniques of developing critical thinking in pre-service teachers at this stage. It should be noted that the above technologies were used at other stages of the lesson, their goal being, respectively, of comprehension and reflection.



The basket of ideas. Students answered questions about what they knew about a particular topic / problem. Everyone wrote down his/her answers, following the exchange of information in team work – writing new ideas. Then in a circle, each team called some of the recorded facts and together made a single list of ideas-abstracts – in one «basket». It is important that all ideas were recorded, even false ones.

Correct / wrong. Using this method, students expected to answer questions on the topic of the lesson. All questions started with «Is it true that ...?». The answers could only be «yes or no».

Thick / Thin Questions. Students were questioned on a specific topic. «Thin» questions required only «yes-no» answers starting, for example: Who ...? What...? Is it true that ...? Is it a correct statement that ...? Is it possible that ...? Do you agree with ...? What is the name...? How do you call ...? «Thick» questions required extended answers – using analysis, synthesis, comparison, evaluation. For example: Give three explanations why ...? Explain why ...? Why do you think that ...? What's the difference between ...? How can one generalize the following concepts ...? What will happen if ...?

The tree of predictions. The following technique contained an element of predicting development of a particular phenomenon in the future. Students voiced their ideas and jointly created a «tree of predictions», where the trunk is a given topic, branches are predictions (I think that ..., it is likely that it will be ...), and leaves are arguments in favor of statements.

2. The second stage was the comprehension of the new material. This stage was an implementation of the content. The organization of this phase provided for the acquaintance of future specialists with new information, development of their critical thinking, skills of independent work, research and productive heuristic activities. In the process of implementing this stage it was important to focus the students' attention on tracking their understanding of the material and recording in the form of questions unclear issues, in order to fill the «blanks» later. After receiving information, everyone talked about which marks / phrases / words helped him/her understand the context. An important principle of the stage of comprehension was to provide students rights/aims at individual search for information with further group discussion and analysis. Among the technologies for developing critical thinking for future teachers at this stage we used Fishbone, INSERT, Bloom's taxonomy, Zigzag and others.

The fishbone. In the process of using this pedagogical tool named after its visual expression that resembles a fish bone, students «broke» a general problem to a number of reasons and arguments. After discussing the problem topic, its clear definition was written in the field «problem». Then there was an analysis of the information on the topic (texts, films, etc.), the reasons and arguments confirming them were highlighted. The conclusion was formulated through the analysis of «causes-arguments».

INSERT. The use of this technique has contributed to the profound understanding by the students of proposed educational material. They got acquainted with certain information and put appropriate marks next to individual words / phrases: «+» I knew that; «-» I did not know that / I thought differently; «?» That surprised me; «!» I would like to know more about it. Afterwards students filled in a table with phrases / words / sentences that struck them - in the corresponding column:

+	-	?	!

Bloom's taxonomy. This tool is developed according to the pedagogical principle of taxonomy and six levels of educational goals in the cognitive field: knowledge – understanding – application – analysis – synthesis – evaluation. After learning the information, students answered the following questions: 1) simple / actual (What ...? Where ...? When ...?); 2) clarifying (Do you think that ...? Do you say that ...? Do you see it so ...?); 3) explaining (Why ...? What does it mean ...? What is the main idea ...?); 4) creative, with an element of prediction/assumption (What if ...? Whether it could be improved ...? Suggest an alternative ...); 5) evaluation (What is the difference between...? How would you define / argue? What judgment can you make?); practical, connecting theory and practice (Where is it used in reality? How can this be used in practice?)

Zigzag. This technology was aimed at a detailed understanding of a certain topic and development of skills for collective critical analysis. Students were divided into groups of 4-6 people. Each team received a task to compose a generalizing text on a topic of the lesson in a certain style (an essay, a poem, an informal letter to friend, a journal article, conference theses, etc.). Each group defined main ideas of the future text (key words / planning / plot). After that, each member of the team played some expert role (a certain number symbolized an expert role). Subsequently, identical numbers from all teams sat down to work in a new, expert group – thus, there were 4-6 expert groups that worked in 4-6 directions. After such a collaboration, the experts returned to their original teams and composed a common generalizing text in a certain style. After writing the text, each team read it to other teams.

3. The third stage is reflection. The aim of this stage was to personalize knowledge of students, to ensure their comprehension, to promote processing of information and methods of cognitive activity. During this phase, future professionals formulated their personal opinions and attitudes towards the studied material, realized ways of acquiring and processing information, corrected their viewpoints, actions, reasoning. Methodical techniques at this stage included writing essays, conducting discussions, drawing schemes, using exercises and techniques, «Palette of emotions», «Traffic light», «Reflexive screen», «Six hats», «Angles», etc.



Six thinking hats. This technique is a simple and practical way of dividing a thinking process into six different modes, each of which is represented by a metaphorical hat of a certain color. Instead of thinking about all at the same time, prospective teachers learned to deal with different aspects of their thinking in turn to finally gather information and come together to a full-fledged conclusion. As part of the study, students were divided into teams, each receiving a «hat». The color of the hat indicated a type of a task: a white hat – tell only facts about the topic; a yellow hat – think why ...; a black hat – prove that ...; a red hat – think of what emotional state this topic can bring us into ...; a green hat – think what positive points this topic has ...; a blue hat – summarize the statements of all hats teams, what useful and new was learned.

Angles. This technique got its name from the form of conduct – students formulated different points of view on the topic at different angles in order to find appropriate arguments, while independently determining controversial issues and directions of a discussion. Texts, articles, case-stories that have a multi-valued context and are associated with everyday ideas, behavioral patterns, social and environmental problems, collective myths and biases are the best for such discussions. This technique includes all stages – «challenge», «comprehension» and «reflection».

The results of the study showed that using the given model of critical thinking development, future teachers pass through three stages in mastering the learning material: perception – comprehension – application. Thus using above techniques increases the likelihood of obtaining the desired final result. This statement is based on the study by D. Halpern, who defines critical thinking as something different in controllability, reasonableness, and purposefulness; as such a type of thinking, which is used in solving problems, formulating conclusions, probabilistic assessment and decision-making [9, p.18].

Conducting the experimental study, we relied on S. Terno’s research concerning the course of critical thinking when solving a problem task [5, pp. 44-45] (see Fig. 1):

Stage I – setting or collision with the problem (requires reflexive and personal levels of thinking), the awareness of the problem is a result of this stage;

Stage II – an attempt is made to overcome an impediment with a help of existing objective methods of action and knowledge that are lacking (the mental process is deployed at operational and subject levels);

Stage III – restructuring methods of actions and knowledge, development of a new perspective, new dispositions, culminating in enlightenment (the process of thinking is carried out at reflexive and personal levels);

Stage IV – substantiation of the found solution and presentation of research results, which requires the development of thought at all levels.

Levels	Stages of thinking			
	Problem setting	Impediment	Restructuring	Substantiation
Communicative				◆◆◆◆◆◆◆◆
Personal	◆◆◆◆◆◆◆◆		◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
Reflexive	◆◆◆◆◆◆◆◆		◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
Subject		◆◆◆◆◆◆◆◆		◆◆◆◆◆◆◆◆
Operational		◆◆◆◆◆◆◆◆		◆◆◆◆◆◆◆◆
Events	awareness	Blockade	enlightment	solution

Fig.1 Functional model of critical thinking

The analysis of scientific literature has shown that critical thinking is not only a general setting on systematic reflection aimed at identifying and eliminating possible mistakes in reasoning. Critical thinking can be determined as a precise algorithm, a sequence of well-coordinated intellectual actions, skillful execution of which will let achieve the goal. In order to acquire consistent critical thinking skills, one should practice using the acquired knowledge first in mastering of learning examples, then doing independent exercises to identify and overcome increasingly complex logical errors and tricks [6, p. 5-6].

In the research we used the algorithm of developing critical thinking after O. Tyaglo, which is partially based on the ideas of well-known American experts N. Brown and S. Kelly [8]. The algorithm of critical thinking development contained four main phases: 1) analysis of problematic reasoning; 2) understanding of reasoning; 3) evaluation of reasoning; 4) critique of argued reasoning. Each of these phases has been implemented through a series of critical questions and clear-cut answers to them. This algorithm was implemented in the course of conducting practical classes with students of the experimental group. A practical set of critical questions is given in Table 1.

In psychological and pedagogical studies, different approaches to the definition of criteria, indicators and levels of critical thinking are distinguished. In our experimental research, we partially relied on the works of S. Veksler, V. Konieva, N. Izotova. Thus, S. Veksler consider criteria for determining a level of criticality to be the identification of significant errors in the tasks, comparison of the material perceived in the task with the given criteria, justification of the evaluation, finding specific proposals to overcome the shortcomings [1, p. 9].



Table 1.

Algorithm of developing critical thinking

№	Phase	Question
1.	Phase of analysis of problematic reasoning	What is the problem and the proposed conclusion? What reasons justify the conclusion? What is the structure of the argument?
2.	Phase of understanding of rea-soning	What concepts or opinions are incomprehensible? What are the value assumptions? What are the descriptive assumptions? What are the conditions for accepting an argument?
3.	Phase of evaluation of reasoning	Is the problem correct? Is the conclusion of the problem correct? Is the reasoning strong? Are the deductions correct? Is the argument strong?
4.	Phase of critique of argued reasoning	What logical errors are made? Is it possible to avoid mistakes and strengthen reasoning? If so, how?

According to V. Konieva, indicators of formation of critical thinking are: awareness (knowledge about the essence of criticality, attitude to the stated quality); independence (ability to determine the subject of critical evaluation, analysis, control in the object of knowledge); assessment of capabilities in solving problems (ability to choose necessary knowledge, ways to solve, actualize one's experience to substantiate own position, points of view); depth (ability not only to find errors, inaccuracies, inconsistencies, contradictions and correct them, but also to reveal the causes of their occurrence, as well as to indicate ways to eliminate mistakes); comprehensiveness (ability to comprehend the object of cognition from different points of view, approach it from different angles); frequency of manifestation of criticality; existence of own position [4, p. 120].

In order to diagnose the levels of critical thinking formation of future teachers, we, basing on the research of N. Izotova [3], have developed a questionnaire for undergraduate students of the specialty «Primary Education». The questions for students in CG and EG are listed below:

1. I analyze the work done according to my own criteria.
2. I analyze all possible scenarios before making a decision.
3. I accept the truth, regardless of opinion of the majority.
4. I try to verify independently the truth of the received knowledge.
5. I doubt some controversial, in my opinion, statements of a teacher.
6. I can objectively and reasonably evaluate my own actions.
7. When I make a decision, I consider all pros and cons.
8. My opinion about my own abilities as well as actions, coincides with the opinions of other people.
9. I always differentiate between the most and least important points in my activity.
10. My academic grades coincide with my self-evaluation.

The level of being critical was assessed using a 4-point scale:

- «in very rare cases» – 0 points;
- «rather rarely» – 1 point;
- «quite often» – 2 points;
- «practically always» – 3 points.

The maximum total score was 30 points.

To determine the criticality of thinking, the formula was used:

$$K_{crit} = N / 30$$

where K_{crit} – coefficient of critical thinking;

N – total score.

According to the obtained values of coefficients, students were divided into three levels according to formation of criticality:

- Low level ($K_{org} < 0,65$) – is characterized by rather rare manifestations of self-reflection, inadequate self-esteem, rare manifestations of a desire to seek the truth, the lack of clear criteria for assessing events, phenomena and other people.

- Medium level ($0,65 \leq K_{org} < 0,8$) – manifestations of self-reflection and self-analysis are quite frequent, the availability of criteria for evaluating people and phenomena, adequate self-esteem, a steady desire for seeking the truth, analysis of events and phenomena.

- High level ($K_{org} \geq 0,8$) is characterized by a steady desire to systematically evaluate own activities and actions of other people, check comprehensively assumptions, ability to look at assumptions as hypotheses requiring verification, and to give up those that do not pass verification, adequate self-esteem.

The results of the diagnosis according to the developed method showed positive changes in formation of critical thinking of students who participated in the forming experiment. Thus, 21,05% of the respondents of the experimental



group reached the high level, 68,42% – the medium level, the remaining 10,53% remained at the low level. The control group also displayed some positive changes, but they did not have such a prominent character. Regarding the respondents from the control group, 6,67% reached a high level of critical thinking, 76,67% – a medium level, and the remaining 16,66% of students remained at a low level.

The results obtained at all stages of the study using a modified method for determining the level of formation of students' critical thinking in the control and experimental groups, indicate that levels are different. The comparative results of the summative and control phases of the experiment are presented in Table 2.

Table 2

Levels of critical thinking development for students of EG and CG

№	Levels of critical thinking development	Experimental group				Control group			
		summative phase		control phase		summative phase		control phase	
		num-ber	%	num-ber	%	num-ber	%	num-ber	%
1.	High	3	7,89	8	21,05	2	6,67	2	6,67
2.	Medium	24	63,16	26	68,42	21	70	23	76,67
3.	Low	11	28,95	4	10,53	7	23,33	5	16,66

Thus, in the experimental group, after the completion of the formative stage of the experiment, a positive trend is observed on the indicators of high (+13,16%), medium (+5,26%) and low (-18,42%) levels of developing critical thinking in students. There were also some positive changes in the control group, but they are not so noticeable. There is no difference in the indicators of the high level of development of critical thinking, the medium level (+6,67%), the low level (-6,67%). The dynamics of change and difference in the levels of critical thinking formation in experimental and control groups are presented in Figure 2.

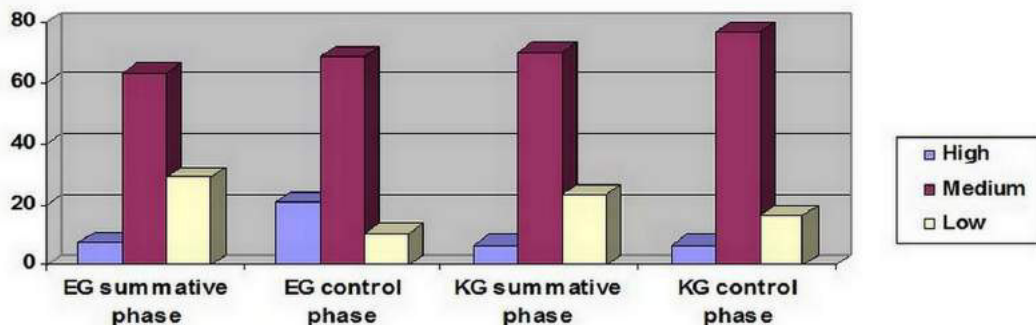


Fig. 2. Levels of critical thinking development in students of EG and CG

A comparative analysis of the results of diagnosing the levels of critical thinking of future teachers in the experimental and control groups before and after the experimental work allowed us to conclude that in the experimental group, the formation of critical thinking of students in learning activities was more effective than in the control group. Hence, the complex use of the suggested methods and techniques in the higher education institutions promotes the formation of critical thinking in students of the specialty «Primary Education».

The research is based on studies by T. Voropay, S. Terno, O. Tyaglo, D. Halpern, T. Khachumyan, who consider critical thinking in connection with the problem of assessment and self-assessment, control and self-control, self-regulation of students in educational activities. We agree with the opinion that a comprehensive model for developing critical thinking of future specialists should be based on the theory, in particular on the necessity to create problem situations and situations of choosing in the learning process; acquaintance of students with principles, strategies and procedures of critical thinking; organization of dialogue while solving problem tasks; ensuring written accounts of students' reflections; allowing the right to err and modeling situations of correction. Under such conditions, the development of critical thinking of future teachers gains consciousness, autonomy, self-organization, reflexivity, control and validity, as confirmed by the results of experimental research.

CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

1. The problem of developing critical thinking in students is diverse. The need for development of this type of thinking is determined not only by its significant role in choosing approaches to solving certain problems, but also by the importance of socialization of the individual, successful adaptation of future specialists to professional activities. Critical thinking is a peculiar way of thinking, the characteristic features being: development of strategies for making right decisions in solving any problems on the basis of obtaining, analyzing, processing information; performing



reflexive actions towards a particular object or phenomenon; balanced analysis of different opinions and views, self-expression, objective evaluation of the process and its outcomes.

2. The model of critical thinking development of students envisaged organizing and conducting classes in such a way that fully matched the purpose and objectives of experimental study. A wide range of innovative technologies, methods and techniques for developing critical thinking of future specialists at all stages of conducting classes has been used, namely: «Basket of ideas», «Right / wrong», «Thick / Thin questions», «Tree of predictions», «Fishbone», «Traffic lights», «INSERT», «Bloom's taxonomy», «Palette of emotions», «Reflexive screen», «Zigzag», «Six hats», «Angles» and others. A complex of educational and cognitive tasks and supporting didactic means to facilitate forming critical thinking of students has been developed.

3. Diagnosing levels of forming critical thinking of future teachers at the summative and control stages of research and experiment work has proved effectiveness of the chosen methodology. According to the analysis of experimental data, it has been established that due to systematic and integrated organization of the formative stage of research, positive progress has been observed in students of the experimental group, in particular, the number of students at high and medium levels of development of critical thinking has increased due to the reduction of respondents at the low level. The implemented methods and techniques of developing critical thinking of future specialists in the learning process ensured the achievement of the research goal and active participation of all members in the pedagogical experiment.

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