

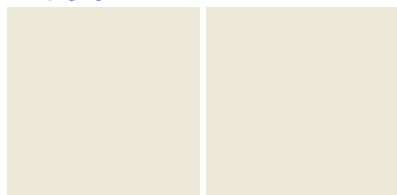
Issue: Volume 49, Number 3 / May-June 2011

URL: [Linking Options](#)

- [Guest Editors' Introduction: Contemporary Research on Learning, Remembering, and Forgetting: The Scientific Legacy of P.I. Zinchenko Today](#) pp. 3 - 10
Anton Yasnitsky and Maria Falikman
DOI: 10.2753/RPO1061-0405490300
- [Memory in the Learning Activity of the Schoolchild](#) pp. 11 - 23
N. V. Repkina
DOI: 10.2753/RPO1061-0405490301
- [Involuntary Remembering of Words in Various Attentional Demands](#) pp. 24 - 39
I. S. Utochkin
DOI: 10.2753/RPO1061-0405490302
- [Current Motivational State May Change the Phenomenology of Recollection Automatically: A New Effect of Activity on Reported Vividness and Confidence](#) pp. 40 - 54
V. V. Nourkova
DOI: 10.2753/RPO1061-0405490303
- [Knowledge Retrieval Strategies: The Case of an Artificial Domain](#) pp. 55 - 67
M. A. Minakova and M. V. Falikman
DOI: 10.2753/RPO1061-0405490304
- [Explicit Ignoring of Information During the Performance of Memory Tasks](#) pp. 68 - 83
Valeriia Gershkovich
DOI: 10.2753/RPO1061-0405490305
- [Nostalgia: Dialogue Between Memory and Knowing](#) pp. 84 - 97
Alexander V. Zinchenko
DOI: 10.2753/RPO1061-0405490306
- [Publisher's Note: Complete Digital Archives of Selected M.E. Sharpe Journals Are Now Available Free of Charge Exclusively to 2011 Institutional Subscribers](#) pp. 98 - 98
DOI: 10.2753/RPO1061-0405490307

Article

Back To: [Main](#) ● [Publication](#) ● [Issue](#)



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Memory in the Learning Activity of the Schoolchild

N. V. Repkina

Abstract:

This article proposes one possible approach to the development of concepts regarding human memory, based on the results of studying it during the educational process from the standpoint of an activity-based framework, whose internal logic required a shift to the study of memory in the context of real-life learning activity. The focus here was on memory's link not to the psychological structure of an action but to the processes of the subject's self-regulation. Since it is reflexive in nature, goal-setting engenders mnemonic processes of a corresponding type. Therefore, the author contends, the main function of memory turns out to be not simply the retention or the selection and interpretation of experience, but its reflexive organization directly in the process of accumulation. The theoretical validity and practical potential of this interpretation of memory are confirmed by the material the author obtained from experimental and mass-scale education aimed at developing the schoolchild as a subject of learning activity.

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N.V. Repkina

Memory in the Learning Activity of the Schoolchild

Keywords

Involuntary memory, memory, comprehension, voluntary memory, developing education, system of developmental education by D. El`konin - V. Davydov, reflexive memory, reflexion, subject, learning activity, goal, goal-setting

Abstract

This article proposes one possible approach to the development of concepts regarding human memory, based on the results of studying it during the educational process from the standpoint of an activity-based framework, whose internal logic required a shift to the study of memory in the context of real-life learning activity. The focus here was on memory’s link not to the psychological structure of an action but to the processes of the subject’s self-regulation. Since it is reflexive in nature, goal-setting engenders mnemonic processes of a corresponding type. Therefore, the author contends, the main function of memory turns out to be not simply the retention or the selection and interpretation of experience, but its reflexive organization directly in the process of accumulation. The theoretical validity and practical potential of this interpretation of memory is confirmed by the material the author obtained from experimental and mass-scale education aimed at developing the schoolchild as a subject of learning activity.

The problem of the association between the processes of memory and education has proved to be one of the central issues both for the modern scientific psychology of memory and for contemporary pedagogy. We see our task in describing in general terms one of the possible and, it seems to us, most persuasive and promising approaches to solving it, which was laid out by P.I. Zinchenko.

Zinchenko conducted memory research in the context of the activity-based framework of A.N. Leontiev. The first studies already revealed the uniqueness of his position—from the very outset he formulated the task of investigating memory in the context of activity. Therefore Zinchenko viewed the results of his research, which he summarized in a monograph [5] and were derived from laboratory models of activity, merely as a first step on the path to understanding the objective patterns of the functioning and development of memory. He underscored the need for studying memory in real-life activity, and especially in the primary stages of schooling.

Favorable conditions arose for this when the USSR Academy of Pedagogical Sciences gave permission to vary the content and modes of schooling within certain limits. Zinchenko was particularly interested in experimental education (which later was given the name of developing education [*razvivaiushchee obuchenie*]), which was based on the main tenets of the psychological framework of A.N. Leontiev and P. Ia. Gal'perin and was implemented by the laboratory of D.B. El'konin and V.V. Davydov with the facilities of School No. 91 in Moscow. In close collaboration with it, a laboratory directed by Zinchenko at Kharkov University began operating in 1963.

The first task was to determine the opportunities for utilizing involuntary memory in the education of younger schoolchildren. The crux of the problem was that the item to be assimilated (and remembered) was not the results of an action performed by a method with which pupils were already familiar, as is the case in laboratory experiments regarding involuntary memory, but the methods themselves. In traditional education these methods, which are formulated as appropriate rules, are remembered by means of memorization. The possibility of involuntary remembering of such educational material was cogently shown already in Gal'perin's studies of the step-by-step formation of mental actions and concepts [2]. But he did not specifically address the conditions for involuntary memory to be successful in education. A study by Sereda explored them [17, 18, 19]. In effect, the results of that study, as well as Gal'perin's study, led to the conclusion that the

reorientation of primary education toward involuntary memory was possible and advisable. But this conclusion left a number of fundamental questions unanswered. First, the study established the effectiveness of remembering particular methods that made it possible to accomplish tasks of a certain type. Yet El'konin and Davydov had already shown in the conditions of experimental education that the contents of formative education must be based from the very outset not on the modes of action themselves but on their sources, the object-based premises, the foundations that make up the content of theoretical concepts [3, 20]. The question of the distinctive features of memory, which enables the productive remembering of theoretical concepts and their systems, was not addressed in Sereda's study. Second, while Sereda acknowledged that voluntary memory in education is just as necessary as involuntary memory, both its function in education and the balance between the two types of memory remained undetermined. Third, the conditions in which involuntary memory is effective were identified when education is organized in such a way that the goals and modes of pupils' actions are preset from outside, by the teacher. Are these conditions sufficient for experimental education, when the activeness of pupils assumes the form of learning activity, i.e. when the goals of actions and the modes of carrying them out are not preset for the pupil from outside but they presume the child engages in his own trial-and-exploration activity?

The next step in solving the more general problem raised by Zinchenko must be a study of memory not within the framework of the assimilation process but in the context of learning activity [*deiatel'nost'*] as the highest form of the subject's learning activeness [*aktivnost'*].

The necessary prerequisites for this study were created by the organization of the educational system of El'konin and Davydov, which made it possible to shape the learning activity of younger pupils in a planned manner. El'konin and Davydov regarded learning activity as an activity of self-change in the subject, involving the mastery of a concept (the general mode of action) that enables the pupil to independently find ways of accomplishing a certain class of practical or cognitive

tasks [3, 20]. Learning activity viewed this way, wherein the pupil would discover and assimilate the content of a concept, took on features close to those of a scientific study, and hence was given the name of “quasiresearch” activity (Davydov).

While this approach was absolutely correct in emphasizing the role of theoretical knowledge as the main source of changes in the subject engaged in learning activity, it did not provide a sufficiently clear answer to the question regarding the content of these changes. The reason was that it did not adequately take account of the two-way nature of human knowledge. Any knowledge is divided into object-based content, i.e. its objective significance, and the meaning that this knowledge takes on for the individual in concrete activity. These two aspects of knowledge play a fundamentally different role in the individual’s life. If the significance of the knowledge creates a possibility for transforming reality, its meaning is a necessary condition for implementing this possibility. This means that the individual as the initiator of activity is characterized not by the content of the knowledge per se that he possesses but by the meaning that it takes on for him. This notion was put forth back in 1947 by Leontiev, who stressed that only if knowledge takes on meaning for the pupil “will it be living knowledge for him, become genuine ‘organs of his individuality,’ and in turn determine his relation to the world” [8, vol. 1, p. 378].

Mastery of knowledge content can be achieved only through its assimilation, i.e. reproduction in the consciousness. The decisive role in mastery is played by thought. But the meaning of the knowledge, the role that it takes on in concrete activity, cannot, be fundamentally assimilated. It can be discovered and comprehended by the individual directly in the process of activity. The comprehension of this meaning constitutes the content of understanding—a special psychic process that, while closely related, is not identical to thought. In our view, the question of the balance between the processes of thought and understanding was not reflected in the theory of learning activity of El’konin and Davydov and calls for special scrutiny. In the context of this article it is important for us to emphasize that it is the process of understanding that attaches a certain meaning to

the knowledge being assimilated, thereby defining the pupil's relation not only to the knowledge but also to himself as the learner.

Hence a change in the subject engaged in learning activity occurs not in the assimilation per se of the knowledge but in the understanding of its meaning.

Of course, understanding the meaning of knowledge is always based on an analysis of its subject content and essentially depends on its substantiveness. Conducting such an analysis is a separate task, during which the concrete content of the knowledge is assimilated. But this task in learning activity is always an ancillary, intermediate one with regard to the task of understanding the meaning of the knowledge. Proceeding from the foregoing, V.V. Repkin defined a learning task not as a task of assimilating a concept, a general mode of action, but as a task of understanding the concrete underpinnings of the action. In performing this task, the pupil must find an answer not to the question of how it is done but to the question of why it is done precisely in that way [9].

Obviously the task of understanding, unlike the assimilation task, cannot be given to the pupil from outside. He can only set such a task for himself, and only if, after encountering difficulties in performing the action, he sees the cause of these difficulties in an inadequate understanding of the concrete underpinnings of the assimilated modes of action (knowledge), which presupposes a fairly high level of development of defining reflexion. This means that learning activity begins not with the acceptance at one moment in time of a goal set from outside but with its definition by the pupil himself, which, as in any human activity, constitutes an elaborate process not simply of completing the definition or of redefinition but of "constructing" a goal, of goal-setting [15].

Given this interpretation of learning activity, the main characteristic of the subject engaged in it is the ability for self-change, i.e. for independently formulating and performing tasks to understand the world. This ability cannot be a prerequisite for learning activity; it emerges and develops during the process as the pupil masters the activity [9].

The above concepts of the content of learning activity were the basis of a version of the formative-education system proposed by V.V. Repkin and set forth in textbooks and methodological guides for the Russian language (Repkin et al.) and mathematics (A.M. Zakharova). We should emphasize that this version was developed not as an alternative to the system of developmental education by D. El'konin - V. Davydov but as its organic outgrowth, which was reflected in Davydov's summary monograph [3].

The implementation of this version of developing education in the Kharkov school-laboratory made it possible to investigate the distinctive features of the memory of a younger school child as a subject engaged in learning activity [12, 13]. Since a learning task, as a task of understanding, cannot be given from outside, the main characteristic of the subject engaged in learning activity is his ability to independently set such tasks for himself, i.e. his goal-setting ability. It was logical to assume that the development of this ability is what produced a restructuring of the memory of the subject engaged in learning activity, if this process indeed takes place. One could expect that this restructuring would manifest itself most clearly in a change in involuntary memory, which is directly related to the goal.

To test the hypothesis, an individual diagnostic experiment was conducted at the end of the third grade, in which pupils were introduced to a somewhat simplified content of the concept of grammatical cases. The experimenter demonstrated to the pupil that the latter already knew quite a bit about cases but could not answer the question of what a case was, and the experimenter suggested that he listen closely to an explanation that would help to answer the question. The explanation, in the form of a discussion, revealed the content of the concept of cases, and the definition was repeated twice. Additional information was provided on the number of cases in other languages. After the discussion the pupil was asked to answer the original question ("what is a case?") as precisely as possible, and several additional questions were asked such that the totality of responses to them made it possible to judge the distinctive features of goal-setting and involuntary memory.

The experiment was repeated in the same school-laboratory for three years. Altogether, seventy-six pupils took part in it. The task-completion time ranged from ten to forty-five minutes.

Since the goal was formulated by the experimenter in a general form that prevented it from becoming a real goal of action by the pupils, they had to fill it with a certain concrete content. The distinctive features of this content were viewed as the indicator of the goal-setting level. It turned out that 80 percent of the pupils defined the content of the concept of a case as the goal, i.e. they set a learning task for themselves. Sixteen percent defined a verbal definition of this concept as the goal. And only certain pupils were unable to define any concrete goal for their actions. Thus, for the vast majority of pupils goal-setting proved to be at a level that enabled them to independently set learning tasks for themselves.

The evaluation of memory took into account the completeness and accuracy of the reproduction of the content of the concept, of its verbal definition and of additional factual material.

Sixty percent of the pupils reproduced the content of the concept, its verbal definition and supplemental material fully and accurately. Twenty percent of the pupils reproduced both the main and supplemental material with several inaccuracies. Typically, all of these pupils defined the goal as the content of the concept. The pupils who defined the goal as the verbal formulation or the definition of the concept reproduced both its content and the definition with flagrant errors, and the supplemental material somewhat better. Finally, the pupils who did not define the goal of the action reproduced only certain fragments of both the main and the supplemental material with a flagrant distortion of the meaning. Thus, the quality of the reproduction mostly correlates with the content of the goals defined by the pupils.

When the results are evaluated in terms of their consistency with Zinchenko's well-known proposition that the efficiency of involuntary remembering depends on the goal of the action [5], questions arise. Why did the pupils who defined the goal as the content of the concept still successfully reproduce its definition? How does

one explain the very low level of recall of the definition of the concept by pupils who defined it as the goal? Why, given the different goals for their action, did pupils recall the factual material relatively successfully? To answer these questions, we must understand why the content of the actual goal proved to be different for various pupils when they performed the same task.

In the classical experiments on involuntary memory the goal of the action is predefined for test subjects, already prepared and in concrete form. The content of this goal is unequivocal and unchanged while the action is performed (to arrange pictures and words on a certain basis, to solve an arithmetic problem, etc.). In this case the goal was predefined in a general form that prevented it from becoming a real goal of action by the pupils (“to find out what a case is”), they had to fill it with a certain concrete content. Exactly what content the goal would be filled with would depend on the meaning that the associated problem situation took on for the pupil. Depending on the level of development of the defining reflexion, this situation can be interpreted either as indicating an inadequate understanding of cases or as revealing a lack of some specific knowledge about it (the verbal definition). Based on this, the object of the action is defined either as the content of the concept or its verbal definition. But in order for the defined object to become the actual goal of action, the pupil must ascertain exactly what he is lacking for an understanding of cases or for a construction of its definition. The answer to this question presupposes that the general model that reflects the content of the concept (or the structure of its definition) and was assimilated in previous education is compared against the problem situation that has arisen. It is in the process of this reflexive control of the initial general model that the flaws in it, the “gaps,” whose removal is the goal of the impending actions are discovered. This goal turns out to be not a concrete image of the required result but rather its hypothetical draft, for which the reflexively evaluated general model is the medium.

Thus, defining the content of the goal of action is not an act occurring at a single moment in time but a process in which three sequential stages clearly stand out. First is a reflexive evaluation of the problem situation. Based on it the task that

arises for the pupil takes on various meanings: either a task of understanding, i.e. a learning task per se, or a task of assimilating concrete knowledge. Second is the actualization of general model of the structure of the concept conforming to the meaning of the task or of the relevant type of knowledge. Third is the reflexive control of the general model, whose results define the hypothetical content of the goal. The hypothesis regarding the content of the goal, its draft, is tested, refined, and adjusted as the task is performed by comparing the result of each successive action against the draft. Therefore the performance of the task proves to be not only a process of achieving a goal but also a process of testing the goal through action (Leontiev), which is a natural conclusion to the goal-setting process.

It is in this single process of goal-setting and goal implementation that the recall of material by means of the model constructed in the goal-setting process takes place. The content, completeness and accuracy of this model ultimately determines the relevant characteristics of memory.

Thus, in real-life learning activity it is clear that involuntary memory depends on the goal-setting process, whereas in laboratory conditions only its dependency on the content of the predefined goal is evident.

This interpretation of the relation between memory and the goal-setting process explains the aforementioned facts, which at first glance are internally contradictory. Indeed, pupils who define the goal as the content of the concept are able, once the goal is concretized, to rely on the relevant general model, which was repeatedly constructed in the process of the previous education, substantively generalized, and assimilated by the pupils. In this general model of the concept are concentrated its main semantic components and the relation between them. For all practical purposes, this model is the model of the logical structure of the definition. In the educational process, however, it has never been viewed from this perspective and has been apperceived by pupils only as a model that reflects the main content of the concept. Clearly, all the elements of the concept, including those that are part of the structure of its definition, must definitely be incorporated into this model and compared with one another. But since the pupils were not

consciously aware of that structure, they did not single out the definition of the concept as a separate object and could not have involuntarily recalled it. Nevertheless, if necessary they were able to construct it by relying on the defined semantic elements of the concept and the substantive relation between them. When answering the relevant question, pupils do not reproduce the definition in ready-made form, but actively construct it. This is borne out both by the variation in the spoken form of the definition of the concept and by the process itself of its formulation, which is filled with pauses, evaluative comments, corrections, etc. This suggests that involuntary memory that relies on a substantively generalized model of a concept proves to be just as reflexive as the actions that it is derived from.

Since the logical structure of the definition in the general model of the concept is nonconscious, the proportion of pupils (20 percent) who performed the same cognitive task defined the semantic elements of the concept inaccurately. The results of the construction of a definition of the concept proved equally inaccurate and incomplete: they lacked the generic characteristic of a case—the grammatical form of the word, which was viewed separately in the explanation of the material. It was not compared by the pupils against the model of the concept and therefore was not established in involuntary memory.

The pupils who defined the object of action as the verbal definition of the concept naturally did not single out either the semantic elements of the concept or the substantive connections between them. But they could not complete the task they had set for themselves, either, since they were not consciously aware of the structure of the logical definition of the concept. Therefore, in attempting to formulate this definition, they could rely only on its spoken form, which was spontaneously assimilated in the process of interaction (“a table is where people eat”). Such “definitions” were often a perfunctory, often meaningless combination of words randomly retained in memory (“a case is a form of a number” and so forth).

The relation between involuntary memory and the model on which the definition of the goal of action is based is also evident in the distinctive features of the recall of the supplemental material (the number of cases in various languages). The pupils who defined and concretized the goal of action on the basis of the model of the content of the concept sought to compare against it each successive fact stated by the experimenter. Therefore the supplemental material proved substantively related to the defined goal of action. This was apparent in the distinctive features of the reproduction of the material. First, the pupils reproduced it in a generalized, obviously reasoned form, and second they were able to concretize the material fairly completely and accurately. For all of the other pupils the material turned out to be unrelated to the goal of action. Remembering of the additional material is explained by the fact that it attracted the pupils' attention because it was unusual and novel. The reproduction was marked by a lack of generalization and by individual facts reproduced in random order and replaced or supplemented with information drawn from past experience rather than from the task material.

The foregoing facts confirm the supposition that memory efficiency depends on the degree to which goal-setting has taken shape and give us a new understanding of the changes that occur in memory in learning activity. Indeed, the memories of most of the pupils who are able independently to set a learning task for themselves show distinctive features that attest to a higher level of development of involuntary memory. But as was established in our study [9, 12, 13], and in the study of G.V. Repkina and A.S. Yachina [10], similar qualitative changes also occur in the voluntary memory of younger schoolchildren. This suggests that these distinctive features indicate not only and not so much an improvement in voluntary and involuntary memory as the qualitative uniqueness of the memory of the developed subject engaged in learning activity, in which voluntary and involuntary memory is organically synthesized.

The uniqueness of this memory is most clearly manifested in situations where performance of a learning task, i.e. the understanding of a certain object, requires the pupil to rely not on the results of his own actions with the object but on its

understanding by another person (a teacher, textbook author, and so forth). As was shown earlier, the process of comparing someone else's thought against a generalized model of the concept makes it possible not only to understand the thought but also to retain it in memory in the form of a concretized model of the concept. This process may be described as comprehending memory. In terms of its characteristics this memory, for the most part, matches the postvoluntary memory detected by E.F. Ivanova among older schoolchildren and undergraduates when she studied the relation between memory and theoretical thought [7]. But a definition of such memory as postvoluntary does not seem precise enough to us. It correctly reflects the changes in the mechanisms of voluntary memory that result from its drawing closer to thought, but it fails to take into account the special function that this memory performs in the subject's activity. As G.V. Repkina showed, the fundamental distinction of the subject's memory from its pre-subject forms is that it allows individual experience not only to be retained but also to be reflexively organized directly in the process of accumulation. This distinctive feature of the subject's memory is described most precisely in G.V. Repkina's definition of it as reflexive memory [11]. This interpretation of the subject's memory is very close to V.P. Zinchenko's interpretation of living memory as a functional organ of the individual [4].

Reflexive memory makes it possible to incorporate mnemonic learning tasks into the process of formative education, e.g. a written summary of a text after listening to it. The performance of this task as a mnemonic learning one presupposes a combination of a set toward remembering the material with a set toward understanding it, which is ensured by reflexive memory.

We conducted another experiment in the above-mentioned classes of the school-laboratory to show how successful the performance of tasks of this type is with reliance on reflexive memory. The pupils were asked to reproduce the main content of a text in writing after listening to it twice. What was distinctive about the text was that two components of fundamentally different content were incorporated into it and unified by a common thematic outline: a description of a

game and a description of two modes of etymological analysis of a word. This required the pupils to concretize the goal set for them (“remember the text”), and the substantial length of the text forced them to do this as well. It turned out the 67 percent of the pupils defined the object of recall as the theoretical material. The reproduction of this material, which was fundamentally new to the pupils, persuasively demonstrated that they understood its content well, which enabled them to reproduce that part of the text fairly completely and accurately, including examples that illustrated it. The successful performance of this mnemonic learning task provides a basis for regarding reflexive memory as one of the most important prerequisites of a shift to independent forms of learning activity, where the center of gravity moves from the pupil’s joint work with a teacher to his independent work with various sources of educational information.

Our study showed that the prerequisites of reflexive memory are a high level of development of the processes of goal-setting, understanding and defining reflexion, as well as mastery of the methods of content analysis and the concept as a form of generalization of its result. These prerequisites are simultaneously prerequisites for the development of the subject engaged in learning activity and, in the conditions of a developing education, take shape by the end of the younger school age range. This makes possible the appearance of reflexive memory, which we recorded in 60 percent of the pupils, and for another 20 percent it was in the zone of impending development.

Naturally, the question arises whether reflexive memory should be regarded as a kind of artifact that is produced by the particular organization of developing education in the school-laboratory and is not reproducible in mass education. An answer to this question is provided by the results of a diagnostic study that we conducted between 1994 and 2004 in seven regions of Russia and four regions of Ukraine and that evaluated the level of development of learning activity by the end of the younger school age range [9, 14, 16]. The program for the study, in addition to assignments that made it possible to evaluate various characteristics of learning activity, included the above tasks of evaluating memory. The study was conducted

in sixty-nine classes (1,485 pupils) that were taking Russian and mathematics under the same version of developmental education by D. El'konin - V. Davydov as the one implemented in the Kharkov school-laboratory and in thirty-eight gymnasium classes (918 pupils) that were learning under the traditional system.

In thirty-nine classes in which the formative-education system was implemented fairly comprehensively, reflexive memory was recorded in 51 percent of the pupils, which for another 10 percent it was in the zone of impending development. In the classes in which the formative-education system was not implemented in a sufficiently comprehensive and consistent way, these figures were much lower (10 and 25 percent, respectively). Finally, in the gymnasium classes that were learning under the traditional system reflexive memory was found in only 4 percent of the pupils (and 17 percent in the zone of impending development). For all of the pupils in whom reflexive memory was found, a high level of development of goal-setting was also recorded.

First of all, what is striking is how close the results were in the school-laboratory and at the public schools where the developing education system was implemented in a fairly comprehensive way. This suggests that reflexive memory is not an artifact but one of the logical results of the purposeful shaping of learning activity.

Second, reflexive memory was found in a portion of the pupils in classes where learning activity was not purposefully shaped. Typically, a high level of goal-setting was also found in these pupils. This leads to the conclusion that the appearance of reflexive memory represents a general pattern in the development of the memory of younger schoolchildren, which consists of a transition from presubject forms of memory to the memory of a subject.

Third, the fact that reflexive memory provides reproduction not only of the content of concepts but also of factual material that is only indirectly related to that content enables us to view it as a holistic system into which previously formed types of memory are organically incorporated. Meanwhile, the quality of the reproduction of the factual material suggests that voluntary and involuntary memory, which

allows it to be remembered are significantly restructured as they become part of reflexive memory.

Finally, the results of our study lead to the conclusion that actual development of the memories of younger schoolchildren depends to a significant degree on the distinctive features of the education in whose context it is taking place. The traditional system of education, whose goal is not the development of the pupil as a learner but his assimilation of a certain amount of knowledge and skills, relies on the processes of thought, memory, and attention that the pupil has already formed, by adapting to their current level of development. It is perfectly natural that such adaptive education (A.G. Asmolov) does not create the necessary prerequisites for the pupil's development as a learner and hence for the concomitant development of his psychic functions, including memory, confining itself in the best case to the refinement of its types and forms that have already taken shape. This is what was found in the gymnasium classes, where the traditional form of education was practiced at a very high level.

Memory development is completely different in the developmental education system of El'konin and Davydov, whose main purpose is to develop the pupil as a subject engaged in learning activity. By creating the prerequisites for such development of the pupil, it also creates the prerequisites for the concomitant development of his psychic functions. But as our study showed, the presence of such prerequisites alone does not completely eliminate spontaneity in the development of memory, as demonstrated by the significant differences in the level of its development in various classes of the developing education system. The relatively low indicators of the development of reflexive memory that were recorded in a number of classes are attributable to the fact that the developing education system was not fully implemented, and therefore sufficient prerequisites were not created for the development of reflexive memory. But this cannot explain the differences between the indicators of the level of memory development in the group of public-school classes where the developing education system was implemented in a consistent and comprehensive way and in the classes of the

school-laboratory. Obviously the developmental education system itself failed to take into account certain specific conditions that are necessary to implement the prerequisites of memory development, which is quite explicable since the developmental education system was oriented primarily toward the development of theoretical thought [3]. In the school-laboratory, where the teacher worked closely with the researcher, it was possible to overcome most of these flaws in the system. But in the conditions of public school few teachers were able to do so. The question of additional conditions that would provide for implementation of the prerequisites of memory development in developing education requires a separate discussion.

In conclusion we should emphasize that we regard our study as a first step that confirms P.I. Zinchenko's notion that memory development in the educational process, when the latter is properly organized, should inevitably lead to the emergence of a higher form of it in which all types of memory interact and organically coalesce with each other.

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