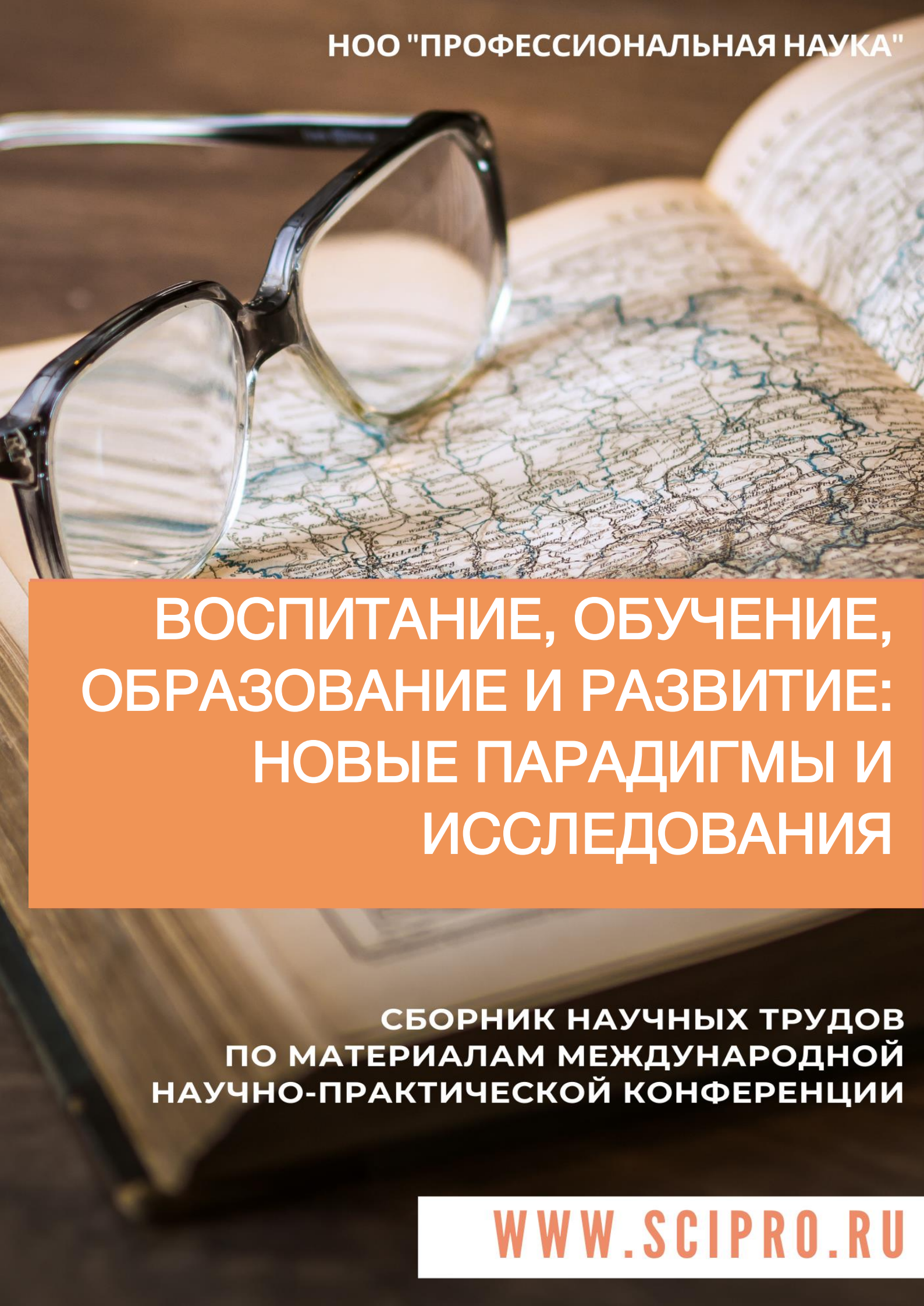# ВОСПИТАНИЕ, ОБУЧЕНИЕ, ОБРАЗОВАНИЕ И РАЗВИТИЕ: НОВЫЕ ПАРАДИГМЫ И ИССЛЕДОВАНИЯ

Воспитание, обучение, образование и развитие: новые парадигмы и исследования

Сборник научных трудов по материалам
Международной научно-практической конференции

10 октября 2022 г.

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СОДЕРЖАНИЕ

СЕКЦИЯ 1. МЕТОДЫ ПЕДАГОГИКИ

УДК 740

Zak A. Characteristics of problem solving methods

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Abstract.The article presents a study of qualitative characteristics that reflect the procedural side of the methods for solving problems associated with empirical and theoretical types of thinking. As a result of individual experiments with third-graders, the features of solving problems using the method of empirical thinking and analytical, reflective, synthesizing methods that characterize the levels of development of theoretical thinking were shown.

Keywords: third-graders, individual experiments, methods of solving problems, the method of "Interchange of signs".

1. Introduction

1.1. Methodological foundations of the study

The present study presents the study of the procedural features of the implementation of empirical and theoretical thinking in solving problems. The experimental work was based on logical and psychological ideas about these types of mental activity, developed in the works of A. N. Leontiev [2], S. L. Rubinshtein [3] and V. V. Davydov [1].

1.1. Methodological foundations of the study

According to A. N. Leontiev [2], S. L. Rubinshtein [3] and others, a task is a goal given to a person under certain conditions. The solution of the problem includes the search for a way to achieve the goal, as well as the very performance of the action determined by this goal. In the course of searching for a way to solve, a person carries out orientation in the conditions of problems, their study, cognition, i.e., thinking.

Performing a cognitive function in solving a problem, thinking can be aimed objectively at reflecting such relations of the data presented in its conditions, on the basis of which either a method for solving only a given problem, or a general method for solving all problems of the class to which it belongs is built. this task is carried out.

In the first case, thinking will be empirical, since here the content of the corresponding class of tasks is reflected relatively directly, in a particular form, as a certainty, denoted by the category of the phenomenon. In the second case, thinking can be qualified as theoretical, because here the content of the corresponding class of tasks is reflected indirectly, in a general form, as a certainty, denoted by the category of essence.

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Based on the fact of the successful solution of a certain problem, it is impossible, therefore, to say what kind of orientation in its conditions (with the help of empirical or theoretical thinking) was carried out by a person. To establish this, one must either observe the search for a way to solve the problem, or offer to solve several more problems of the same class as the first one. Then each task will act objectively as a phenomenon of some kind. In this case, it is necessary that the tasks differ significantly in external features of their conditions. With an empirical orientation in terms of tasks, a person objectively has no reason to solve all the proposed tasks successfully in a limited time. Such a result can be obtained only by chance, since the conditions of each subsequent task will act as a new object of knowledge, fundamentally different from the previous one. In this position, a person, starting to solve the next problem, tries, as the studies of V.V. Davydov [1] showed, to use a successful method of solving the previous problem, relying on the external similarity of its conditions with the conditions of the next one.

Here, therefore, a formal (empirical) generalization of tasks is performed, which, according to V.V. Davydov [1]. at the same time, each subsequent problem is solved as a relatively independent and particular one through trial and error.

With a theoretical orientation, a person objectively has the opportunity to successfully solve all the proposed problems, since the initial method of such an orientation ensures the selection in their conditions of a relation of objects that is universal for constructing and solving this class of problems.

If, further on, he uses a method of orientation that is adequate to single out special forms of this general relation, i.e., essential relations necessary for constructing subclasses of problems of the proposed class, then he will have the opportunity to make a meaningful grouping of the solved problems by accepting the distinguished significant relationship for its objective basis.

And, finally, if a person implements a method of orientation that is adequate to single out the unity of the universal relation and its relatively isolated forms, then in this case he will be able to propose, produce the conditions of the problem of a new subclass of the class being solved.

This follows from the fact that the allocation of such certainty in the content of the class of problems being solved is connected, according to the provisions of dialectical logic, with the exhaustion of the general relation by its special forms by deriving the latter from the former. The realization of the noted possibility should thus testify to the presence in a person of a reflection of the class of tasks being solved at the level of a genuine concept as a unity of the universal, special and individual, the whole.

1.2. Characteristics of the experimental situation for studying the features of types of thinking

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In developing the general scheme of the experimental situation, which could be embodied in various concrete materials, we proceeded from the logical characteristics of theoretical thinking presented above.

Firstly, the subject must be offered to solve not one, but several tasks objectively of the same class. At the same time, the observed features of the conditions of the proposed problems should differ quite clearly. Compliance with this requirement when constructing a specific technique will allow, with the successful solution of such problems, to observe the fact of a theoretical approach to their solution, which is implemented, in particular, by implementing the analytical method of theoretical thinking.

Secondly, the proposed tasks should objectively relate to different subclasses of this class. This will make it possible, if all problems are successfully solved, to observe a meaningful grouping of problems, the basis of which is taken to be their objective belonging to different subclasses of the same class. This fact, according to our ideas, should testify to the implementation of the reflexive method of theoretical thinking.

Thirdly, it is expedient to select such a class of problems, in relation to which it was possible to develop problems not of two, but of several subclasses. In this case, opportunities are created for the successful solution of the proposed tasks and the allocation of tasks of different subclasses to observe the production of a new subclass of tasks of this class by a person. In the presence of such a fact, it can be assumed that, solving the proposed problems, he fulfilled not only the analytical and reflexive methods of theoretical thinking, but also the synthesizing one.

Thus, the general research strategy of our experiments in studying the noted types of thinking was to describe the typical procedural characteristics of mental activity, respectively for one result or another. In other words, the research task was to highlight the characteristics of empirical thinking and the main ways of theoretical thinking: analytical, reflexive and synthesizing.

2.Materials and methods

The purpose of these experiments was to highlight, by observing the actions of children in solving problems, the typical features of research activity that unfolds in the implementation of empirical thinking, as well as different ways of theoretical thinking. We assumed, on the basis of the logical-psychological analysis excellent above, that the analytical, reflexive and synthesizing methods of theoretical thinking are carried out in solving problems in different ways, that is, they have a different specific operational composition, since the conditions for their implementation differ.

2.1. Characteristics of the experimental technique

We have developed the "Interchange of signs" [4] technique, which included a class of problems from several subclasses. The solution of problems involved the implementation of actions with objects. In these tasks, it was required to move cards with signs according to certain rules. For example, one arrangement of cards with letters is required, in particular, the arrangement of "P, T,

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M" is converted into another arrangement of the same cards - "M, T, P" - in one movement, one permutation. At the same time, for one action in these problems, for one move, a simultaneous mutual exchange of places of any two cards is taken. In the given example, the correct action would be to exchange the places of the "P" and "M" cards in the first, original location.

Based on the material of these tasks, an individual experiment was carried out as follows: in the first part, the subject mastered the indicated rule for moving cards, in the second part, he solved several relatively complex tasks.

The training part of the experiment began with the fact that the child was asked to simultaneously rearrange the cards "M, P" with both hands so that they were arranged like "P, M". After that, it was explained to him that he had solved the problem of rearranging the cards in one action. Then he was asked to solve in one action tasks like: 1) rearrange "R, T, C" as "C, T, R" and 2) rearrange "K, W, N" as "W, K, N".

Then, for the solution, a task was proposed in two actions of the type "T, M, C" rearranged as "C, T, M". If in this case there were difficulties, the experimenter prompted the first move: swap the cards "T" and "M", or "T" and "C", or "M" and "C". The child performed the second action independently. After that, he was asked to solve another problem in two actions of the same type, in order to make sure that such problems are feasible.

After successfully solving the two-way task on their own, the children had to solve several basic tasks of the following type:

1)   7 5 2 3 6 8 4 1 9 rearrange as 2 7 5 8 3 6 9 4 1

(six acts)

2)   2 8 6 1 3 5 7 4 rearrange as 1 2 8 6 4 3 5 7

3)   (six acts)

3) T K L M P V R B S N F W rearrange as L T K V M P S R B W N F (eight acts)

4) R B T V K S M D F N L G rearrange as V R B T D K S M G F N L (nine acts)

The solution of these problems was organized in this way. The child was standing near the table, on which the experimenter had already arranged the cards in accordance with the conditions of the 1st task. The subject was asked to solve it in six steps. At the same time, he was reminded that, as in the previous tasks, a simultaneous permutation, a simultaneous exchange of places of any two cards, is considered to be one action, and that only the cards located on the left are swapped, and the cards on the right are a model, a requirement of the problem.

2.2. Evaluation of problem solving

If the child managed to move the cards in accordance with the sample in six actions, then such a solution was qualified as successful. If the problem could be solved correctly, i.e., rearrange the cards in accordance with the sample, but for more than six actions, then such a solution was

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qualified as incorrect and the child was asked to solve it again (for which the experimenter returned the cards left location in the original order) for the required number of actions.

If the child began to get confused when solving the problem: he rearranged unnecessary cards, violated the rules for their movement (i.e., he could not solve the entire problem himself), then in this case the experimenter helped him to correctly perform all the movements.

After any of the indicated options for solving this problem, the child solved the 2nd problem. Cards corresponding to its conditions were arranged in the same way as the cards of the 1st task, in a line. After solving the 2nd problem, it was proposed to solve the 3rd and 4th.

If the child could not correctly solve all four problems even with the help of the experimenter, then the experiment with him ended. If all the tasks were solved correctly, then a conversation was held with the child. Before it began, the experimenter returned the cards from the left arrangement in each of the tasks to their original order.

The conversation began with the experimenter saying to the child: "Many children, like you, have solved these four problems. Some children said that these tasks are all different; others said that all these tasks are similar; the third children said that these tasks are divided into two groups. Which child do you think is right? After each answer, the child was asked to justify his opinion.

2.3. Logical characteristics of tasks

Before qualifying the possible answers of the children, let us turn to the features of the proposed tasks.

Firstly, these tasks objectively belong to the same class, i.e., their construction and solution are based on a single principle: in order to successfully cope with any task, it is necessary in each task to identify groups of interconnected movements cards.

So, in the first problem there are three such groups, in the second - two, in the third - four, in the fourth - three. In the first and third tasks, each of these groups consists of three cards: 7 5 2; 3 6 8; 4 1 9 and T K L; M P V; R B S; N F W. In the second and fourth tasks, each of such groups of interrelated cards includes four cards: 2 8 6 1; 3 5 7 4 and R B T V; K S M D; F N LG.

A single principle for constructing and solving such problems is that in each of the selected groups one of the cards must move several times in order for the cards to take the required location.

For example, in order to rearrange a group of cards "7, 5, 2" in two moves so that it is "2, 7, 5", you can act in at least three ways: 1) first swap "7" and "5", and then "5" and "2"; 2) first swap "7" and "2", and then "7" and "5"; 3) first swap "2" and "5", and then "2" and "7". In any case, as you can see, one of the three cards - in the first case "5", in the second "7", in the third "2" - moves twice, and the other two one by one.

The initial and necessary for the implementation of this principle is the ratio of places of the same cards in the initial and required locations. In both groups of three cards and groups of four cards, one of the cards in the starting position (compared to the other cards) is furthest away from

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where it should be in the pattern. So, in the group "7, 5, 2", which needs to be converted into "2, 7, 5", cards "7" and "5" are in the initial location in neighboring places with respect to their required location, and the card "2" is two places away from the required one.

Such a ratio of places of cards of the required location to the initial one is the initial, necessary and universal for a whole class of problems for moving cards according to the rule of simultaneous interchange of places. This selection of tasks methodically provides the fact of highlighting certainty in the content of this class of tasks, denoted by the category of the universal.

Secondly, the tasks are selected so that in two of them this general relation is realized in a group of three cards (1st and 3rd), and in the other two it is realized in a group of four cards (2nd and 3rd). 4th task). This is the realization, in our opinion, of the special forms of existence of this initial relation, which underlie the division of these four tasks of one class into two subclasses: tasks "collected" from a different number of groups of three interconnected cards, and tasks "collected" from a different number of groups of four interconnected cards. Consequently, the discussed selection of tasks methodically provides the fact that the subjects highlight certainty in the content, denoted by the category of the special.

However, these two subclasses of problems do not exhaust the entire class, the construction and solution of which is based on the above general relation. The subject has the opportunity, having successfully solved all the problems and having distinguished both subclasses among them, to offer one more, at least a subclass of problems, for example, "collected" from groups of five interconnected cards: "61827 49035" to convert into "76182 54903 » for eight actions.

Thus, the noted selection of tasks methodically provides the fact that the subject in the content of the class of tasks being solved defines certainty, denoted by the category of the individual (as the unity of the universal and the special). In other words, the ability of the subject to suggest at least one more subclass of this class of tasks, i.e., to single out one more special form of the existence of a general relation, indicates that at the same time the unity of the general relation and its special forms is distinguished.

2.4. Qualification of children's actions

Returning now to the consideration of the children's answers to the experimenter's question, it is possible, in the context of the identified logical characteristics of the proposed tasks, to characterize the children's statements in the following way. If the child believes that all tasks are different, because "they contain a different number of cards" or "a different number of actions," then it is clear that in this case, as it seems to us, based on the logical characteristics of empirical and theoretical types of thinking, It is based on external, directly observable features of the conditions of these tasks. Consequently, the child solved problems within the framework of an empirical approach, empirical consideration of their content.

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If the child believes that all tasks are similar, "because in all tasks it is necessary to rearrange the cards" or "because everywhere these cards (points to the cards of the left location) must be put like these (points to the cards of the required race ¬provisions)", then we can say that he is guided by external, insignificant features of the conditions of tasks, for the selection of which there is no need to solve problems, it is enough just to listen to the experimenter's instructions. Thus, in this case, too, we characterized the solution of problems by these subjects as based on an empirical method of orientation in the conditions of the problems.

If the child believes that all tasks are similar, but justifies his opinion differently: "because everywhere one card needs to be rearranged several times," then we can say that, according to the above logical analysis of the content of tasks, he is guided by the essential relation , initial for their construction and solution. In other words, the child objectively singles out certainty in the content of tasks, denoted by the category of the universal, and, consequently, in solving them, he carried out theoretical thinking in an analytical way.

If the child believes that tasks are divided into two groups, either "because two tasks are for six actions, and two for more", or "because where there are letters, there are twelve cards, and where the numbers are smaller", then this case (as in the two previous ones), it can be assumed that he is guided by the external features of the conditions of the problems, the selection of which does not require their solution.

If the child believes that the tasks are divided into two groups, but, unlike the previous case, justifies this opinion by the fact that "in these tasks (pointing to the 1st and 3rd tasks) you need to rearrange three cards , and in these (points to the 2nd and 4th tasks) there are four cards", then, according to the noted logical analysis, we can assume that he singled out special forms of existence of the original, universal relationship. This means that when solving these problems, the child thought theoretically not only in an analytical way, but also in a reflexive way.

The experimenter suggested to the children who expressed this opinion: "What task can be thought up so that the cards also change places, but so that the new task is composed differently from the first and third and not like the second?"

If the child could not come up with a problem that was not similar to the first, third and second, then the experiment with him ended. If a child suggested, for example, a task "assembled" from groups of five or six interconnected cards, then in this case, relying on logical analysis, it can be argued that he reflected the unity of the general relationship and its special forms, i.e., he singled out the certainty denoted by the category of the individual, and thereby reached the truly conceptual level of reflecting the content of this class of problems. Consequently, when solving these problems, the child thought consistently by all methods of theoretical thinking: analytical, reflective, and synthesizing.

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Concluding the consideration of the features of the research methodology, it should be said how the selection of subjects was organized. Experiments with third-graders were carried out until each of the four groups of children noted: those who solved problems on the basis of empirical orientation in their conditions, as well as on the basis of theoretical orientation in analytical, reflective and synthesizing ways, will include 30 people. Thus, a total of 120 schoolchildren took part in the experiments.

3. Results

As a result of conducting experiments in accordance with the above procedure, four groups of children were characterized on the basis of the procedural characteristics of their actions in solving problems.

In the first group there were children who solved all four problems correctly, but, as could be judged from their statements about the problems, on the basis of an empirical orientation in their conditions. Some of these children considered all the tasks to be different, others to be similar, others grouped the tasks into pairs - in all these cases they were guided by the external features of the conditions of the tasks. Let's call them "empiricists" conditionally.

The second group included children who considered all problems to be similar in terms of content, i.e., who solved all problems correctly on the basis of theoretical orientation in the conditions of problems in an analytical way. These are "analysts".

The third group consisted of children who singled out pairs of problems on the basis of their belonging to different subclasses, i.e., who solved all problems correctly with the help of theoretical orientation in their conditions in a reflexive way. These are "reflexive". It should be noted that among the third-graders it was not possible to recruit 30 people who solved the problems correctly on the basis of theoretical orientation in their conditions using the synthesizing method. As it turned out, there were only a few such children ("synthesizing").

3.1. Characteristics of problem solving

Let us consider in detail the features of solving these problems by children of different groups: those who solve problems in an empirical way ("empiricists"), in an analytical way of theoretical thinking ("analysts", in a reflexive way ("reflexive") and in a synthesizing way ("synthesizing").

3.1.1. The actions of the "empiricists"

The following was typical for the children of this group. Executive activity, i.e., activity directly related to the achievement of a result, with the actual solution of the problem, differed in that there were relatively long and relatively equal time intervals between individual moves, movements of pairs of cards. These movements themselves were often erroneous, performed uncertainly, but ultimately correct. At the same time, the nature of card movements within one group differed from the nature of card movements in other groups of the same task.

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The fact is that, as already mentioned, within a group, for example, of three cards, the order of movements can be different. So, in order to convert "P, R, S" into "S, P, R" in two moves, you can, firstly, rearrange "P" and "R", and then "R" and "S", - here the "P" card first moves to an adjacent place, and then through one; secondly, to rearrange "P" and "S", and then "P" and "P", - here the "P" card first moves through one place, and then to the next one; thirdly, rearrange "S" and "P", and then "S" and "P", - here the card "S" each time moves to the next place.

Based on the features of the noted three types of card movements, the first two can be conditionally called mixed, since of the two movements, one consists in rearranging the card to an adjacent place, and the other through one. The third type of movement can be conditionally called homogeneous, since both moves are carried out by rearranging the cards to neighboring places.

Returning to the peculiarities of the executive activity of the "empiricists", it should be said that when solving each problem, the types of movement of the cards were different: in some groups, the movement was mixed, in others – homogeneous.

The noted features of the executive activity were combined with certain features of the search-testing, which precedes the actual solution of problems. The search and testing activity was expressed in the movements of the hands (fingers) and gaze.

So, before the next action, one could observe frequent and relatively chaotic movements of the gaze from the initial location of the cards to the required one and back. At the same time, the hands touched those two cards, the rearrangement of which was assumed by this action. This was followed by the movement of cards.

We can say that in this case, the samples were deployed, mainly with the help of movements, gaze. But sometimes practical tests were also added to the visual ones: the child not only touched the cards being moved, but also made their incomplete movements (imitated, only indicated the movement) in order to check whether he had chosen the cards correctly for the next action.

Characterizing search-testing activity in terms of its research, cognitive meaning, we can say, despite the differences in its specific manifestations, that the subject of this activity was always only two cards, only one specific action in solving a problem. At the same time, it is important to note that such exploratory activity directly passed into executive activity, since it "served" each action separately.

A number of children moving cards were accompanied by a score of actions. At the same time, they counted, naming the next number at the same time as moving the cards.

It should also be noted that the exploratory activity of these children usually changed from the 1st task to the 4th, but only slightly: mainly along the line of reduction of manual tests and deployment of visual ones. In general, the process of solving problems among the "empiricists" remained unchanged: the alternation of research and executive activity with each individual action.

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3.3.2. Actions of "analysts"

The procedural characteristics of problem solving in children of this group are as follows. The executive activity of the "analysts" was distinguished by the fact that they performed several actions relatively simultaneously: two actions each in the 1st and 3rd tasks and three actions each in the 2nd and 4th. This corresponds to the fact that, as already mentioned, the 1st and 3rd tasks were "collected", respectively, from three and four groups of three interconnected cards, and the 2nd and 4th tasks were "collected" from two and three groups of four interconnected cards.

The very execution of such a few actions was sure and unmistakable. At the same time, in different groups of cards within the same task, the types of movement of the cards were different: mixed and homogeneous.

The search-testing activity of the "analysts" unfolded in the form of tracing gaze movements. At first, such tracking concerned all the cards and the initial and required location, and then, as it could be seen, the subject's gaze was focused on two or three cards. In this case, the movement of the gaze from the initial location of the cards to the required one became more frequent, but not as much as among the "empiricists".

Such visual tests preceded, as observations showed, the performance of not one, but a series (of two or three) of actions. Therefore, we can assume that the subject of the search activity was several pairs of cards, and its research meaning consisted in the outline of two or three next steps for solving the problem. It is also characteristic that, unlike the "empiricists", the research activity of the "analysts" did not go directly and directly into the executive, since it "served" not one separate action, but several actions at once, necessary to solve the problem.

It is interesting to note that the account of actions in solving problems was different for the "analysts". As a rule, these children did not count the actions performed from the first to the last, that is, they did not name all the numbers in order: "the first action, the second ..., ... the sixth ...", but counted the actions either in pairs (1st and 3rd tasks), or in threes (2nd and 4th tasks). For example, when solving the 1st task, they counted as follows: "one, two, ... one, two ..., one, two ...".

Changes in the process of solving problems from the 1st task to the 4th among the "analysts" were expressed in the fact that their actions became more and more fast and confident. Only the ratio of research and executive activity remained unchanged: the outline and execution of several actions at once.

This indicates, in our opinion, that the content of orientation under the conditions of these tasks is fundamentally different for "analysts" and "empiricists".

3.1.3. Actions of "reflexive"

Consider now the procedural characteristics of "reflexive". It should be noted right away that their executive activity and "analysts" were almost no different: they also performed several actions at once, two or three, while solving problems, their actions were confident and error-free. In

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different groups within the same task, the types of card movements were, as a rule, different: mixed or homogeneous.

However, all the "reflexive" ones met at least one problem, in the solution of which in all its groups of cards the movements were of the same type: either mixed in all groups, or homogeneous in all groups. This happened most often when solving the 3rd problem, sometimes when solving the 4th, i.e., when solving problems with a relatively large number of groups.

Observing the search-testing activity of the "reflexives", one could notice a number of differences from the similar activity of the "analysts". So, if for "analysts" the initial gaze movements, tracing the location of all the cards in the original and necessary place, then turned into movements that are correlated sequentially, as the task is solved, with separate groups of cards, then for "reflexive" these initially common tracing gaze movements usually ended with the selection of the number of groups of cards.Most often this happened when solving the 3rd task, but sometimes also when solving the 2nd task.

The allocation of the number of groups, i.e., the reflection of such a feature of the content of tasks as the number of groups of interconnected cards from which the task was "assembled", could be judged by two points. First, a number of "reflexive" children indicated the number of groups by touching their outermost cards with their hands (fingers) or pointing to the central card of the group. Second, either in combination with the indicated manual actions or without them, many children expressed their knowledge of the number of groups out loud, but to themselves.

Thus, in comparison with the "analysts", the "reflexive" ones had a new, additional moment in their research activity: the allocation of the number of groups of interconnected cards before performing a specific outline of movements in each separate group of cards. It was also characteristic of the "reflexive" that their speech reflected the features of groups of interconnected cards with the correlation of different tasks.

So, when examining the conditions of the 2nd task, "reflexive" children usually said, referring to the number of cards in a separate group: "It's different here, here there are four", and at a similar stage when solving the 3rd task chi: "here again, as in the 1st, three cards" and when solving the 4th task: "here, four, as in the 2nd task." Such content of statements was not among the "analysts".

At the same time, the counting of actions in solving the problem did not differ between the "reflexive" and "analysts" in content: both of them counted only the number of movements in one group, but not in relation to the entire task. It can be assumed, in our opinion, that this feature of fixing the number of actions performed in solving problems, which is characteristic only for "analysts" and "reflexive" (i.e., in general, for "theorists", in contrast to "empiricists"), can be qualified as a special kind of objectivity, replacing the originality of the conditions of specific task situations.

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This type of account "one, two, ... one, two, ..." or "one, two, three ..., one, two, three, ..." reflects in a verbal-sign form the interconnection of several cards in solving problems, dividing the conditions of problems of outwardly very different types into groups of cards that are common in their function, that is, into functionally significant "units" of the content of tasks.

3.1.4. General characteristics of the actions of children of different groups

Concluding the consideration of the features of solving problems by the subjects of these three groups, it is necessary to summarize the data obtained as follows.

First, for the "empiricists" element-wise orientation in the conditions of tasks and the implementation of the solution of the problem by performing separate, independent actions are typical. In this case, a separate act of orientation directly passes into a separate act of execution.

"Analysts" are characterized by an orientation towards groups of objectively interconnected cards and the implementation of a solution by performing a series of two or three actions at once. At the same time, individual acts of orientation constitute a special, functionally independent activity, in contrast to acts of execution. The "reflexive" ones are also characterized by an orientation towards groups of objectively interconnected cards and the implementation of a decision through a series of executive actions. However, unlike "analysts", "reflexive" ones also focus on the number of such groups in each task and on the number of cards in groups.

Secondly, the search-testing activity of "analysts", aimed objectively at highlighting the relationship of cards in terms of movement, can be qualified as a manifestation of analysis, which, as part of the analytical method of theoretical thinking, functions as an action. The fixation of this interconnection of cards in verbal form as the selection of only two or three actions (as mentioned above) can be considered as an activity directed by a person objectively at the results of his analysis of subject conditions, i.e. as a manifestation of reflection . And since, as observations have shown, such fixation plays an auxiliary role in orientation under the conditions of tasks, it means that reflection functions as a condition for this meaningful orientation, i.e., as an operation.

The search-testing activity of the "reflexives", aimed objectively at identifying the number of groups in tasks and the number of cards in groups, can also be qualified as a manifestation of analysis, and aimed at fixing the features of groups of interconnected cards - as a manifestation of reflection. The latter has an objectively independent result - the selection of methods of analysis, which is manifested in the statements of children about the different composition of groups in different tasks: in the 1st and 2nd, 3rd and 4th - and about the same composition of groups, in the 1st and 3rd and in the 2nd and 4th tasks.

Reflection functions as part of the reflexive method of theoretical thinking as an action, since objectively, as has been shown, it has an independent direction, a special goal - highlighting the similarities and differences in the methods of analysis, through which the similarities and

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differences of groups of interconnected cards are distinguished, from which "collect" tasks of different subclasses.

Thirdly, comparing the productive characteristics of cognitive (mental) activity with the above procedural characteristics of problem solving, we can assume that it is true that the identification of the external similarity of the features of the conditions of tasks is formally general, the allocation of the initial characteristics of the content of the class of tasks being solved - general and highlighting the content originality of the existence of the initial characteristics of the content of this class of tasks - highlighting the special - all this presupposes, respectively, different ways of mental activity.

3.1.5. The actions of "synthesizing"

It was noted above that among the third-graders it was not possible to find a sufficient number of subjects capable of solving problems of the proposed class with the help of theoretical orientation in their conditions in a synthesizing way. In other words, there were only a few people who, having identified two groups of tasks (based on the fact that groups of three interconnected cards were used in the 1st and 3rd tasks, and in the 2nd and 4th tasks - from four interconnected cards), were able to offer another type of task - including groups of five interconnected cards.

Since these were very quick-witted (according to teachers) students, it can be assumed that at primary school age, at least in relation to the proposed class of tasks, the synthesizing method of theoretical thinking does not have time to form.

Search experiments showed that such a method was already formed among fifth-graders: among the well- and excellent-performing children, 30 people were found who solved these problems within the framework of a theoretical approach using a synthesizing method.

Consider the procedural characteristics of solving problems by "synthesizing". Their executive activity was distinguished by the fact that, while performing a series of actions without serious interruptions, they used one type of movement of cards (either mixed or homogeneous) in different groups when solving a separate problem. In most of the subjects, the transition to a single type of card movement in different groups was observed when solving the 3rd and 4th tasks, i.e., tasks with a relatively large number of groups of interconnected cards.

The search and testing activity of the "synthesizing" was characterized by the fact that its subject was the content of the entire task as a whole. This was expressed in tracing gaze movements along the initial and required arrangement of cards, in highlighting the total number of groups of interconnected cards, in a preliminary outline - which could be judged by the corresponding gaze movements, as well as by imitating the movement of cards by hand movements. - all required actions of the task, all executive actions.

Sometimes, in the process of such an outline of the proposed solution as a whole, the children said: "every time it's the same: the last card should be put in the first place." Sometimes it

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was possible to judge the selection of this feature of the content of the task by the repetitive movement of both hands imitating the movement of the cards.

It is interesting to note that for the "synthesizing" actions, the task was the same as for the "analysts" and "reflexive", that is, it symbolized the interconnection of two or three movements. But, unlike them, for the "synthesizing" this calculation was carried out not at the stage of actually solving problems, the actual movement of cards, but at the stage of playing the entire solution.

Thus, observation of problem solving by children who proposed a new subclass of problems of the class being solved showed that this productive characteristic presupposes an appropriate way of theoretical orientation in the conditions of problems: playing the entire solution of the problem. In the course of such playing, as it turned out, the children objectively singled out the fact that all groups of interconnected cards in all tasks are built according to a single principle: the last (rightmost) card should end up as a result of displacements in the first (leftmost) place.

4. Conclusion.

The ascertaining experiments described above, which were carried out in order to establish the correspondence between the productive and procedural characteristics of theoretical thinking. The typical characteristics of cognitive activity were determined, which, as observations have shown, are inherent in solving problems within the framework of the empirical approach, on the one hand, and also within the framework of the theoretical approach using analytical, reflexive and synthesizing methods, with the other side.

Such typical characteristics include: for the empirical approach – element-by-element orientation in terms of tasks and alternation of research and executive activity after each actual action to solve the problem; for the theoretical approach as a whole – an orientation towards holistic education in the conditions of tasks and the alternation of a series of acts of research and executive activity, that is, after two or three actual actions to solve the problem.

At the same time, for different methods of the theoretical approach, the following points were typical: proper orientation towards holistic education in terms of tasks (analytical method), orientation towards the essential features of the selected holistic education (reflexive method), orientation towards the unity of holistic education and its essential features (synthesizing method).

In further studies of the problem under study, we plan to determine the quantitative characteristics of the distribution of the discussed methods of solving problems among younger schoolchildren of the second and fourth grades of elementary school and among younger adolescents - the fifth and sixth grades of secondary school.

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УДК 159.9.075

Рокицкая Ю.А. Исследование взаимосвязи жизнестойкости и копинг-поведения подростков

Investigation of the relationship between resilience and coping behavior of adolescents

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Аннотация. Статья содержит теоретическое обоснование и корреляционное исследование взаимосвязи жизнестойкости и копинг-поведения подростков. Были использованы теоретические методы – анализ психолого-педагогической литературы по проблеме феноменологии жизнестойкости и - копинг - поведения подростков и их взаимосвязи; эмпирические методы, представленные психодиагностическим методом, использовались психодиагностические методики: «Опросник жизнестойкости» (А. Мадди, в адаптации Д.А. Леонтьева), «Опросник способов совладания» (Р. Лазарус), «Опросник преодолевающего поведения» (Т.В. Барлас); методы обработки данных, математико-статистического анализа: (методы описательной статистики; корреляционный анализ К. Пирсона). Статистическая обработка данных производилась с использованием программы «SPSS 19.0 for WINDOWS». Проведенный теоретический анализ проблемы и наличие зафиксированных статистически значимых корреляционных взаимосвязей между исследуемыми показателями свидетельствуют о взаимной обусловленности жизнестойкости подростков с активным копинг поведением, ориентированным на решение проблемы.

Ключевые слова: жизнестойкость, совладание, копинг-поведение, подростковый возраст

Abstract. The article contains a theoretical justification and a correlation study of the relationship between resilience and coping behavior of adolescents. Theoretical methods were used – analysis of psychological and pedagogical literature on the problem of the phenomenology of resilience and coping behavior of adolescents and their interrelation; empirical methods presented by the psychodiagnostic method, psychodiagnostic methods were used: "The Questionnaire of resilience" (A. Maddi, in adaptation D.A. Leontieva), "Questionnaire of coping methods" (R. Lazarus), "Questionnaire of overcoming behavior" (T.V. Barlas); methods of data processing, mathematical and statistical analysis: (methods of descriptive statistics; correlation analysis by K. Pearson). Statistical data processing was performed using the program "SPSS 19.0 for WINDOWS". The theoretical analysis of the problem and the presence of statistically significant correlations between the studied indicators indicate the mutual conditionality of the resilience of adolescents with active coping behavior focused on solving the problem.

Keywords: resilience, coping, coping behavior, adolescence

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ВВЕДЕНИЕ

Рост количества и интенсивности чрезвычайных ситуаций природного, техногенного и социально характера, агрессивность информационной среды, дегуманизация и насилие в образовательной среде, интенсификация учебного процесса негативно сказываются на психологическом благополучии и социализации подростков, что определяют научно-практический интерес психологов к исследованию и формированию ресурсов личности подростков, препятствующих   вовлечению в деструктивное стрессовое реагирование. К категории таких ресурсов следует отнести жизнестойкость подростков.

В современной психологии существует проблема концептуальной «размытости» феномена жизнестойкости личности. Объем понятия широк: от личностного свойства до интегрального, системного образования [2]. Исследователи жизнестойкости относят данный феномен: к психологии   преодоления стресса, социальной адаптации [1]; к базовым интегральным личностным характеристикам превенции суицидального поведения [5];   к психологическим,   личностным   ресурсам   устойчивости   человека,   саморегуляции, выполняющего   буферную функцию, уменьшающего зависимость психологического благополучия от факторов среды и ситуации [6].

Категория «жизнестойкость», по мнению С. Мадди, есть устойчивая диспозиция личности, которая позволяет ему оставаться активным и препятствует негативным последствиям   стресса,   представляет   психологическую   живучесть   и   расширенную эффективность   человека,   а   также   является   показателем   психического   здоровья, характеризуется   как   три взаимосвязанных установки (вовлеченность, контроль и вызов), определяющих взаимодействие людей с миром. Вовлеченность предполагает активное участие субъекта в собственной жизнедеятельности. Проявление контроля выражается в сознательной установке, что борьба и   выбор собственной стратегии деятельности в конкретной ситуации определяют последствия происходящих событий. Вызов выражается в стремлении пережить собственный опыт, будь он позитивным или негативным необходимо для собственного развития личности [9,11].

По определению Д.А. Леонтьева «жизнестойкость» характеризует меру способности личности   выдерживать   стрессовую   ситуацию,   сохраняя   при   этом   внутреннюю сбалансированность и не снижая успешность деятельности, и представляет собой систему убеждений о себе, о мире, об отношениях с миром [8].

Компоненты жизнестойкости развиваются в детстве и подростковом возрасте в тесной взаимосвязи   с   самостоятельностью   и   показателями здоровья [10], с выигрышными жизненными сценариями [4]. А тот факт, что жизнестойкость представляет собой внутренний ресурс, который подвластен самому человеку, это то, что он может изменить и переосмыслить, то, что способствует поддержанию физического, психического и социального здоровья,

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установка, которая придает жизни ценность и смысл в любых обстоятельствах многократно приумножает ценность исследования жизнестойкости подростков.

Идеи взаимосвязи жизнестойкости и копинг поведения личности просматриваются в исследованиях Л.А. Александрова, Д.А. Леонтьева, С.Мадди, М. Микулинчера, М.А. Одинцовой, Е.И. Рассказовой, В. Флориана и др.

Постулат С. Мадди о том, что в основе жизнестойкости лежит не отрицание стресса как моделирование нереальной ситуации, а умение признать реальность стрессовой ситуации и мужество как стремление превратить эту ситуацию в преимущество для себя [7] позволяет жизнестойкость рассматривать как ресурс, на основе которого формируются модели копинг-стратегий [2].

Д.А. Леонтьев и Е.И. Рассказова установили, что каждый структурный компонент жизнестойкости обеспечивает свой вклад в позитивную переоценку личности случившегося негативного события, а вместе —обеспечивают выбор жизнестойкой копинг-стратегии [7,с. 178-179].

На современном этапе становления феноменологии копинг-поведения (синоним совладающее поведение) трактуется как социальное поведение или комплекс осознанных адаптивных действий (когнитивных, аффективных, поведенческих), помогающих человеку справляться с внутренним напряжением и дискомфортом способами, адекватными личностным особенностям и ситуации, через осознанные стратегии действий (Л.И. Вассерман, С.А. Хазова). Природа взаимосвязи жизнестойкости и копинг-поведением подростков выражается в том, что жизнестойкость определяет внутреннюю девальвацию значимости происходящего при оценки стрессовой ситуации, которая перестает восприниматься как конфликтная, психотравмирующая, угрожающая, фрустрирующая и питает уверенность в собственных ресурсах активного совладания трудностями.

МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЯ

Эмпирическое исследование осуществлялось на базе МАОУ СОШ г. Челябинска» в 2021 г. В исследовании приняли участие учащиеся 7-х классов (13-14 лет). Выборка уравновешена по гендерному составу и включает 26 мальчиков и 26 девочек. Общий объем выборочной совокупности составил 52 подростка.

В ходе исследования были использованы следующие методы и методики: 1) теоретические – анализ психолого-педагогической литературы по проблеме феноменологии, классификации и структуры жизнестойкости и копинг-стратегий поведения подростков и их взаимосвязи; 2) эмпирические, представленные психодиагностическим методом; 3) методы обработки данных, математико-статистического анализа: (методы описательной статистики; корреляционный анализ К.Пирсона. Статистическая обработка данных производилась с

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использованием программы «SPSS 23.0 for WINDOWS». Использовались психодиагностические методики: «Опросник жизнестойкости» (А. Мадди, в адаптации Д.А. Леонтьева), «Опроснике способов совладания» (Р. Лазарус), «Опросник преодолевающего поведения» (Т.В. Барлас).

РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЯ И ИХ ОБСУЖДЕНИЕ

Для установления наличия и характера взаимосвязи между показателями жизнестойкости и копинг поведения подростков был использован корреляционный анализ (коэффициент корреляции К.Пирсона), который дает возможность количественной оценки степени согласованности (взаимосвязи) исследуемых показателей не опосредованное вмешательством исследователя. Массив полученных коэффициентов корреляции был классифицирован на две группы по основанию – направление корреляционной связи (положительная (прямая) и отрицательная (обратная)) Результаты представлены в табл.1 и табл.2.

Табл. 1

Положительные корреляционные взаимосвязи показателей жизнестойкости и стратегий копинг-поведения подростков (N =52)

Показатели стратегий копинг-поведения	Показатели жизнестойкости			
	Вовлеченность	Контроль	Принятие риска	Жизнестойкость
Самоконтроль	,456***	,421**	,381**	,490***
Принятие ответственности	,643***	,633***	,451**	,711***
Планирование решения проблемы	,614***	,596***	,470***	,673***
Положительная переоценка	,696**	,538***	0,252	,652***
Разрядка	,577**	,567***	,496***	,663***
Рациональные действия	,616**	,614***	,424**	,668***
Поиск помощи	0,193	0,08	,363**	0,216
Настойчивость	,528***	,502***	,301*	,549***
Выражение чувств	,435**	,315*	,305*	,424**
Позитивное мышление	,492***	,441**	,281*	,512***
Отвлечение	,565***	,663***	,394**	,671***
Успокоение	,419**	,511***	0,253	,491***
Контроль эмоций	,625***	,614***	,493***	,696***
Самоизменение	,368**	,313*	0,174	,369**
Юмор	,506***	,493***	,341*	,540***
Оценка вины	**,548***	,464***	,370**	,564***
Примечание: N (n)-кол-во испытуемых; метод к. Пирсона * - p≤ 0,05, ** - p≤0,01, ***- p≤ 0,001;				

Количественный анализ полученных результатов позволяет зафиксировать 64 положительные корреляционные взаимосвязи между показателями жизнестойкости и копинг-поведения подростков, прием 58 из них имеют высокий уровень статистической значимости, что составляет 90,6 % от общего числа положительных корреляций. К категории копинг-стратегий,

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имеющих наиболее высокие коэффициенты корреляции с жизнестойкостью подростков относятся такие как: принятие ответственности (,711***), контроль эмоций (,696***), планирование решения проблемы (,673***), отвлечение (, 671***), рациональные действия (,668***), положительная переоценка (,652***).

Качественный анализ уровня значимости и характера корреляционных взаимосвязей исследуемых переменных позволил сформировать понимание взаимной обусловленности жизнестойкости подростков с активным копинг поведением, ориентированным на решение проблемы. То есть, чем выше выраженность жизнестойкости подростков, тем выше сформированность способности признавать свою роль в проблеме и собственные ошибки, анализировать их с целью не допустить повторения, стремление в трудной ситуации сохранять самообладание и контроль над собой, не показывать своего состояния, регулировать свои чувства и действия, предпринимать произвольные, проблемно-сфокусированные усилия по изменению ситуации, включающие мысленные усилия по анализу ситуации и поиску способов решения проблемы, составлять и поэтапно выполняет план, связанный с ситуацией и только в случае устойчивого неуспеха, переключаться на другие предметы, обращаться к другому роду деятельности.

Табл. 2

Отрицательные корреляционные взаимосвязи показателей
жизнестойкости и стратегий копинг-поведения подростков (N =52)

Показатели стратегий копинг-поведения	Показатели жизнестойкости			
	Вовлеченность	Контроль	Принятие риска	Жизнестойкость
Конфронтальный	-,585***	-,584***	-,282*	-,617***
Дистанцирование	-,579***	-,552***	-,541***	-,655***
Поиск соц. поддержки	-0,14	-0,127	-0,008	-0,122
Бегство(избегание)	-,712***	-,638***	-,418**	-,730***
Отстранение	-,569***	-,437**	-,363**	-,556**
Фатализм	-,558***	-,531***	-,536***	-,648***
Преодоление вне реальности	-0,041	-0,112	-0,122	-0,099
Отрицание	-,518***	-,398**	-,344*	-,523***
Самообвинение	-,501***	-,334*	-0,198	-,451**
Нерешительность	-0,241	-0,241	-,302*	-,299*
Социальная изоляция	-0,158	-0,176	-0,123	-0,175
Сдерживание	-,371**	-0,266*	-0,218	-,356*
Примечание: N (n)-кол-во испытуемых; метод К.Пирсона * - p≤ 0,05, ** - p≤0,01, ***- p≤ 0,001;				

В результате исследования обнаружили себя 48 отрицательных корреляционных взаимосвязей между исследуемыми показателями. Из них количество статистически значимых - 32 взаимосвязи, что составило 66,6 % и это существенно уступает количеству зафиксированных положительных значимых корреляций.

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При качественном анализе сгруппированных отрицательных коэффициентов корреляции следует отметить, что наиболее высокий уровень статистической значимости имеют коэффициенты корреляций между показателями жизнестойкости подростков и такими копинг-стратегиями как: бегство (-,730***), дистанцирование (-,655***), фатализм (-,648***) конфронтальный (-,617***). Другими словами, чем ниже жизнестойкость подростков, тем выше такие деструктивные способы совладания со стрессом как, стремление мысленно и поведенчески избегать проблемы, предрасположенность к отсутствию активности направленной на изменение ситуации. Такой подросток отдаляется от ситуации, уменьшая ее значимость, уходит от активных действий, воспринимает происходящее как неизбежное, выжидает что будет сохранения привычное поведение, либо проявляет агрессивную активность с целью изменить ситуацию, тяжелые жизненные обстоятельства, которые надо победить и/или уничтожить.

Теоретический анализ проблемы и наличие зафиксированных статистически значимых корреляционных взаимосвязей между исследуемыми показателями свидетельствуют о том, что жизнестойкость является важным компонентом в структурно-динамической организации копинг-поведения подростков.

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УДК 377

Панова М.В. Дисциплина «Компьютерное моделирование» при обучении студентов первого курса технических специальностей

Discipline "Computer modeling" in teaching first-year students of technical specialties

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Аннотация. Анализируется вопрос использования современных информационно-коммуникационных технологий (ИКТ) в курсе компьютерного моделирования. Рассмотрены преимущества применения ИКТ в учебном процессе и эффективность использования данных технологий при проведении теоретических занятий.
Ключевые слова: компьютерное моделирование, презентация, визуализация
Abstract. The issue of using modern information and communication technologies (ICT) in the course of computer modeling is analyzed. The advantages of using ICT in the educational process and the effectiveness of using these technologies in conducting theoretical classes are considered.
Keywords: computer modeling, presentation, visualization

Для повышения качества подготовки обучающихся технических специальностей необходимо внедрение и активное использование информационно-коммуникационных технологий (ИКТ) в рамках учебного процесса. Внедрение ИКТ в учебных заведениях среднего профессионального образования (СПО) направлено на совершенствование качества преподавания дисциплин технического профиля. Новые информационные технологии обучения активизируют учебную деятельность обучающихся и развивают их творческие способности. В этих условиях важное значение имеет определение того, какие из новых методов обучения дают наибольший эффект при преподавании и дальнейшее внедрение их в учебный процесс [1].

Начиная с 2021 года набора обучающиеся специальности 24.02.01 «Производство летательных аппаратов» на первом курсе изучают учебную дисциплину «Компьютерное моделирование», которая является предлагаемой частью общеобразовательного цикла программы подготовки специалистов среднего звена в соответствии с ФГОС по специальности 24.02.01 «Производство летательных аппаратов». Учебная дисциплина «Компьютерное моделирование» наряду с учебными дисциплинами общеобразовательного цикла обеспечивает формирование общих компетенций для дальнейшего освоения

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профессиональных модулей. В ККМТ «МГОТУ» на изучение курса «Компьютерного моделирования» отводится один семестр.

Специфика учебной дисциплины «Компьютерное моделирование» заключается в освоении приёмов работы в системе автоматизированного проектирования (САПР) Autodesk Inventor. На втором курсе у студентов начинается дисциплина «Инженерная графика», студенты, как правило, испытывают сложности с восприятием новой информации, связанным с пространственным мышлением, не всегда воспринимают объяснения преподавателя. Наибольшее затруднение большинство студентов, изучающих курс инженерной графики, испытывают при мысленном оперировании пространственными фигурами. Стоит отметить, что количество выполняемых чертежей в данном курсе большое, частично их нужно выполнять дома, в связи с чем у обучающихся возникают проблемы со сдачей предмета.

Приобретение навыков создания трёхмерных моделей позволяет обучающимся лучше справляться в программой на старших курсах, информация, получаемая во время занятий по «Компьютерному моделированию» способствует лучшему восприятию новых идей и их применению в инженерной практике. Использование метода графического моделирования при изучении объектов ракетно-космической отрасли приводит к тому, что в процессе деятельности приходится постоянно оперировать пространственными образами, что создает принципиально новые требования к развитию пространственного мышления [2], а также происходит повышение практического содержания знаний.

Курс «Компьютерное моделирование» рассчитан на 22 недели. Недельная нагрузка обучающегося по курсу — 5 академических часов.

Еженедельные занятия включают:

- тематические лекции;

- выполнение практических работ.

По каждому разделу курса предусмотрено промежуточное контрольное задание. Предусмотрено итоговое контрольное тестирование по всему содержанию курса (дифференцированный зачёт).

Курс состоит из 5 разделов:

- общие сведения о системе Inventor;

- твердотельное моделирование в системе Inventor;

- создание сборки изделия в системе Inventor;

- введение в виртуальную реальность;

- основы проектной деятельности [3].

В ККМТ «МГОТУ» при проведении теоретических занятий по компьютерному моделированию для лучшего усвоения материала преподаватели используют презентации в качестве наглядных иллюстрированных материалов.

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Текст, графика, компьютерная анимация, видео организованы в единую среду, которая разрабатывается в соответствии с определенными приёмами и правилами с целью максимально удобного восприятия информации. Основными задачами презентаций можно считать акцентирование внимания аудитории на наиболее важных моментах и улучшение восприятия и осмысления представленных материалов. Именно в соответствии с этими задачами и определяется характер и объем информации на слайдах, их количество и графическое оформление [4].

Мультимедийные презентации позволяют весь лекционный материал сопровождать пояснениями в виде 3D-изображений, показывать порядок и последовательность создания трёхмерных моделей. Все графические построения сопровождаются описанием последовательных операций и подробно показаны все этапы решения поставленных задач. Эффекты анимации оживляют слайды, делают презентацию более привлекательной. Использование анимации придает слайдам подвижность, позволяет дополнительными средствами концентрировать внимание аудитории на нужных моментах [4]. При недопонимании представленного материала существует возможность неоднократно возвращаться к предыдущему месту.

Чтение лекции заключается в связном и развернутом комментировании преподавателем подготовленных наглядных материалов, которые полностью раскрывают тему данной лекции. Для того, чтобы обучающиеся смогли увидеть и мысленно представить трёхмерные модели, презентация сопровождается анимированными объёмными рисунками, с помощью которых представление изучаемого материала становится интересным, красочным, живым и динамичным. После лекции-презентации 90% процентов студентов без особых затруднений читают и выполняют изображения трёхмерных моделей.

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