Level of Metacognition Development of University Students in the Process of Studying of Psychological and Pedagogical Disciplines

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Abstract*:* The article is devoted to studying the level of metacognition development among university students. The results of thesis research of the level of metacognition development of university students in the process of psychological and pedagogical disciplines study are presented.
Theoretical justification of the metacognition notion is given in this work. The analysis of domestic and foreign sources for metacognition researches is conducted. The level of metacognition development among students of specialty "Education" was analyzed and the results of the research were interpreted. Metacognitive characteristics of the personality, metacognitive behaviour, as well as types of reflection and metacognitive inclusion and awareness in educational activities are practically considered.

I.   INTRODUCTION

According to the State Program of Education and Science Development of the Republic of Kazakhstan, the main directions of work on improving the quality of education are to ensure equal access of all participants of the educational process to the best educational resources and technologies. The Program helps to meet the needs of students in obtaining education that ensures success in a rapidly changing world and form an intellectual, physical and spiritually advanced citizen of the Republic of Kazakhstan. Academic knowledge, functional skills, personal competencies and relationships are no longer sufficient to prepare a student for life in such environments. We need absolutely new qualities such as metacognition, metacognitive knowledge [1]. One of the main objectives of education is to provide students with metacognitive competencies, strategies, skills and metacognitive abilities within the educational process, which will later

be reflected in academic success and in future professional activities.

There is a contradiction between the necessity of development and application in pedagogical practice of metcognition technologies and the lack of psychological and pedagogical theories, methodical developments, allowing to realize the metadisciplinary approach in educational practice. The study of metcognition reflects trends in modern science. This field is characterized by the diversity of the considered problems, used methods and results, but at the same time it is generally accepted that metcognition is associated with quality assurance and efficiency of activities.

Traditionally, metcognition is considered as part of educational activities, and recently it has also been actively studied in professional activities. The role of metcognition in developing professional competence is considered. The prospect of developing this problem in terms of joint research activities and complex practices is anticipated. The most successful students have a specific understanding of the state of their own knowledge and can regulate their learning process.

Therefore, the inclusion of metadisciplinary learning affects not only the quality of cognitive activities, but also the development of professional metacognition as a whole.

II.   METHODOLOGY

Today, the concept of "metacognition" is used in the study and teaching of various disciplines (cognitive psychology, pedagogical psychology, developmental psychology, philosophy, etc.). This allows some researchers to use other concepts such as "self-regulation", "self-control", "executive control", etc.

The concept of metacognition and research of metacognition processes have a significant place in psychology and pedagogy. Significant researches on the problem of the structure and dynamics of processes providing cognition self-control is carried out in metacognitive psychology (J. H. Flavell, R. Kluwe A. Brown and others) [2,3,4]. In recent years, the problem of metacognition has also been developed by Russian scientists (M.A.Kholodnaya [5], A.V. Karpov, A.A. Pligin, etc.).

Metacognition is defined as a system of processes on initiation, organization, construction and control of the subject's activity, which determine the content, course and efficiency of cognitive activity. In the structure of metacognition there are two main components: cognitive-emotional and behavioral. Cognitive-emotional component is a system of information about cognitive activity as a specific type of human activity: content, structure, methods and conditions of effectiveness as well as the evaluation of individual cognitive resources (metacognitive knowledge and experience). Behavioral component is a system of processes ensuring self-regulation. Metacognitive processes have the following features based on the works of A. Brown, R. Kluwe, M. A. Kholodnaya, O. A. Konopkin: gnostical goal setting; modeling of significant conditions for cognitive activity; programming of cognitive actions; self-control of the process and results of learning.

In modern psychology, the metacognitive direction begins with J.H. Flavell's work "Metamemory." In the early 1970s, the problem of multilevel organization of consciousness was raised. Since the late 1970s, the metacognitive direction has been investigating cognitive processes (J.H. Flavell, J.R. Anderson, S. Taylor, R.E. Mayer, D.J. Hacker) [6,7,8,9]. Since the late 1980s, the metacognitive direction has been investigating cognitive processes and the whole personality (J.H. Flavell, R. Kluwe, A. Brown, H.M. Wellman) [10]. Today, there are number of researches on metacognitive psychology such as: Theoretical researches of the ontology of metacognition, its genesis, structural and functional organization (R. Kluwe, A. Brown, H.M. Wellman); applied researches in the field of cognitive learning (J.T. Jost, A.W. Kruglanski, T.O. Nelson) [11]; researches in the neuropsychology of metacognition processes (K. Vogeley, K.E. Weed, A.R. Luria) [12,13]; researches of the role of metacognitive functions in professional activity; general psychological

researches on structural and functional regularities of metacognitive processes and abilities (B.G. Ananiev, A.G. Asmolov, K.A. Abulkhanova-Slavskaya); systemic approach to research in the field of metacognitive science. (I.V. Blauberg, V.N. Sadovsky, E.G. Yudin).

Professional pedagogical activity is distinguished in the following researches: abilities, aptness, talent of a teacher (N.V. Kuzmina); psychological bases of a tecaher personality formation (A.B. Orlov, Z.A. Reshetova, A.I. Sherbakov); psychological readiness for work (A.A. Smirnov); psychology of creativity and pedagogy (Y.A. Ponomariov, L.I. Aidarova); psychological features of individual style of a teacher (A.K. Markova, B.I. Dodonov); formation of professional interests (E.A. Klimov); formation of emotional regulation of teacher's behavior (R.P. Milrud); formation of pedagogical communication (V.A. Can-Kalik, N.I. Gudkina); psychodidactics (E. Stones); technification of pedagogical process (N.Yu. Fominykh) [14], organization of educational process (M.E. Nurgalieva) [15]. The problem of metacognition development in professional education of a teacher, the problem of formation of metacognition at the stage of educational and professional activity of a student is not studied enough. The problem of the research was to find ways to develop metacognition of students at the university stage of professional training. The goal of this study is level of metacognition development of university students in the course of study of psychological and pedagogical disciplines

III. MAIN PART

Prerequisites for the development of research in the field of metacognition were the works of the following scientists: J.H Flavell, A. Brown, M.J. Lawson, J. Wilson, R. Kluwe, M.A. Dirkes, D. Ridley, P. Schuts, R. Glanz, C. Weinstein, R. Fisher, S.G. Paris, P. Winograd, G. Schraw, M.A. Kholodnaya, S. Mirkov, K.J. Crippen, K. Hartley, S. L. Rubinstein, U. Naisser, V. N. Druzhinina. R. Kluwe includes regulatory processes in metacognition, which help to determine the order of steps aimed at solving the problem and imply the determination of the intensity and work speed needed to solve the problem. M.A. Dirkes refers to metacognitive processes as conscious choice of cognitive strategy and planning. The cognitive planning processes are described in the works of A. Brown, D. Ridley, P. Schuts, R. Glanz, C. Weinstein, G. Schraw, K.J. Crippen, K. Hartley. In 1963, J.H. Flavell's work "Development Psychology of Jean Piaget", introduces the term "metacognition," which is seen as a conventional experience, the basis of life wisdom. In 1967 J.H. Flavell's work "Genetic Psychology of Jean Piaget", defines the meaning of the personality's activity and the limiting properties of the object in the process of acquiring knowledge, shows the organization of cognitive activity. A scientist defines cognition as organized activity. He wrote: "Each action presupposes a certain intellectual structure, a multitude of mutual links between cognitive acts and between the concept and meaning that these acts express. Any intellectual organization should be understood as something whole, as a system of relations between elements".

In 1971, J.H. Flavell formulated an understanding of the term "metacognition", which characterizes the subject's ability to manage and track the processes of remembering, saving and reproducing information. In 1976, J.H. Flavell introduced the concept of "metacognition" into psychology in his work "Metamemory". He wrote: "In any cognitive interrelations of people with each other or a person in interaction with the environment there are multiple processes of information processing. In this context, metacognition shows itself as a monitoring process, which is subject to specific objectives that regulate and coordinate cognitive operations and information blocks". Metacognition is a basic and simultaneously "through" characteristic of the psyche. From this position, the first definition is formulated.

Definition 1: Metacognition is a system of human knowledge about the peculiarities of one's own activity and ways to control it.

The above characterization is a description that this research will try to clarify through the following five comments, which reveal the relationship of the process owner with the surrounding world. Metacognition,

as understood by the scientists, is an activity that characterized by such features as psychological reality having localization in the higher nervous activity, number of subjects, subject content, inner activity, psychological structures of a personality, features of thinking, view (image) of the world. J.H. Flavell identified four components of metacognition: metacognitive knowledge, experience, goals and strategies. The first two components are reflexive formations, thanks to which the human intellect acquires some new quality- "cognitive monitoring".

The first property of metacognition is a psychological reality with localization in higher nervous activity. J.H. Flavell explains this by the fact that "the functioning of the intellect is a special form of biological activity and therefore has properties in common with the original activity from which it arose. The neurological and sensory structures that make up our specific heredity complicate or facilitate the functioning of the intellect". Further studies of metacognition processes in higher nervous activity performed in neuropsychology and presented in K. Vogeley, M. Vavrik, P. Walton, and A. R. Luria works, testify to the localization of metacognition processes in higher nervous activity. German researcher K. Vogeley, revealing self-representing cerebral representation, points out that when metacognitive knowledge of one's skills is actualized, activating areas of the ventralis callosal gyrus, and this occurs when cognitive structures are used, where the temporal zone of the right hemisphere cortex begins to dominate. According to the author, metacognition processes and the self-image, which regulate the cognitive sphere of the subject, at the level of neurons shows the presence of two different systems. The same opinion is held by English scientists M. Vavrik, P. Walton, who attribute orientation in the cognition to the functions of the frontal lobes cortex and the functions of "body self-reflection" to the parietal cortex. The above data correlate with A.R. Lurie's researches, which identified the cortex of frontal lobes and the zone of topical-spatial orientation as the higher integral brain zones, formed completely to adolescent age and responsible for the higher forms of activity and behavior regulation.

Therefore, the consideration of metacognition as mental properties and states suggests that, accompanying intellectual activity, it may be different in intensity. From this position, O' Neil formulates the following definition of metacognition.

Definition 2: Metacognition is a property of mental character characterized by stability and individuality as a way of response to a problem situation.

The second property of metacognition is the highest level of formation. J.H. Flavell believed that the main difference between cognition and metacognition is the orientation of the process. Cognition is aimed at the cognition of a reality (e.g., nature, mathematics, etc.).

Metacognition is a "cognition of cognitive phenomena." Fundamental in J.H. Flavell's metacognition concept is the definition of "thinking about one's thinking". Thinking can be seen as: the metacognitive knowledge at the moment of what we know; the metacognitive skill according to what we currently think; and the metacognitive sense of how we can assess our current cognitive or emotional state. In order to differentiate metacognitive thinking from other types of thinking, it is necessary to consider the source of metacognitive thought processes. Metacognitive thought processes originate from a person's inner ideas about this reality. This difference in the term is fixed in the prefix "meta" (from the Greek "after" or "beyond"). The difference between cognitive and metacognitive strategies (orientations) is as follows: the former help the individual to achieve a specific cognitive goal (e.g., to understand the text), and the latter are used to control the achievement of this goal (e.g., self-control to understand the text). J.H. Flavell came up with the idea that there is a metaprocess that regulates every cognitive process, respectively the processes of metamemory, metacognitive thinking, metaperception. Memory is not seen as an isolated function, but as part of the processes of reflection of the outside world in our consciousness, which are generally called cognitive processes. Metapatter includes storage and intellectual structures, search and

solution, thought control (J.H. Flavell). Metacognitive thinking about cognitive tasks is intentional, predictable, with a specific purpose and orientation to future thought behavior (J.H. Flavell). According to the orientation of the mental process, there are two levels of information processing: objective and metacognition level, and two metacognition processes - assessment and quality control. J. Flavell's definition of metacognition is basic and used in psychology for almost thirty years. Most scientists stick to this definition. J.R. Anderson defines "metacognition as the knowledge and control of cognitive processes," S. Taylor defines "metacognition as the knowledge on how to apply knowledge effectively and reliably," J.T. Jost, A.W. Kruglanski, T.O. Nelson defines metacognition as "the ability to analyze, understand, and control one's learning", R.E. Mayer defines metcognition as the knowledge and understanding of one's cognitive processes.

Later on, the meaning of the concept of " metacognition" was expanded on the basis of scientists' study of the most important properties of metacognition and identification of three groups of relations between intellect and mental processes, which limit the scope of definitions such as: relations between the intellect and the mental processes controling behavior, relations between the intellect and the personal experience, relations between the intellect and adaptive structures. On the basis of the relationship between the intellect and mental processes that regulate behavior, the definitions of "metacognition" and "metacognitive process" are given in the works of M.A. Dirkes, R. Kluve, D. Ridley, R. Fisher, A.V. Karpov.

Definition 3: "Metacognitive processes are processes aimed at connecting new information and previously learned knowledge, conscious choice of cognitive strategy, planning, monitoring, evaluation of cognitive processes" (M.A.Dirkes).

Definition 4: "The metacognition structure is the processes that help allocate resources to the current task, aimed at checking and evaluating the solution of the task" (R. Kluwe).

Definition 5: "Metacognitive processes are processes that include planning and strategy selection, conscious control of learning, error correction, analysis of the effectiveness of cognitive strategies, and behavioural change when necessary" (D. Ridley).

Definition 6: "Metacognitive processes are the processes of recognizing a problem, identifying and defining the elements of a situation, presenting the problem, creating a thought map of the problem, comparing it with others, planning actions, identifying resources and setting targets, evaluating progress and solutions" (R.Fisher).

Definition 7:"Metacognition is a system of human knowledge about the peculiarities of one's own activity and ways to control it. The content of metacognitive knowledge includes knowledge about one's abilities, motives, interests, desires, and learning strategies. Metacognitive processes are the processes of planning and controlling cognitive activities, checking the results of these activities". A. Brown. J.H. Flavell emphasized the close connection between metacognition and complex affective reactions. He believed that metacognition can be accompanied by an experience of success, satisfaction, motivation, failure. S.G. Paris, P. Winograd, D.J. Hacker have developed this idea in their researches from the perspective of the theory of personality (personality constructs), the theory of personality ability.

Definition 8: "Metacognition includes knowledge of one's knowledge, processes of motivational and emotional states, ability to consciously and deliberately control and regulate one's knowledge, thinking processes, motivational and emotional states". S.G. Paris and P.Winograd student of J.H. Flavell completed the first definition by summarizing the processes and states highlighted by S.G. Paris, P. Winograd, taking into account individual abilities.

Definition 9: "Metacognition is the ability to control emotional states, but it is also regulation and

monitoring of cognitive processes" (D.J. Hacker). In proposing this definition D.J. Hacker argued that "metacognition thinking does not come from the immediate human external reality; rather, the source of metacognition is tied to internal mental reality, and may include knowledge of that reality itself; how it works and how it feels. As shown in the seventh, eighth, ninth, and tenth definitions, scientists turn to the personal experience of an individual, preserving the notion of metacognitive processes. A.L.Brown expands the idea of meta-knowledge by characterizing personal activity. J.H. Flavell sees as a source of metacognition experience the situations that are emotionally intense, such as soul pain and crisis. The significance of adaptive metacognition was examined through metacognition mechanisms, which provided an explanation for many personality disorders in the area of affect. In 1996, metacognition processes were systematized and divided into groups where consciousness and the unconscious are present.

The third property of metacognition is the integrity of the structure of metacognition and cognitive control. Metacognition can be considered through two factors - metacognition through metacognition processes and metacognition monitoring. Later, these two factors were interpreted by Marzano and his co-authors as metacognition forming knowledge and monitoring of cognitive abilities of the subject, knowledge and monitoring of cognitive processes. J.H. Flavell offers a model of metacognition and cognitive control. The model is based on the premise that a person is able to influence through metacognition and metacognition sensation on goals, concrete actions and strategies. Based on J.H. Flavell's work, R. Kluwe, in relation to the metacognition actions, distinguishes two main features: knowledge according to the structure of thought functioning, ability to evaluate, control the direction of thought processes. R. Kluwe linked cognition about the functioning of thinking with declarative knowledge (storing data in long-term memory), and the ability to control and regulate the direction of thinking process with procedural knowledge (stored system processes). R. Kluwe believes that the preserved processes of systemicity are the processes aimed at solving problems of a certain nature. According to R. Kluwe, the mechanisms regulating the actions of selection, implementation of resolution process regulation represent knowledge of metacognitive and executive processes.

Metacognitive knowledge is the knowledge about the functioning of the cognitive processor and the control of cognitive processes. Metacognitive knowledge includes three types of metacognitive knowledge: knowledge of declarative character, knowledge of procedural meaning, knowledge of certain conditions. Knowledge of a declarative nature carries conceptual knowledge about the features of specific tasks or types. Knowledge of procedural importance has information about how exactly a cognitive strategy is applied depending on the conditions, what its priority in this situation. There are two groups of knowledge in procedural knowledge: if conditions are changed, how this will affect knowledge of the task, its requirements and how these requirements will be met; knowledge of certain strategies for solving tasks (cognitive strategies to achieve the goal; metacognitive strategies to control the progress of cognitive strategies).

Metacognition control includes activities that involve the prediction, evaluation and regulation factors of cognitive processes. It is important to use executive processes of control in order to obtain information about human thought processes. These processes assume the subject to identify the task in the process of activity, for example, planning, evaluating and controlling when it comes to promoting this activity; predicting the forthcoming result, speaking about regulatory processes. Planning involves the targeted selection of cognitive strategies, taking into account the specifics of the task and it is largely dependent on declarative knowledge and knowledge of conditions. Executive processes involve the control and regulation of cognitive processes that are equally consistent with metacognition strategies (by J.H. Flavell) and metacognition skills (by A. Brown, H.M. Wellman). Metacognitive assessment includes evaluation of performance and self-evaluation. S.G. Paris, P. Winograd, supporting this idea, understand metacognition as two essential constructs: self-esteem and self-management of knowledge. Self-esteem is a person's awareness of knowledge, ability to assess his emotional state in relation to his knowledge, abilities,

motivation. Scientists point out that the driving force behind the development of this system is individual activity, and therefore include in metacognition planning, control, monitoring and evaluation activities. Relationship between intelligence and adaptive structures. The level of complexity and breadth of the external and intrapsychical reality coverage determine individual features of personality adaptation. As it is known, information storage lies at the heart of learning processes and formation of individual experience of the subject's activity. The evaluation of emotional states is important too, which is the basis for the subsequent evaluation of the goals and requirements of the tasks, knowledge of solution strategies. Emotional and motivational state often determines the regulation of new strategies in the acquisition of knowledge and the probable possibility of transferring the solution strategies to other tasks. Regulation can predict what the outcome of the work will be. The regulation includes an assessment of current activities and a comparison with the objective of the current result. Executive processes aim and influence the organization and coordination of own thinking. These processes allow to build a certain algorithm of available resources for the task, to identify and allocate the resources of the current task, to plan the order of actions that are the basis for solving the task, the sequence of actions to implement the goals, to determine the pace of work needed to solve the task. Planning, evaluation and regulation of cognitive activities by algorithm precedes, accompanies and completes each activity stage.

The fourth property of metacognition is the influence of the activity development level on the consciousness of a person.

A characteristic feature of the scientific product of cognitive scientists are models representing the composition, functional device, communication between the blocks of the model. The functions of the metacognitive system imply the study of the surrounding world, the creation of a subjective image of the objective world, the development of a strategy of one's behavior, the formation of goals and motives for human actions.

The fifth property of metacognition is the subject content of thought activity. H. Gardner, author of the theory of multiple intelligences, justifies the existence of up to eight different intellectuals in each person: spatial, linguistic, musical, logical-mathematical, naturalistic (associated with the tendency to observe and classify natural phenomena), corporal-kinesthetic, interpersonal (social) and intrapersonal (which determines the wealth of spiritual life). On a cognitive level, these factors reveal the mechanisms of realization of the intellect in a certain area of reality (e.g. linguistics, music, mathematics, biology, human relations with the world and other people, the position of the individual towards culture, religion, philosophy). According to H. Gardner and R. Kluwe, on the level of metacognition, there are processes of a systemic nature in a multitude of intelligences and processes that affect the resolution of a problem in a certain direction.

The sixth property of metacognition is the results of metacognition activity. In addition to the traditionally studied processes of information processing, there are metacognition processes responsible for managing current intellectual activity. Since the second half of the 20th century the psychological researches has increasingly raised the subject of metacognition processes.

Table 1. Metacognition processes

Metacognition processes	Results of metacognition activities
Metacomprehension	Conscious choice of information processing strategies at preliminary categorization by the algorithm of perception simplification.
Metamemory	Ability to actualize incoming information, assess the process of learning at different levels and be able to relate new incoming knowledge to the areas

	of existing knowledge.
Metathinking	The result of the systematization and structuring algorithm of all experience elements in certain fields of knowledge is the knowledge of an individual about their knowledge.
Metacognitive knowledge (metacognition)	Beclarative knowledge, procedural knowledge, knowledge of conditions
Metacognitive Control	cognitive planning, cognitive assessment, cognitive regulation
Metacognitive processes and personal experience	The ability of goal setting, the ability of forecasting, the ability to determine the available resources for the task implementation, the ability to direct and locate the resources of the current task, to determine the algorithm of actions for making the task decision, the ability to set a sequence of actions for the implementation of goals, the ability to determine the pace of work corresponding to the task solution.

Later on, the meaning of the concept of " metacognition" was expanded on the basis of scientists' study of the most important properties of metacognition and identification of three groups of relations between intellect and mental processes, which limit the scope of definitions such as: relations between the intellect and the mental processes controling behavior, relations between the intellect and the personal experience. In metacognition, mental processes are integrated. Metacognition is seen as the unity of mental processes, properties and states. The definition of metacognition includes three aspects of the mental sphere of personality: cognitive, affective and behavioral. General provisions of the metacognition concept: knowledge of one's knowledge, processes of motivational and emotional states; ability to consciously and deliberately control and regulate one's own knowledge, processes of thinking of motivational and emotional states; relations between intellect and adaptive structures. The level of complexity and breadth of the external and intrapsychical reality coverage determine individual features of personality adaptation. In the process of self-study and self-development, metacognition skills play an important role, which are professionally important qualities of a modern specialist. Research shows that metacognition helps to understand the meaning of what is being learned, making it possible to view metacognitive skills as the basis for successful learning. Metacognition skills affect the success and effectiveness of the learning process, as it is important for the students to be aware of their strengths and weaknesses. Consequently, there is a need to identify educational methods in which students can improve their metacognition skills. The problem of research is determined by the need to study metacognition, inclusion in the learning process as a future professional activity, as well as the components considered as success factors in the development of professional metacognition, such as reflexivity and metacognitive behavior.

The research was conducted in universities. 160 students from the 1st to the 2nd study year participated in the research, with the age from 18 to 20 years old. The control group (CG) included 81 students, the experimental group (EG) included 79 students. Diagnosis was carried out in individual contact mode, by filling out the forms. The main objective of the study was to select appropriate methods, carry out diagnostic work using psychodiagnostic techniques, analyze and compare the results. The problem of research is determined by the need to study the level of development of metacognition among students as a factor of success. At the stage of the ascertaining experiment, the components of the students' metacognition competence such as motivational, cognitive, and reflexive were diagnosed. Based on the components under consideration, the criteria and corresponding indicators were selected.

Diagnosis of the motivational component was carried out by two indicators: motives aimed at obtaining new knowledge or mastering a profession, and motives for applying metathinking. In order to check the

motives aimed at obtaining new knowledge or mastering a profession, the results obtained in the professional selection group using the questionnaire of professional motivation in the transition to the 2nd study year were used. The professional motivation questionnaire is designed to study and assess the main components of general and professional motivation. The questionnaire allows to estimate 10 components of motivation reduced into 10 scales, 8 of which reflect theoretical ideas about the structure of personality, 2 scales are additional, they reflect interests and aptitude to learning in general and to a certain specialty. The diagnostic results were ranked in three levels. A high level of motivation to acquire new knowledge or professions in the control group and the experimental group of students showed zero results, 69.5% of students in CG and 58.5% of students in EG had an average level, 30.5% of students in CG and 41.5% of students in EG had a low level. There is a high percentage of students with an average level of professional motivation, while a low level is quite high, the CG average value significantly higher than the EG and the low level is significantly lower. This result may be the result of the fact that the level of necessary motivation for mastering a profession varies significantly each year and depends on many factors. The predominance of the middle level demonstrates the conscious need for professional motivation of more than 60% of students, while those with low levels have doubts about the correct choice of profession. Evaluating the results obtained by this indicator, it should be noted that CG students are more motivated to master a profession, at the same time both in the control group and in the EG have no students with a high level of professional motivation, which in turn indicates the need for more careful selection of candidates for admission to higher education.

The level of the motives manifestation for the use of metathinking was checked using observation in the process of teaching psychological and pedagogical disciplines. The motives for the use of metacognition showed the following values: 3.5% of students in KG and 2.5% in EG showed a high level, 58.2% of students in CG and 59.5% in EG had an average level, 37.6% of students in CG and 38% in EG had a low level. These values show that, on average, about 3% of students understand and consistently use their metathinking, about 59% of students understand that by organizing their own work using metathinking the learning task can be accomplished most effectively, and about 38% of students do not think about using metathinking or have no idea what it is.

The cognitive component is represented by two indicators, such as: thinking processes, expressed in the ability to think (generalization, analysis, flexibility, inertness, attentional set-shifting), in the ability to perceive (speed, accuracy, distractibility), in the skills of attention (distribution, attentional set-shifting), in speaking skills (language use, literacy); in the imagination (spatial); knowledge of the basics of self-organization, forms and methods of independent planning, analysis, control and correction of their educational and professional activities according to the test. A set of methods was selected on the basis of selected criteria of metacognition competence assessment. A Short Selection Test of General Ability (SST) was used to test the first indicator of the cognitive component. The diagnostic results were ranked in three levels. A high level of thought processes was noted in 16.5% of students in CG and 12.7% in EG, the average level was 71.7% of students in CG and 73.4% in EG, a low level of thought processes was determined in 11.8% of students in CG and 13.9% of students in EG. Thus, there is a high percentage of students with an average level of development of thought processes. At the same time, a slight difference between the results of indicator measurement in the CG and the EG indicates an approximate identity of these groups.
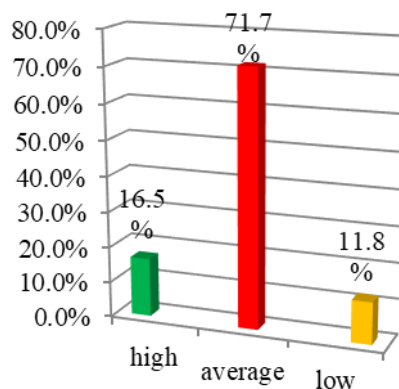
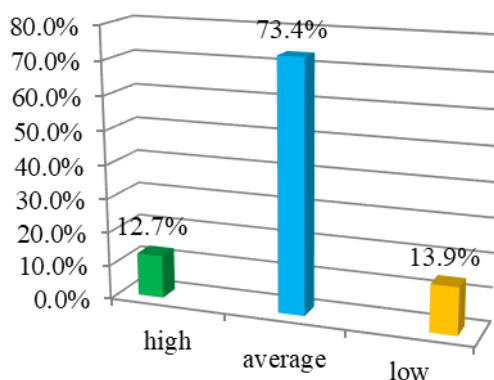**Diagram 1.** Level of thought processes in the control group

Diagram 2. Level of thought processes in the experimental group

The reflexive component was tested according to the metacognitive personality test (John Everson), which has four scales: metacognition involvement in activities, self-testing, strategy use, action planning. As with the previous components, the results were ranked in three levels, with each scale considered separately. The methodology fundamentally highlights the following components of metacognition: planning, self-testing, monitoring thought processes, selecting and applying cognitive strategies. Each scale was seen as a relatively independent and sufficiently significant metacognition property of the individual.

Table 2. Scales of metacognitive properties of personality

"Metacognition involvement in activities" scale		
levels	Control group	Experimental group
high	10,6 %	22,8 %
average	63,5 %	45,6 %
low	25,9 %	31,6 %
"Usage of strategies" scale		
high	2,3 %	17,7 %
average	62,4 %	48,1 %

low	35,3 %	34,2 %
"Action planning" scale		
high	3,5 %	5,1 %
average	53 %	48,1 %
low	43,5 %	46,8 %
"Self-testing" scale		
high	2,4 %	1,3 %
average	28,2 %	29,1 %
low	69,4 %	69,6 %

The number of students with a high level of "Metacognition involvement in activities" was 10.6% CG and 22.8% EG, with an average level of 63.5% CG and 45.6% EG, with a low level of 25.9% CG and 31.6% EG. This suggests that students have knowledge about the use of metathinking, but it is used by a small percentage of students in the CG and twice as many in the EG. There are significant differences between the high and medium levels, but the low level is higher in the EG. On the "Usage of strategies" scale, 2.3% of students in CG and 17.7% in EG demonstrated a high level, while the average level was 62.4% in CG and 48.1% in EG, and the low level was 35.3% in CG and 34.2% in EG. The number of students with high level of strategy use was significantly higher in the EG, but the average level prevailed in the EG, with low level of metathinking strategy. There was almost the same number of students in both groups, which suggests that students are aware of a small number of cognitive strategies and opportunities to use them, but 80% of students consciously do not use them. Analysis of the results on the "Action Planning" scale showed that only 3.5% of students in CG and 5.1% in EG showed a high level, while 53% of students in CG and 48.1% in EG showed an average level, 43.5% of students in CG and 46.8% in EG showed a low level. These results led to the conclusion that both groups had almost the same level of educational planning and goal-setting. However, relatively few students are aware of the possibility of planning educational activities and use these skills. The fourth "Self-testing" scale showed rather low indicators, namely: A low level was observed in 69.4% of students in CG and 69.6% in EG, average level in 28.2% of students in CG and 29.1% in EG, high level in 2.4% of students in CG and 1.3% in EG.

Thus, students have weak ideas about the algorithms of work if it is necessary to independently verify the results of the educational task. Significant differences in the indicators on the three high level scales in CG and EG demonstrate that the university program aimed at the development of metadisciplinarity in the younger generation of students. This program has yielded positive results, however, the overall average values for all levels have shown slight differences in groups. The research made it possible to conclude that the level of motivational, cognitive, operational and reflexive components of metacognition competence of students does not meet the requirements for a university graduate. This has determined the relevance of introducing new organizational and pedagogical conditions that increase the efficiency of training of modern specialists. Such specialists are capable of self-monitoring their knowledge, setting goals and planning the self-educational process, understanding the peculiarities of their thinking and effectively using them in educational activities.

IV.   CONCLUSION

In the course of this work there was an analysis of local and foreign sources devoted to the topic of metacognition. Various definitions of metacognition were analysed. The analysis of psychological and pedagogical literature showed that there is no clear concept of metacognition in national science. There is no unified understanding of the term "metacognition" in psychology and pedagogy. The corresponding methods were selected. The diagnostic work was carried out with the help of psychodiagnostic methods, the results of the development level of students' metacognition were analyzed and interpreted during the study of psychological and pedagogical disciplines. For the successful level of development of metacognition among students it is necessary to have a specially organized metacognition environment aimed at formation of self-determination processes, development of ability to take into account features of intellectual sphere and choice of optimal strategies for the achievement of the set goals.

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