UDK 159.955; 159.953 **V. O. Voloshyna**

Facing Up to the Problem of Metamemory abilities' Development

У статті проаналізовано теоретичні положення проблеми розвитку метапам'яттєвих здібностей, на основі яких розроблена тренінгова програма їх розвитку. Наведені результати експериментальної верифікації апробації тренінгової програми розвитку метапам'яттєвих здібностей.

Ключові слова: *метапам'ять, метапам'яттєві здібності, тренінгова програма.*

В статье проанализированы теоретические положения проблемы развития способностей метапамяти, на основе которых разработана тренинговая программа их развития. А также, приведены результаты экспериментальной верификации апробации тренинговой программы способностей метапамяти.

Ключевые слова: *метапамять, способности метапамяти, тренинговая программа.*

In the article the author analyzed the results of theoretical aspects of problems of metamemory abilities' development. On the basis of these results a training program was designed. Also, there are outcomes of experimental verification of the training program for metamemory abilities' development illustrated in the article.

Keywords: *metamemory, metamemory abilities, training program.*

Purpose. One of the most recently debated topics is focused on the problem of metamemory abilities' development. On the one hand, the number of authors, who devoted work to exploration of ways of metamemory abilities' development, belong to a class of common and almost impossible to form or using non-standard tasks, either through teaching logic and more. Metacognitive learning is about of developing an intelligence, the totality of mental abilities and strategies, which enable the process of learning and adapting to new conditions [12]. Most methods

of cognitive training emphasize the importance of metacognitive processes that allow the subject to control cognitive activity, and thus, to make it more effective. Theoretical analysis of some literature confirmed that despite of the importance problem of metamemory abilities' development in the domestic psychology underrepresented programs of development.

Theoretical background. Metamemory development involves mastering different cognitive strategies that allow people to update metacognitive processes and manage cognitive activities, as well as the formation metamemory abilities and cognitive processes, which are related to resources that helps adequately assess their own memory. The result of training is metamemory awareness, which represents the ability to realize their own cognitive activity and necessary cognitive and arbitrary use of metacognitive strategies [2].

There are several approaches to explore metamemory abilities; the most effective ones are those that combine theoretical and practical training. In this case student not only learns about cognitive processes and strategies (metacognitive knowledge), but also practicing cognitive and metacognitive skills in the classroom [7], because neither theory nor practice alone does not give a good and lasting results of development [9].

In Soviet psychology has repeatedly expressed the idea that the assessment of individual intellectual capabilities are much more important than characteristics of the "analytical" (cognitive) processes, because it also defined as the features "integrated mental processes" (in the form of goal-setting, planning, forecasting, decision making, etc.) [2]. It is determined by two main factors: a small lifetime of metacognitive school and the historical development of this area.

Domestic and foreign scholars do not distinguish separately metamemory abilities, and consider them in the context metacognitive processes. Metacognitive ability to characterize individual personality characteristics (second-order cognition), allowing the individual to reflect, evaluate and consciously (unconsciously) to manage its own mnemonic system in assessing the effectiveness or building predictive models [2]. The value of metamemory abilities is that people

are came to realize their own thinking process, and can constantly be evaluated or make adjustments to their internal mental strategy [5].

Thus, we can conclude that metamemory ability - is the individual and psychological characteristics of a person, which is the ability to adequately assess the possibility of its own memory.

Most of the early studies were phenomenological metamemory abilities. However, the transition from descriptive studies to empirical, their number has increased and there was a need for their classification. It was proposed several classification schemes that group these studies. Despite the fact that there are few differences among them, in general, there are three main groups [2]:

I group - the study of cognitive control: evaluating the accuracy of knowledge distribution and characteristics of attention and efforts to their own ideas about the mnemonic activity.

II group - self-study: study features understand and use various mnemic strategies, their effectiveness for a certain type of problem solving.

The third group - the control and regulation of research: the study of the relationship of features metamemory basic processes and their interdependence.

As metamemory abilities are defined as individual psychological characteristics of person, which is the ability to adequately assess the possibility of its own memory, we are on the basis of theoretical analysis and relying on the results of the strategy developed metamemory abilities:

- the formation of conceptual ideas about memory;
- improving knowledge about the peculiarities of memory and skills to manage their memory;
- develop skills to use strategy metamemory;
- productivity;
- development of logical thinking;
- the skills of planning and self-regulation.

In our program have been used games with a pencil and verbal games, crosswords, puzzles, puzzle, logic exercises, exercises on the development of

memory that develop concentration, stability intellectual processes, improve basic thinking operations - analysis, synthesis, generalization, abstraction, raising interest in intellectual quest and help to improve memory. Intellectual important game because most players, even without thinking about the consequences, developing not only a memory, steady attention, attention, observation; imaginative, logical, psychological, philosophical and creative thinking, the speed of thought; and patience, confidence, patience, tolerance, and other personal and characterological quality [1; 2; 8].

The proposed training program is aimed at mastering system perceptions of their cognitive processes such as memory. This will allow students flexibility in setting educational goals, to the current and final control of the process of intellectual activity, applied cognitive strategies, self-planning, evaluation and monitoring of their own cognitive activity, which is essential for understanding their own cognitive processes.

We have developed a comprehensive training program consists of three blocks: I - theoretical (aimed at forming a conceptual ideas about memory and improve knowledge about the peculiarities of memory that is presented in the form of mini-lectures) II-practical (aimed at forming metamemory abilities (provides the skills to manage your memory and logical thinking development) and III-reflective (to assess learning, generalization of experience, assess the achievements of participants planning opportunities for application of acquired knowledge and skills).

The methodological basis of our program for developing metamemory abilities are concepts of Flavell J.H., who claimed that the formation of metamemory is impossible without the support of the thinking tools and operations, knowledge about mnemotechnics underlying assets. According to the researchers, metacognitive thinking, monitoring and evaluation of cognitive processes form the basis of metacognitive activities. The wording of thinking strategies involves three stages: the task of tracking the processes of thoughts and feelings that accompany decisions; generalization, classification of the information

received and the primary formulation strategies; the final formulation and operationalization ways of thinking. [6] It should teach students to plan learning process because it leads to its frequency, duration, amount of material in order to timely and successfully solve the learning tasks.

The study was conducted under the Research Laboratory of Cognitive Psychology National University "Ostroh Academy".

Participants. Thirty-three Ukrainian-speaking students (26 women and 6 men; mean age = 18.21 years, SD = .85) participated in the experiment. The participants were divided into two groups: Experimental (n=16) and Control (n=16).

Materials. All items in the experiment were presented on PC computers, using the software E-prime 2.0. Items consisted of 60 Ukrainian-Swedish word pairs standardized to vary on the following variables: item difficulty and familiarity. All stimuli were specially selected by such characteristics as: difficulty and familiarity and thereby were divided for 30 word pairs in each study list (interference vs control).

Procedure. The experiment had six discrete stages. *(1). EOL phase.* The 30 Ukrainian-Swedish word pairs were presented separately and for each item the participants made an EOL judgment. In the EOL session the participants focused on the time they get later for study and on the word pairs. In the instruction participants were informed that they would later learn the items. The EOL question was as follows: "How sure are you that you will learn to remember the Swedish word if shown the Ukrainian?" The participant reported his or her estimate on a 1 (very easy) to 6 (very hard) ordinal scale, by pressing the appropriate button on the computer screen with the mouse button. The order of presentation of the pairs was randomly determined for each participant. This procedure continued until all 30 items had been judged. (3). *Study phase*. Before the study phase the participants were instructed to study each pair so that later, in the following stage, they would be able to recall the second word in each pair when the first is presented. During the study phase, the 30 stimulus Ukrainian-Swedish word pairs were presented one

after the other in a new individual random order. Each word pair was individually displayed in the center of the screen. The order of time presentation of the word pairs was random. *(4). JOL phase.* After all word pairs have been studied the participants perform JOLs on the 30 word pairs that did not receive JOLs before. All JOLs was cue-only JOLs, that is, when making the JOL the participants were only shown the first word of the word pair. The JOL question was following: "How sure are you that you later will recall the Swedish ward if shown the Ukrainian?" The participant reported his or her estimate on a 1 (very unsure) to 6 (very sure) scale and entered it on her or his monitor. The order of presentation of the pairs was randomly determined for each participant. *(5) Filler activity.* The main aim of this stage was to divert attention from previous phases of the experiment and to update the information learned to further its recall. Before the studied task was to solve basic math equations (duration - 3 min.). *(6)* C*ued recall test.* The recall test was given directly after filler activity. The participants were instructed to fill in the Swedish word when shown the Ukrainian. They were allowed 25 s to answer on each trial.

The next step of the experiment was to conduct the training program. The program consisted of three sessions lasting three hours each.

After this, it was continued with repeated measurement of metamemory variables. The procedure was similar to the first stage, but study list was different.

Results. All effects declared reliable from initial analyses of variance (ANOVAs) have p less than the alpha level of .05. All correlation coefficients are Goodman-Kruskal gamma correlations, which are the best of the available measures of metamemory accuracy (Nelson, 1984), and t-test.

Within-group differences of mean values for EOL, JOL judgments and memory performance are shown on Table 1 and 2. These results indicate that the differences between the EOLs (p = 0,85), JOLs (p = 0, 06) and memory perfomance (p = 0, 35) in the control group are not significant, ie, participants evaluated their ability to remember stimuli in control group equally. This can be explained by the fact that investigated the control group did not participate in the

second stage of the experiment, and according to this group, we did not make any impact.

Table 2.

Group contrasts of mean values for EOLs in experimental and control groups

	Experimental Group			**Control Group**		
	JOL_{before}	**JOL_{after}**		**JOL_{after}**	**JOL_{before}**	
	M (SD)	*M(SD)*	*t (p)*	*M (SD)*	*M(SD)*	*t (p)*
Judgments	2.12 (.23)	3.32 (.94)	3.99* (.05)	3.25 (.43)	3.19 (.76)	.84 (.85)
G	.25 (.45)	.39 (.54)	1.99 *(.02)	.27 (.48)	.39 (.55)	1.04 (.09)
O/U	+.43 (.15)	+.31 (.22)	1.89 *(.03)	+.26 (.20)	+.29 (.28)	.84 (.21)
C	.19 (.13)	.22 (.18)	.55 (.57)	.26 (.13)	.27 (.15)	.09 (.99)
R	.13 (.02)	.02 (.02)	1.99* (.05)	.02 (.03)	. 02 (.03)	1.14 (.31)
Kn	.17 (.02)	.16 (.02)	1,19* (,05)	.15 (.03)	.14 (.01)	,89 (,25)
Br	.11 (,03)	.16 (.06)	1.10* (,05)	.09 (,04)	.10 (.05)	.79 (,13)

*Note. * = indicates significant differences as measured by paired-sample t-test (* for p's ≤ .001; ** for p's ≤ .05).*

In the experimental group we found significant difference between these variables. Differences between mean values of ratings EOL (p = 0.05) are statistically significant. So we can conclude that the participants increased ability to monitor further storage in general: the choice of strategy of storing, distribution time study and etc.

Table 2.

Group contrasts of mean values for JOLs in experimental and control groups

	Experimental Group			**Control Group**		
	JOL_{before}	**JOL_{after}**		**JOL_{before}**	**JOL_{after}**	
	M (SD)	*M(SD)*	*t (p)*	*M (SD)*	*M(SD)*	*t (p)*
Judgments	4,89 (.87)	3.61 (.94)	3.65* (.02)	3.32 (.99)	3.22 (.92)	3.24 (.06)
G	0,22 (.45)	.32 (.54)	3.12* (.02)	.25 (.55)	.27 (.42)	1.04 (.19)
O/U	+.27 (.21)	+.33 (.23)	2.97* (.05)	+.29 (.18)	+.16 (.35)	3.74* (.02)
C	.27 (.13)	.24 (.18)	.55 (.57)	.27 (.15)	.26 (.15)	.09 (.99)
R	.03 (.02)	.02 (.02)	2.99* (.05)	. 02 (.03)	.04 (03)	1.14 (.31)
Kn	.20 (.02)	.22 (.02)	1,29* (,05)	.21 (.01)	.20 (.03)	,89 (,25)

Br	.22 (,03)	.22 (.04)	1.30* (,05)	.19 (.05)	.22 (.06)	.99 (,12)

*Note. * = indicates significant differences as measured by paired-sample t-test (* for p's ≤ .001; ** for p's ≤ .05).*

Also, we found statistically significant differences for JOLs (see. Table 2). Their role in the learning process is very important for understanding the mechanisms underlying the control of their own cognitive processes and is the basis for finding ways to improve the functioning of these processes. Also, JOLs are defined as predictions of future memory after learning has taken place rather than before. JOLs have been investigated extensively in part because of their central role in models of self-regulated learning (Nelson & Narens, 1990; Schwartz, 1994; Thiede & Dunlosky, 1999). JOL theories have increasingly focused on the inferential nature of these judgments. That is, when making a JOL, people presumably draw inferences about their future performance based on a variety of cues pertaining to the task (Koriat, 1997). Therefore, we can assume that the respondents who participated in the training program may be further determining the level of learning to decide whether they want to read or skip to the next task.

Statistically significant differences were also found in memory task (p = 0.05). Thus, it indicates that training program leads to better metamemory performance in the experimental group. Therefore, we empirically confirmed that training program is significantly contributed to the development of metamemory variables.

Concluding remarks. Thus, complex work using selected exercises creates conditions and prerequisites for the successful metamemory abilities' development, because it contains the potential formation monitor and control further storage in general: the choice of strategy memorization, study time allocation, increase productivity the development of logical thinking, planning and the skills of self-experience, of collective experience solving problems and overcoming difficulties. Implementation of this training suggests mastering system representations of their cognitive processes.

The obtained results during diagnostic and prognostic stage of research results allow, firstly, noting the necessity of forming not only need in knowledge of how memory works, but also form its main components. Secondly, it underlines the importance of knowledge, naturally may be used by students in the learning process.

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