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**«METACOGNITIVE MONITORING OF SOLUTION OF EDUCATIONAL
TASKS: PSYCHOLOGICAL MECHANISMS AND DEVELOPMENT
CONDITIONS IN THE EDUCATIONAL PROCESS»**

Specialty 19.00.07 - Pedagogical psychology (psychological sciences)

ABSTRACT OF THE DISSERTATION

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Relevance of a research. Development of a problem of metacognition is among the directions of researches which are most intensively developing today in modern psychology. Introduction of a construct «metacognition» allowed psychologists to progress in understanding of mental regulation of processes of the solution of problems of various type and contents significantly. The significant data opening an essential role of metacognitive activity as a factor of effective functioning of processes of knowledge are obtained

The problem of metacognitive activity in the learning is the central direction of psychology and pedagogical researches today, and metacognitive processes act as one of the most important prerequisites of the high-organized learning.

A key role in structure of metacognitive activity of the student is played by processes of metacognitive monitoring. From the theoretical point of view, it is considered as the difficult complex of informative acts including various ways of tracking by the student of process and results of own knowledge when performing problems of assimilation of experience. Monitoring processes are the initial basis for all subsequent stages of metacognitive regulation. They initiate inclusion of managing directors of knowledge of strategy of metacognitive control. At the same time processes of monitoring are updated at all stages of expansion of metacognitive activity of the student, since the moment of formulation and acceptance of an educational task and finishing assessment of its solution.

At the same time there is a considerable massif of the empirical works confirming the central place of monitoring in the learning. They include tens of researches in which it is shown that pupils with the high level of development of metacognitive monitoring show higher academic success. In general mature forms of metacognitive activity act as a condition not only the current educational progress, but also achievement of competence at development of concrete areas of knowledge. This circumstance induces to search of psychological mechanisms of metacognitive monitoring in the solution of educational tasks.

Research objective: theoretical and methodological justification and empirical check of procedural model of metacognitive monitoring of the solution of

educational tasks and definition on its basis of psychology and pedagogical conditions of development of metacognitive skills in school students and students.

Research problems:

1. To carry out the theoretical analysis of history, current state and the most significant trends in development of a problem of metacognition and metacognitive monitoring in the learning.

2. To define the place of metacognitive monitoring in structure of metacognitive activity, to show the central value of monitoring processes in regulation of the informative sphere of students.

3. To systematize scientific research in which the role of metacognitive activity in general and metacognitive monitoring in relation to the academic achievement is opened.

4. To carry out comparison of various psychology and pedagogical models of metacognitive activity in structure of the learning and to reveal their opportunities and restrictions in an explanation of mechanisms of metacognitive monitoring of the solution of educational tasks.

5. To analyze the available theoretical representations and experimental developments describing mechanisms of tracking by the person of own cognitive activity in an general-psychological context and to define the possible prospects and difficulties of their use within a psychology and pedagogical perspective.

6. To formulate the theoretical provisions proving a role heuristics as psychological mechanisms of metacognitive monitoring of the solution of tasks of the learning.

7. To develop the theoretical model describing essence of metacognitive monitoring of the solution of educational tasks on this basis and to show its advantages in comparison with other theoretical approaches to its studying.

8. To carry out an empirical inspection of model of metacognitive monitoring of the solution of educational tasks and to analyze a role of heuristic processes in removal by students of metacognitive judgments.

9. On the basis procedural model to construct a number of the forming experiments and to conduct researches of influence of psychology and pedagogical conditions on characteristics of metacognitive monitoring of the solution of educational tasks. To reveal ways of development of metacognitive skills.

Research object: metacognitive monitoring of the solution of educational tasks.

Subject of investigation: the psychological mechanisms defining functioning of metacognitive monitoring of the solution of educational tasks, psychology and pedagogical factors and conditions of formation of skills of monitoring.

The **general hypothesis** of a research consists in the assumption that key characteristics of metacognitive monitoring are caused by heuristic conclusions about process and results of the solution of an educational task which are made studying on the basis of indirect signs of own cognitive activity.

The provisions submitted for protection:

1. The role of metacognitive monitoring in structure of metacognitive activity is caused by the fact that its judgments initiate the subsequent work of metacognition, are updated at all stages of the solution of an educational task, are involved in regulation of various aspects of the solution of tasks.

2. Identification of mechanisms of monitoring activity of the student demands specification of psychology and pedagogical models of metacognitive activity and transfer of general-psychological theoretical developments and empirical results to the area of educational researches.

3. The procedural model of metacognitive monitoring of the solution of educational tasks explains monitoring as set of acts of a heuristic inference of metacognitive judgments on the basis of substantial and procedural characteristics of the solution of an educational task. Acts of creation of monitoring by the subject of judgments represent conclusions on the basis of indirect signs of the solution of a task. Along with heuristic processes by a source of formulation of metacognitive judgments the analytical processes consisting in rational, consecutive tracking studying own cognitive activity in the learning act.

4. Accuracy of judgments of metacognitive monitoring positively corresponds to the academic success studying at various steps of educational process, within studying of various domain.

5. Various forms of a problematization of metacognitive knowledge of pupils reduce the impact of heuristic processes on monitoring. It occurs because reasonings of students on the accuracy of own monitoring initialize processes of conscious critical reconsideration of the metacognitive judgments received as a result of a heuristic conclusion.

6. Characteristics of tests of knowledge (type of a test task, the number of possible answers, contents of the instruction to test tasks, quantity of the correct answers in the paragraph of the test) have significant effect on judgments of metacognitive monitoring. It does them by the important tutorial to skills of a self-assessment students of own knowledge and competence.

7. Dynamics of metacognitive monitoring which is expressed in change of confidence and accuracy of metacognitive judgments, is defined by joint influence external (type of test tasks, the number of possible answers in the test, the instruction to test tasks, a situation of assessment of educational achievements) and internal (domain-specified knowledge, personal confidence, a self-assessment of metacognitive knowledge and skills, achievement motivation) factors.

The most significant results of a research:

1. As a result of the theoretical analysis, it is shown that the metacognitive activity is an essential factor of effective cognitive functioning of the subject. Metacognition substantially causes quality of distribution of cognitive resources and a resulting effect of the solution of the most various tasks: sensory, perceptual, the mnemonic, intellectual, on decision-making and others. Therefore, the construct «metacognition», is theoretical abstraction which has considerable potential in terms of an explanation of various phenomena of the learning and instruction. This concept discloses new aspects in activity of the student which were not a studying subject in psychological researches earlier.

2. The theoretical analysis revealed that a specific place in structure of metacognitive activity is held by the processes of metacognitive monitoring representing tracking by the subject of process and results of the solution of a cognitive task. The key role of monitoring is defined by the following circumstances: its process and results produce processes of metacognitive control; monitoring is updated at all stages of the solution of a task, monitoring is involved in regulation of various parties of cognitive activity; represents a complex system of the informative acts including metacognitive judgments of various type. As a result monitoring acts as a condition of productive regulation of the cognitive sphere of the person and is a factor of adequate realization of processes of metacognitive control of the solution of tasks. The essential value, in this regard is given to such characteristic of monitoring as its accuracy.

3. It is established that way of a research of quality of metacognitive monitoring is the paradigm of calibration (realism) of confidence which assumes comparison of a subjective and objective picture of the solution of tasks. Within this paradigm important phenomena which can be designated as various distortions of metacognitive monitoring are revealed. Among them the most important place is taken by the overconfidence phenomenon, and its various manifestations connected with internal features of the subject and characteristics of solvable tasks.

4. The appeal to empirical researches of educational activity recorded inaccuracy of estimates by school students and students of own knowledge and informative opportunities in the solution of educational tasks. At the same time the overestimate of own knowledge of the learning are most widespread. In the researches conducted within a calibration paradigm it is shown in phenomena of overconfidence of the solution of tasks of the doctrine. Close positive connection of the level of development of skills of metacognitive monitoring of the solution of educational tasks and the academic success is found. Students who estimate own competence of the learning more objectively show significantly higher academic success. In turn excessive confidence in the solution of educational tasks is characteristic of the underachieving students. This ratio is reproduced when using

various methods of measurement of monitoring processes, on material of various curriculum and at the students representing different steps of educational process in the solution of educational problems of various type and complexity, in the conditions of the foreign and domestic educational environment.

5. The ratio between the level of development of metacognitive skills in general and metacognitive monitoring in particular, and the academic achievements is recorded in various foreshortenings of the analysis of educational process. So, it empirically is confirmed in researches: a) with students at various steps of educational process (school students, bachelors, undergraduates, graduate students); b) on material of various domains-specified knowledge (humanitarian disciplines, natural-science disciplines, social sciences, technical disciplines, etc.); c) with use of various research assessment procedures of metacognitive activity (a metacognitive conversation; polling techniques, method of reasonings aloud; experimental studying in a calibration paradigm); d) on material of the solution of educational problems of various type (computer imitations, text tasks, tests of knowledge, tasks for understanding of texts, etc.).

6. The main theoretical approaches to a problem of metacognitive activity in the learning are generalized and systematized. It is revealed that the models presented in the analysis not always raise the question of knowledge monitoring mechanisms therefore they have no necessary level of specification. The insufficient specification of the analysis of metacognition of the learning leaves beyond limits studying of options of negative impact of metacognition on the academic success, cases when metaknowledge can not only facilitate, but also complicate development of the subject of the doctrine. The same circumstance complicates the solution of significant applied educational tasks – design and introduction of the procedures aimed at the development of skills of metacognitive monitoring.

7. The analysis of theoretical approaches to a problem of monitoring of knowledge revealed two various points of view on psychological mechanisms of removal of judgments of the person of own cognitive processes and opportunities. In terms of personal approach of distortion of monitoring of knowledge are a

consequence of steady personal lines (self-confidence). The psychological mechanism which is offered by representatives of personal approach as an explanation of phenomena of excessive confidence in own informative opportunities is self-deception. The alternative point of view is heuristic approach according to which the source of distortions of monitoring of knowledge lies in cognitive processes. The heuristic processes which are the cornerstone of creation of metacognitive judgments act as the psychological mechanism of excessive confidence. There is a substantial empirical support to hypotheses of a role эвристик in the course of metacognitive monitoring. There are convincing data opening a contribution familiarity heuristic, availability and a binding in process of formulation of metacognitive judgments. They are received on material of the decision various including educational tasks and also in relation to various types of metacognitive judgments.

8. Other opposition developed in cognitive psychology and comprises the competition between two types of the hypotheses concerning psychological mechanisms of metacognitive monitoring. On the one hand, it is the hypothesis assuming direct access for the subject to own cognitive activity. On the other hand, there is a hypothesis of heuristic assessment of indirect signs of functioning of knowledge and removal on their basis of metacognitive judgments. Metacognitive monitoring from a position of a heuristic hypothesis should be understood not as actually judgments and as conclusions. The person not so much perceives, observes the knowledge how many thinks about it, going beyond that information which it obtains in the form of indirect markers of the decision. At the same time, along with mechanisms of a heuristic conclusion of metacognitive judgments, also analytical processes are involved in tracking of process and results of the solution of an educational task.

9. Transfer of the general-psychological researches of conclusions received as a result of the analysis about influence heuristics on metacognitive monitoring is carried out. The procedural model of monitoring of the solution of educational tasks which includes two ways of formulation of metacognitive judgments became its

result. First, judgments of monitoring are presented as result of heuristic assessment to pupils of indirect signs of process and results of the solution of an educational task. As the content of metacognitive monitoring represents set of conclusions, but not direct judgments of process and results of the solution of an educational task, signs of the decision (availability, familiarity) act as significant factors of monitoring irrespective of the valid level of success of the decision and create prerequisites of emergence of illusions of knowledge and competence. Secondly, the analytical component of model is presented as set of processes of rational, consecutive judgment of own cognitive activity in the learning. On the one hand analytical processing is implemented in that case when process of the solution of a task is initially developed and rather well conscious. On the other hand, this component of monitoring can be involved in critical reconsideration of already developed metacognitive judgments which are created on the basis of a heuristic conclusion. The offered procedural model has a number of advantages in terms of opportunities of penetration into an essence of mechanisms of metacognitive monitoring and also in respect of promotion of the possible hypotheses concerning difficulties of metacognitive training in skills of monitoring has high degree of generality in relation to educational problems of various type.

10. The empirical research from 14 series which showed that in the course of metacognitive monitoring of the solution of educational tasks, students at creation of metacognitive judgments lean on heuristic assessment of indirect signs of process and results of the solution of a task is conducted. There are steady interrelations between procedural signs of the decision (a variable of availability of the solution of a task), substantial signs of the decision (a variable of a familiarity of maintenance of a task) and metacognitive monitoring of the decision. It is proved that heuristic assessment of quality of process and results of the solution of tasks is separate, not depending on the level of subject knowledge and also some cognitive and personal characteristics of the student, the factor determining the accuracy of metacognitive monitoring.

11. The specified interrelations are very steady and are fixed: a) on material of educational problems of various type (tests of knowledge of various curriculum, tasks on detection of educational difficulties, tasks on social interaction); b) in tasks with various domain-specified knowledge (various psychological courses, Russian, literature, questions on the general awareness); c) at the students representing various professional and educational groups (school students and students of various age); d) with use of various ways of an operationalization of variables (value and objective judgment of a factor heuristics). Along with a contribution of heuristic processes the facts of the involvement of analytical strategy into process of formulation of metacognitive judgments are empirically recorded.

12. Sizes of the found correlation show that heuristic assessment of availability of the solution of an educational task, is more significant factor of metacognitive monitoring in comparison with assessment of a familiarity of a task. In general, the obtained empirical data, testify in favor of the offered procedural model of metacognitive monitoring of educational tasks according to which formulation of metacognitive judgments is made by the pupil on the basis of implicit heuristic assessment of procedural and substantial indirect signs of the solution of an educational task.

13. In the forming part of a research consisting of 9 series various psychology and pedagogical conditions of development of skills of metacognitive monitoring in pupils were studied. It was shown that the problematization of the current metacognitive knowledge which is carried out in the form of the critical argument of metacognitive judgments leads to a certain improvement of characteristics of monitoring of the decision. The essence of these changes consists in removal of effect of impact of heuristic processes on metacognitive monitoring and the subsequent decrease in confidence in the decision of tests of knowledge and also tasks on formulation of educational difficulties. Various forms of a problematization of the current metacognitive knowledge lead to a certain improvement of characteristics of monitoring of the decision. The essence of these changes consists

in decrease in effect of impact of heuristic processes on metacognitive monitoring under the influence of conscious revision of initial metacognitive judgments.

14. Implementation of the procedure of a problematization of metacognitive knowledge of students in the form of criticism of availability of the answer as valid sign of its correctness showed in the test that these experimental training influences do not lead to a rupture of relation between heuristic processes and judgments of monitoring. However, they initiate analytical activity of students which consists in more careful and critical approach to own metacognitive judgments. It in turn leads to decrease in confidence in the decision and increase in accuracy of metacognitive monitoring.

15. In two researches of the forming stage it is shown that change of parameters of monitoring of the decision (decrease in confidence in the solution) updates at pupils of strategy of metacognitive control that is expressed on the one hand in their consent to revise the last decisions, with another – in improvement of indicators of effectiveness of the solution of an educational task.

16. It is revealed that various characteristics of tests of knowledge (type of a test task, contents of the test instruction, the number of answers distractors) significantly change dynamics of metacognitive monitoring of the solution of educational problems of this type and can compensate effect of impact of heuristic processes on metacognitive knowledge of the student. Thus, the model of metacognitive monitoring of the solution of educational tasks was confirmed in aspect of influence of objective characteristics of an educational task on monitoring judgments.

17. Effects of interaction external (characteristics of tests) and internal (cognitive, metacognitive and personal) factors of metacognitive monitoring of the decision are found. This circumstance needs to be considered at further development of the theory of metacognitive activity in the learning.