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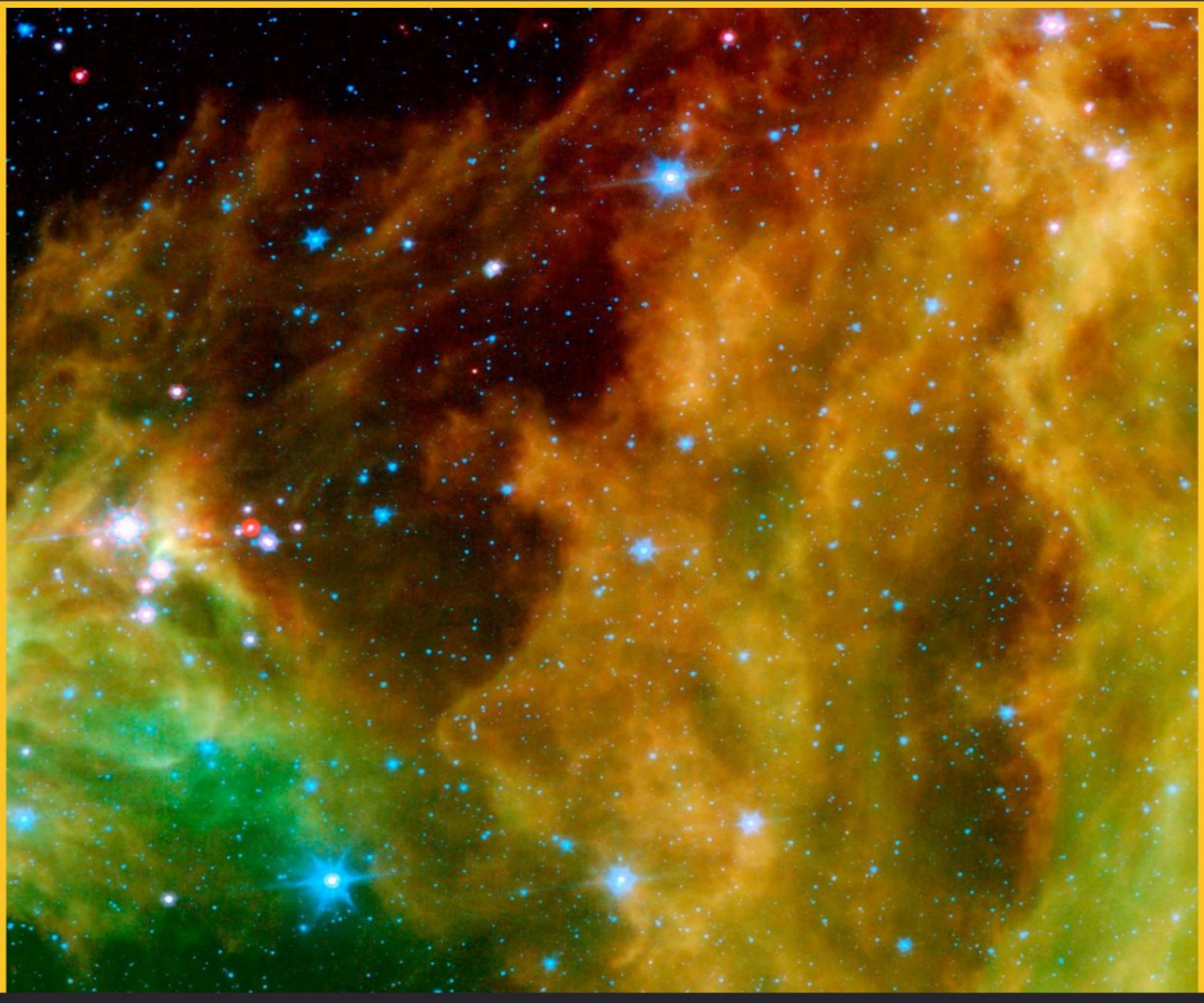

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UDC 372.851

Fokina N.B. Development and use of board games to improve the effectiveness of learning

Разработка и использование настольных игр для повышения эффективности обучения

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Abstract. *The article deals with the problem of increasing the effectiveness of education through the involvement of schoolchildren in the process of creating educational board games, gives recommendations on the pedagogical conditions for accompanying the creation process, and proposes an author's model for designing an educational game.*

Keywords. *Training, efficiency, motivation, game technologies, design, model.*

Аннотация. *В статье рассматривается проблема повышения эффективности обучения через вовлечение школьников в процесс создания учебных настольных игр, даются рекомендации по педагогическим условиям сопровождения процесса создания, предлагается авторская модель проектирования учебной игры.*

Ключевые слова. *Обучение, эффективность, мотивация, игровые технологии, проектирование, модель.*

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Наш мир постоянно модернизируется и изменения затрагивают все сферы современной жизни. В школьном образовании делается акцент на внедрение инновационных технологий и методик, это повышает не только эффективность обучения, но и заинтересованность обучающихся в освоении учебного материала.

Мы стараемся привить любовь к окружающему миру и людям ребенку с детства, поэтому важно также с ранних лет воспитывать в нем тягу к знаниям. Не только на

уроке, но и во внеурочное время нужно поддерживать мотивацию к обучению. Для этого мы используем различные технологии, в том числе и игровые. Геймификация входит в нашу жизнь. Самым простым и понятным для детей видом активности является игра. Они легко и быстро вовлекаются в процесс и с удовольствием воспринимают информацию. И лучшим, на наш взгляд, является привлечение ребенка к созданию игры. Создавая игру, школьники учатся ставить цели, достигать их, решая необходимые задачи, приобретают знания в процессе планирования и выполнения постепенно усложняющихся практических заданий – проектов игры.

С какого возраста школьники могут сами создавать игры?

С помощью учителя, следуя определенной модели, это возможно с начальной школы. Конечно, мы понимаем, что чем старше ребенок, тем сложнее и интереснее созданная им игра. Но мы не должны забывать тот факт, что мотивировать и развивать надо с раннего возраста.

Перед учителем стоит очень важная задача- разработать такую модель для создания игры, чтобы повысить познавательный интерес школьников, сделать занятия ярче, именно это будет формировать положительную мотивацию к обучению, что повлечет за собой развитие внимания, увеличение работоспособности, при этом будут сформированы навыки целенаправленной деятельности по нахождению способа решения проблемы, а еще разовьется умение работать в команде.

Для разработки такой модели необходимо правильно определить цель. Что мы хотим получить на выходе продукта? Главной целью нашей работы стало повышение эффективности обучения школьников посредством вовлечение их в создание и реализацию настольных учебных игр.

Задачи, решаемые в процессе построения модели мы уже рассмотрели с вами выше.

Предлагаемая нами модель (рис. 1), включает в себя четыре этапа проектирования:

- Диагностический этап
- Этап непосредственного проектирования
- Этап реализации
- Этап рефлексии.

Рис. 1. Модель проектирования игры.

Нельзя создать игру для обучения без диагностики того, для кого она создается. Поэтому на первом этапе диагностируется класс в целом и индивидуально учащиеся. Диагностика как психологическая, так и успеваемости. На следующем этапе проектируются содержание и методика игры, проектируется программа сопровождения, на последнем этапе рефлексии- также проводят констатирующие тесты.

На протяжении всех перечисленных этапов идет психолого-педагогическое сопровождение, сопровождаемое педагогическим консилиумом для анализа и оценки эффективности процесса.

Приведем пример игры по математике для учащихся начальной школы, созданной ребятами из 6 класса. Тема, рассматриваемая в этой игре «Сложение и вычитание натуральных чисел». Младшим школьникам было дано поле игры (рис. 2), на нем изображен котенок с произвольно расставленными фигурами, рядом- правила.

Рис. 2. Пример игры для обучающихся начальной школы

Таким образом, поставленная цель была достигнута. Модель для разработки настольных учебных игр повысило мотивацию и эффективность обучения. Хотим заметить, что разработчики представленной игры- ребята, не проявляющие ранее интереса к предмету и к обучению в целом. На данный момент их успеваемость стала выше, мотивация к обучению также повысилась. Игра стала надежным инструментом популяризации математики, помощником и учителям, и ребятам. Всем участникам процесса стало весело и легко изучать математику и проверять полученные знания.

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UDC 37

Mishina T.V. Dance as a form of sociocultural activity

Танец как форма социокультурной деятельности

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Abstract. *The article considers various approaches to the definition of the concept of "dance competition", describes the main characteristics of dance and competition. The historical perspective of the origin of dance competitions since antiquity is given. It was determined that the value orientations of the peoples are reflected in the dance art, its history and ideological views are traced.*

Keywords: *dance, competition, games, competitions, social and cultural activities.*

Аннотация. *В статье рассмотрены различные подходы к определению понятия «танцевальный конкурс», описаны основные характеристики танца и конкурса. Приведен исторический ракурс зарождения танцевальных состязаний со времен античности. Определили, что в танцевальном искусстве отражены ценностные ориентиры народов, прослеживается его история, идеологические воззрения.*

Ключевые слова: *танец, конкурс, игры, состязания, социокультурная деятельность.*

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Танцевальный конкурс представляет собой одну из ярких форм социокультурной деятельности населения, которая физически активна и имеет различные жанровые и стилевые направления. Современный мир представляет широкое поле для выбора реализации танцевальных возможностей для взрослых и детей, огромное количество различных танцевальных направлений и конкурсов как для профессионалов, так и для новичков-любителей.

Танец представляет собой форму хореографического искусства, в котором главным инструментом создания художественного образа является движение человеческого тела. Рассмотрение танца отдельно от музыки, эмоционального сопровождения невозможно. Марта Грехем, известный американский хореограф, определяла танец как «подлинное выражение глубочайших душевных чувств, высвобождаемое через движение тела» [4].

Проведя анализ различных определений танца российских и зарубежных авторов, можно выделить, что танец включает грациозность, элегантность и пластичность, имеет своей целью донести до зрителя определенную мысль, историю, погрузить в атмосферу, для это танцев использует музыку, костюм, способности своего тела для движения и мимики.

Танец присутствует практически во всех этнических культурах и их традициях. С развитием цивилизации происходило параллельно и развитие танца, его усложнении, появились различные стили, виды и формы.

Танец многогранен, он служит инструментом самовыражения, способом социального взаимодействия, является состязательным видом спорта и показательным видом искусства.

В отличие от иных видов искусства, существующих в мировой истории, танец сложно идентифицировать с определенным периодом его зарождения. Известно, что еще в древнейшие времена танец был частью культуры и применялся в религиозно-обрядовой деятельности, сопровождая различного рода ритуалы. Позднее в этнографических, антропологических источниках мы находим описание танцевальных обрядов не только как части религиозного ритуала, но и в описание любовных игр между партнерами, а также как соревновательный акт для выявления лидера. То есть о зарождение танцевальных конкурсов можно говорить с древнейших времен.

Конкурс (от лат. concursus – соревнование) – это состязание, между представителями различных направлений деятельности в области спорта, науки, искусства и так алее, с целью выявления лучших исполнителей, мастеров.

Люди с древнейших времен выражали интерес к состязательности в спорте, творчестве, искусстве. Зарождение соревнований по танцевальному искусству можно проследить еще в эпоху фараонов, когда в древнем Египте для привлечения внимания верховного жреца храмовые танцовщицы состязались в своем мастерстве. Как отмечает Шериф Х. М.: «Конкуренция и желание получить превосходство требовали работы над изяществом и легкостью движений; движения усложнялись, и далеко не каждая танцовщица могла двигаться подобным образом, так как этот вид танца требовал очень большой гибкости и длительных тренировок» [5].

Рассматривая древнеиндийскую праздничную культуру, мы наблюдаем соревнования борцов, музыкантов, фокусников, канатоходцев в честь Бога Индры, при этом данные соревнования носили развлекательный характер и служили для увеселения публики, поэтому соревнующиеся одновременно исполняли и роль

комедийных актеров. То есть уже в древние времена мы наблюдаем интеграцию спорта и искусства в массовых зрелищах.

В Древнем Китае праздничная культура была соотнесена с временами года и всегда сопровождалась конкурсными программами. Так, по их поверьям считалось что танцевальные состязания в зимний период способствовали плодородию и успехам на весь будущий год.

Отдельно, в истории зарождения конкурсных программ следует выделить праздничную культуру Древней Греции, которая лежит в основе и современной праздничной культуры. Именно праздники Греции подарили нам Олимпийские, Пифийские и Дельфиские игры, в которых музыканты, певцы, актеры и танцоры состязались за лидерство и известность.

Праздничная культура Средневековья и Возрождения подарила миру первых профессиональных танцовщиков в лице трубадуров, гистрионов, жонглёров. В благородных кругах проводились состязания на баллах и маскарадах, оценивалось виртуозное исполнение танца, при этом отслеживалась легкость в исполнение, гибкость и подвижность. Победителей выбирали зрители аплодируя. В XI веке в Шотландии зародился конкурс волынщиков и танцоров «горские игры», который актуален и по сей день.

Первые соревнования по танцам среди разных танцевальных школ появились в Ирландии, где именитые танцовщики обучали своих учеников своему мастерству. Преподаватели тоже участвовали в состязании и проигравших должен был покинуть место проведения соревнований вместе со своими учениками и не появляться в городе со своими программами в течение года. Все почести доставались школе победителя.

Танцевальные конкурсы характерны и для традиционной русской культуры. На всех праздничных событиях, ярмарках, свадьбах танцы приобретали соревновательность и назывались перепляс, который актуален и современной культуре. Характеризуя перепляс, Юдин А.В. отмечал: «Элементов в переплясе может быть использовано множество, а их комбинация и последовательность – чистая импровизация танцующего. Участники перепляса соревнуются в силе, ловкости, выносливости и изобретательности. Задача - перетанцевать соперника. Соревнуясь в пляске, молодежь щеголяла ловкостью, удалью, грацией, и праздничными нарядами».

Таким образом, мы можем заметить, что танец являлся частью культурной жизни различных народов задолго до современной его интерпретации, и по мере развития видов танца появлялись и новые формы соперничества.

В танцевальном искусстве отражены ценностные ориентиры народов, прослеживается история, идеологические воззрения, образ жизни, а также индивидуальные качества танцора, его характер, физические способности, эмоции и чувства. При помощи танца люди устанавливают межкультурные и личные связи, участвуя на соревнованиях различного уровня представляют свою страну, свой этнос, город. В танце отсутствует вербальное общение, танцоры не произносят слов, но язык танца насыщен выразительностью, ведь музыка, ритм, темп, пластика, человеческое тело, эмоция иногда говорят громче слов, именно поэтому язык танца является международным, он понятен каждому, не зависимо от того, на каком языке говорит человек, какими знаниями он обладает.

Значение танцевальных конкурсов в мировой культуре очень велико, так как конкурс позволяет открыть новых «звезд танца», дает возможность юным танцорам выйти на мировую арену [3]. Так же конкурсы различного уровня предлагают коммуникационную площадку для хореографов, педагогов и молодых исполнителей, дающих им возможность не только познакомиться и представить свои работы, но и обменяться опытом, перенять новые идеи для творчества, расширить свой танцевальный кругозор.

Также, танцевальные конкурсы являются одним из способов сохранения культурного наследия. Классические спортивно-бальные произведения помогают сохранить нашу историю, развивают эстетические ценности, воспитывают подрастающее поколение. Помимо классических номеров, на конкурсах демонстрируют навыки современной хореографии, знакомят с различными новыми направлениями танца. Это стимулирует педагогов хореографов искать новые пластические средства и танцевальные формы, внедрять их в свои привычные программы. Каждый конкурс – событие культурной жизни нашего города, региона, страны, развивающий эстетические, физические и духовные ценности [2].

Таким образом, хореографические конкурсы имеют не только художественное, но и общественное значение. Способствуют сплочению представителей коллективов из разных городов и стран, позволяют развивать свои танцевальные направления и перенимать опыт других коллективов, дают возможность заявить о себе и о своей школе, а победителям продвинуться на ступень выше в мечте.

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UDC 740

Zak A. Features of compiling plot-logical tasks by elementary school students

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Abstract. *The article presents an experimental work aimed at determining the features of creative mental activity in compiling plot-logical tasks of non-educational content. 105 second-graders and 107 third-graders participated in individual experiments. The experiment with each child included 4 series: in the first and second series it was proposed to compose tasks in the external plan, in the third and fourth - in the internal plan. It was shown that one part of the children act formally, offering unsolvable problems, the other part - meaningfully, offering one or two solvable problems, the third part - productively, offering three to five solvable problems. In the third grade (compared to the second) there were fewer children acting formally and more acting meaningfully and productively.*

Keywords: *plot-logical tasks, second-graders, third-graders, compiling of tasks, ways of compiling: formal, meaningful, productive.*

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1.Introduction

One of the urgent tasks of psychological and pedagogical science is the study of the conditions that ensure the development of independent thinking of schoolchildren in the course of education. On the one hand, this means that it is necessary to intensify research in the direction traditional for educational psychology - the formation of schoolchildren's methods of independent problem solving. On the other hand, it follows from this, in our opinion, that it is necessary to conduct new research, in particular in the direction related to the formation of schoolchildren's methods of independent production or formulation of tasks on various topics of subjects included in the school curriculum.

The provisions of the new FSES IEO contain indications of the need for elementary school students to achieve meta-subject results, which are, in fact, means and ways of implementing independent thinking, associated, in particular, with the ability to solve creative problems [5]. Such skills also include actions related to the independent compilation of new tasks by children, with the independent achievement of a creative goal.

In preliminary experiments with a small number of younger schoolchildren of different ages, on the material of this trial methodology, it was revealed that there are three ways to compose tasks.

The first method is characterized by the ability to formulate tasks formally. This means that children make up tasks of a non-problem type. One variant of such compilation is characterized by the fact that the answer is already presented in the condition of the formulated problem, it does not need to be searched for. For example: “Petya, Kolya and Vasya jumped high at competitions at school. Petya jumped higher than Kolya, and Kolya jumped higher than Vasya. Who jumped higher than Kolya? The second option is due to the fact that this question cannot be answered according to the condition of the task, For example: “Petya, Kolya and Vasya jumped high at competitions at school. Petya jumped higher than Kolya, and Kolya jumped higher than Vasya. Who is Petit?

The second method is characterized by meaningful formulation of tasks. This means that children make up problems in which an answer can be found by correlating the judgments given in the condition. For example: “Petya, Kolya and Vasya jumped high at competitions at school. Petya jumped higher than Kolya, and Kolya jumped higher than Vasya. Who jumped the highest? In this case, children usually make up one or two tasks to be solved.

The third way is characterized by productive tasking. This means that the children make up not one or two tasks, as in the previous case in the meaningful compilation of tasks, but three or five similar tasks.

2.Material and methods

The purpose of our study was to determine how these ways of composing problems are distributed among children in the second and third grades.

It was assumed that in the third grade, in comparison with the second grade, there will be more children who are meaningful and productive in constructing tasks, and fewer children who use the formal method.

A total of 212 students took part in four series of individual experiments that were conducted in the last quarter of the academic year:: 105 of them were in the second grade, 107 in the third. Among the students of the second grade, 27 people participated in the first series, 24 in the second, 29 in the third, and 25 in the fourth; Among the pupils of the third grade, 29 people participated in the first series, 25 in the second, 27 in the third, and 26 in the fourth.

To achieve this research goal, we have developed a methodology that includes plot-logical tasks of varying complexity. They are inferences built on plot material: their conditions contain information about the properties and relationships of people and things. Based on this information, it is required, correlating the content of these judgments (general and particular) in the condition of the problem, to find out the content of the given judgment (private). In other

words, in such tasks it is necessary to draw a conclusion about the presence or absence of certain properties and relations in people and things presented in the condition. Similar problems are interesting for children and can serve as material for their independent compilation of similar problems (for more details on plot-logical problems, see our studies [1], [2], [3], [4]).

The experiments were carried out on the material of the tasks of the "Negation" technique related to the implementation of the reasoning, in which it was required, by correlating the data in the condition of the judgment task of different levels, to find out the content of the unknown (i.e. given) judgment. For example, the following task: “Petya and Nina had a dog each: someone had a Zhuchka, someone had a Polkan. Nina didn't have a bug. Which of the guys had Polkan?”

To answer a problem question (i.e., to find an unknown quotient judgment), it is required to correlate the general judgment “Petya and Nina had a dog each: someone had a Bug, someone had a Polkan” and a private judgment “Nina did not have a Bug”. As a result, we can conclude (i.e. find another private judgment) - "Petya had Polkan."

Four series of individual experiments were carried out:

- in the first series, tasks of the first degree of complexity were solved and compiled in the external plan,

- in the second series, tasks of the second degree of complexity were solved and compiled in the external plan,

– in the third series, tasks of the first degree of complexity were solved and compiled internally,

- in the fourth series, tasks of the second degree of complexity were solved and compiled internally.

Thus, the series of experiments differed both in terms of the conditions for solving and compiling problems (i.e., externally or internally), and in their complexity, meaning the number of judgments that need to be compared in order to find a solution to problems).

2.1. The first series of experiments

In the experiments of the first series, the problems were solved and compiled externally, i.e., using cards with drawings. Some of them show girls and boys having different looks (that is, dressed differently or doing different things), while other cards show various kinds of objects found on the street, in the house, at school, etc.

First, the child was given a sheet of paper with text and was asked to read and solve a training problem: “Alik and Borya came to the store. Someone bought a pen, someone bought a pencil. Alik bought a pencil. What did Boris buy? If the child did not cope with such a task, then work with him ended.

If the child successfully solved the training task, then he was offered three main tasks of varying complexity, each of which was printed on a separate sheet of paper in large print.

First, it was necessary to solve the main task No. 1: “Sasha and Galya were reading: someone was reading a newspaper, someone was reading a magazine. Sasha didn't read the newspaper. What did Galya read? (This is a task of the first degree of difficulty, since the conclusion is proposed to be made taking into account one judgment: "Sasha did not read the newspaper").

If the child could not solve this problem, then work with him ended. If he successfully solved problem No. 1, then he was asked to solve the main problem No. 2: “Misha, Vova and Dima ate vegetables. Someone ate cucumbers, someone tomatoes, someone carrots. Misha ate carrots, Vova did not eat tomatoes. What did Dima eat?” (This is a task of the second degree of complexity, since the conclusion is proposed to be made taking into account two judgments: "Misha ate carrots" and "Vova did not eat tomatoes").

If the child successfully solved problem No. 2, then he was asked to solve the main problem No. 3: “Natasha, Vera, Fedya and Tolya went to different cities. Some of the guys went to Orel, someone to Voronezh, someone to Ryazan, someone to Kursk. Natasha went to Orel, Vera went to Voronezh, Fedya did not go to Ryazan. Where did Tolya go? (This is a task of the third degree of complexity, since the conclusion is proposed to be made taking into account three judgments: "Natasha went to Orel", "Vera went to Voronezh" and "Fedya did not go to Ryazan").

In any case, whether the child successfully or unsuccessfully solved the main task No.3, he (subject to the successful solution of the main task No. 2) was asked to further compose tasks of the first degree of complexity, i.e. tasks with two actors, as in the main task No.1.

“Now you will come up with problems yourself, where there were two guys who were doing something. You have already solved this problem. Come up with as many tasks as you want”.

Saying this, the experimenter pointed to a sheet with the conditions of the main task No.1 located on the table. Thus, the subjects were asked to come up with tasks of the first degree of complexity, similar to task No.1.

To write down the conditions of the new task, the child was given a separate sheet of paper. To make it easier for the child to come up with a plot basis for the task and it is easier to establish a connection of one or another person with one or another object, he received cards with drawings: some depicted girls and boys who had a different appearance (i.e., dressed differently or doing different things), and others - different kinds of objects found on the street, in the house, at school, etc. These cards could be moved and compared in different ways.

It is important to note that the child is not told how many tasks to complete, but only says: "Think up as many as you want."

2.1.1. Groups of children

Five groups of children were identified according to the specifics of the task preparation. The children of the first group refused to compose tasks, saying "... I don't know what to do...", "... I don't know how...", etc.

The children of the second group acted formally. Their actions were characterized by the following. Sometimes they read problem No. 1 again, and sometimes they did not reread it (recall that the sheet with its conditions was located on the table to the left of the child).

As could be seen (especially when the children read the problem aloud), when reading the marked problem, they did not have a special consideration of its conditions - the problem was simply read as some plot text.

After that, they proposed tasks without first solving them. At the same time, different variants of the formal formulation of tasks were encountered.

First, unsolvable problems. For example, some of the children “composed” such tasks: “Vasya and Kolya ate porridge: someone buckwheat, someone rice. Vasya did not eat semolina. What did Kolya eat? or “Misha and Sergey painted: someone painted planes, someone drew tanks. Misha and Sergey drew different objects. What did Misha draw? As can be seen, in these problems there are no grounds for finding a solution, since the necessary data are not available in their conditions.

Secondly, non-problematic tasks. For example, some of the children suggested a task of this type: “Vova and Galya were picking berries: someone was picking raspberries, someone was strawberries. Vova picked raspberries, Galya picked strawberries. Who collected raspberries? As you can see, the solution process is not assumed here, since the answer to the question of the problem is already given in its condition.

Thirdly, tasks-copies. In these cases, the children suggested (without knowing their solution) correct, problematic, solvable tasks, since they exactly copied the main task No. 1, for example: “Katya and Masha did their homework: someone solved examples, someone wrote words. Katya did not solve the examples. What did Masha do?”

The children of the third group acted meaningfully, since they made up one or two (but not more) correct, solvable problems, since they were first convinced that the problem they proposed had a solution, for example:

1) “Igor and Vanya were playing chess. Someone won 3 times, someone 2 times. Vanya did not win 3 times. How many times has Igor won?”

2) Marina and Galya drew animals. Someone drew bears, someone hares. Marina did not draw hares. Who did Galya draw?”

The actions of the children of the third group were characterized by the fact that before proposing new tasks, they first turned to the conditions of the main task No. 1: they read the conditions of this task several times, but not in its entirety, but in parts, in separate judgments and sentences. It can be assumed, based on observations of their actions, that they were trying to understand the "arrangement" of this task, to understand how it combines judgments of different types - general and particular.

Children of the fourth group acted productively, since they made up several (three - five) tasks to be solved. However, all tasks were built according to one scheme, one template, for example:

1) “Borya and Kostya were picking mushrooms: someone was picking russula, someone was white. Borya did not collect russula. What did Kostya collect?”

2) “Nina and Liza knitted: someone knitted a scarf, someone knitted a hat. Nina did not knit a scarf. What did Liza knit? ”

3) “Olya and Gena sculpted from plasticine: someone sculpted a hare, someone sculpted bear. Olya did not sculpt a hare. What did Gena sculpt? ”

The generality of the construction of these three tasks is manifested in a number of circumstances: a negative judgment always concerns the first of the actors and the first of the objects mentioned, the question always contains the name of the second actor (and not the first) and always refers to the object, not to the person).

2.2. The second series of experiments

In the second series of experiments (as in the first), the children were allowed to use the cards offered to them with images of children and objects when solving and compiling.

But only those children who were able to solve all the main problems (No. 1, No. 2 and No. 3, of the first, second and third degrees of complexity) were allowed to compose problems, since they were asked to compose problems not of the first (as in the first series), but the second degree of complexity, i.e. tasks with three actors, as in the main task No. 2.

The child was told: “Now you will come up with tasks yourself, where there were three guys who were doing something. You have already solved this problem. Come up with as many tasks as you want. Saying this, the experimenter pointed to the sheet with the conditions of the main task No. 2, located on the table.

Thus, the subjects were asked to come up with tasks of the second degree of complexity, similar to task No. 2. Just as in the first series, the child was given cards with images of children and objects, as well as children's actions with objects. According to the nature and results of compiling tasks of the second degree of complexity, the children were divided into four groups.0

2.2.1. Groups of children

The first group included two subgroups of children who acted formally when compiling tasks. The first subgroup consisted of children who offered unsolvable problems. In some cases, the tasks lacked an object of comprehension that was missing in the condition, for example: “Petya, Misha and Vasya went in for sports: someone played football, someone played volleyball, someone played basketball. Petya played football, Misha did not play hockey. What did Vasya play?”

As you can see, in the first sentence (general proposition) there is no “hockey”, but in the private negative proposition it is present. In other cases, the tasks contained two negative judgments, for example: “Kolya, Natasha and Igor watched TV: some in the morning, some in the afternoon, some in the evening. Kolya didn't watch TV in the morning, Natasha didn't watch TV in the afternoon. When did Igor watch TV?”

The second subgroup consisted of children who offer non-problematic tasks without negative judgments. In this regard, the answer to the problem is contained in its condition, for example: “Vasya, Misha and Liza cut out figures: someone cut out circles, someone squares, someone triangles. Vasya cut out circles, Misha cut out squares, Lisa cut out triangles. What did Vasya cut out?”

The second group included children who act meaningfully when compiling tasks. They offered one or two correctly constructed problems of the second degree of complexity, which they themselves previously (that is, before formulating the final version of the condition) solved, for example: “Katya, Vera and Marina ate porridge. Someone ate rice, someone buckwheat, someone oatmeal. Katya ate rice porridge, Vera did not eat buckwheat. What kind of porridge did Marina have? ”

The third group included children who showed the productivity of the author's thinking. They offered several (three - five) solvable, well-formed problems, where judgments were selected according to the same scheme, for example:

1) “Vera, Nadya and Galya painted animals: someone a fox, someone a wolf, someone a bear. Vera drew a fox, Nadia did not draw a wolf. Who drew the bear?”

2) “Dima, Oleg and Seva jumped high: someone took first place, someone second, someone third. Dima took first place, Oleg did not take second place. Who took third place? ”

3) “Katya, Masha and Lena embroidered: some with blue threads, some with red, some with green. Katya embroidered with blue thread. Masha did not embroider with red threads. Who embroidered with green threads? ”

The literal similarity of these three tasks is characterized by a number of features.

Firstly, the first of these characters is combined in a judgment with the first of the mentioned items - in the first task: "Vera drew a fox ...", in the second task: "Dima took first place ...", in the third task: "Katya was embroidered with blue threads ... ".

Secondly, the second of the named characters in a negative judgment is combined with the second of the mentioned objects, - in the first task: "Nadya did not draw a wolf ...", in the second task: "Oleg did not take second place ...", in the third task: "Masha did not embroider with red threads ... ".

Thirdly, the question is addressed to the character, not the object - in the first task: “Who drew the bear?”, in the second task: “Who took third place?”, in the third task: “Who embroidered with green threads?”.

Fourthly, the question contains the third of the mentioned “things of thought”, in the first task: “Who drew the bear?”, in the second task: “Who took third place?”, in the third task: “Who embroidered with green threads?”

2.3. The third series of experiments

In the third series of experiments (unlike the first two series), the children were not offered cards with images of characters and objects that were related to these characters according to the plot of the tasks, but they were required to solve and compose tasks only in terms of oral or written speech, without any reliance on drawings and images, that is, in the internal, mental plan.

At the same time (as in the first series), when compiling tasks, the child had the opportunity to refer to the sheet with the conditions of the main task No. 1, placed on the table to the left of the child.

First, the children were offered to solve one training and three main tasks, and then (those who managed to cope with the task of the second degree of complexity - No. 2) were asked to create new tasks of the first degree difficulties. The same groups of children were singled out according to the peculiarities of the task preparation.

2.4. The fourth series of experiments

In the fourth series of experiments (as well as in the third series), the tasks were solved and compiled internally, using oral and written speech. First, the children solved the training and main tasks, then (those children who were able to solve all the main tasks - the successful solution of task No. 3 was of fundamental importance here) were asked to compose tasks of the second degree of complexity (i.e. tasks with three characters and three objects).

At the same time (as in the second series), when compiling tasks, the child had the opportunity to refer to the sheet with the conditions of the main task No. 2, placed on the table to the left of the child.

The same groups of children were singled out according to the peculiarities of the composition of tasks (the fourth group, just as in the second and third series, included only fifth-graders who acted in an original way) and with the same characteristics of the tasks they proposed as in the second series (see above).).

3. Results

The tables show the number of students who formally, meaningfully and productively compiled logical problems in each of the four series of experiments.

Table 1

The results of the second-graders compiling plot-logical tasks in a formal, meaningful and productive way (in %)

Methods for compiling tasks	Series of experiments			
	First	Second	Third	Fourth
Formal	55,6	58,3	65,5	76,0
Meaningful	33,3	33,4	34,5	24,0
Productive	11,1	8,3	0,0	0,0

Table 2

The results of the third-graders compiling plot-logical tasks in a formal, meaningful and productive way (in %)

Methods for compiling tasks	Series of experiments			
	First	Second	Third	Fourth
Formal	30,6	36,0	44,5	53,9
Meaningful	48,3	44,0	40,7	34,6
Productive	24,1	20,0	14,8	11,5

Analysis of the data in tables 1 and 2 allows us to formulate a number of provisions.

First, in each class, the number of children who make up unsolvable tasks (i.e., acting formally) and solving tasks (i.e., acting meaningfully and productively) directly depends on the degree of their complexity. Thus, in the first and third series, the tasks consisted of a larger number of children than, respectively, in the second and fourth, although in the first-second and third-fourth series, the tasks were compiled under the same conditions (recall that in the first and third series there were tasks of the first degree of complexity, and in the second and fourth - of the second degree of complexity).

Secondly, in each class, the number of children who make up unsolvable and solvable problems directly depends on the conditions for compiling: externally or internally. So, in the first and second series, the tasks to be solved were more children than, respectively, in the third and fourth, although in the compared series the tasks were of the same degree of complexity - the first (in the first and third series) or the second (in the second and the fourth

series), we recall that in the first and second series the tasks were compiled with the help of cards, and in the third and fourth - orally or in writing, but without cards.

Thirdly, it is of interest that the form of actions in the preparation of tasks to a greater extent affects the success of the author's thinking, than their degree of difficulty. So, in each class, the total number of children who compose tasks meaningfully and productively in the second series (i.e., using cards, but of the second degree of complexity) is greater than the number of children compiling tasks meaningfully and productively in the third series (i.e. without cards, but the first degree of difficulty).

4.Conclusion

So, the conducted research confirmed his initial hypothesis: indeed, in the third grade there are fewer children who act formally when compiling tasks, and more children who prefer to use productive and meaningful ways.

The results obtained should be considered in the context of the design features of the experiments.

First, the experiments were carried out individually.

Secondly, only one type of plot-logical tasks was used - "Negation". The peculiarity of these tasks is due to the fact that when solving and compiling them, it is necessary to compare affirmative and negative judgments. This creates certain difficulties for children's actions when comparing these tasks with tasks of the "Who has what" type. In the latter, only affirmative judgments are offered, for example: “Petya and Vasya bought school supplies. Someone bought pencils, someone bought pens. Vasya bought pens. What did Peter buy?”

Thirdly, the experiment included four series, differing in the conditions in which the children were asked to act: in the first series, tasks of the first degree of complexity were solved and compiled in the external plan, in the second - tasks of the second degree of complexity in the external plan, in the third - tasks of the first degree complexity in the internal plan, in the fourth - tasks of the second degree of complexity in the internal plan. This experimental design allowed to identify the relationship between the success of drawing up tasks with their complexity and the nature of actions (in the external or internal plan).

In general, it can be said, based on the data obtained in the study, that, in relation to plot-logical tasks, teaching children in the second and third grades is a period of relatively intensive formation, mainly of a meaningful way of composing tasks, their proactive production. The productive method during this period is formed less intensively, since in the second grade this method was implemented only when compiling problems in the first and second series (that is, when compiling problems only on the external plane). In the third grade,

although this method was observed when compiling tasks in the third and fourth series, it was only in a few percent of the children.

In the future, it is planned to conduct a study of the features of compiling plot-logical problems with both first-grade and fourth-grade students. In this case, sufficient conditions will be created in order to characterize the age-related dynamics of mastering meaningful and productive ways of producing tasks in the primary grades as a whole.

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UDC 740

Zak A. Formation of Metasubject Intellectual Actions for schoolchildren in grades 5 – 6

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Abstract. *The article is devoted to the presentation of a study aimed at studying the features of the formation of metasubject intellectual actions (cognitive competencies) during the period of schoolchildren's education in grades 5 and 6. On the material of tasks of non-educational content, the features of age-related changes in skills related to the construction of inferences, the development of methods for solving problems, planning to achieve the desired result, reflection of one's own actions are shown.*

Keywords: *construction of inferences, development of methods for solving problems, planning to achieve the desired result, reflection of one's own actions; schoolchildren of 5th and 6th grades; plot-logical and spatial-combinatorial tasks.*

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1.Introduction

The general meaning of this study was to develop such an important direction in solving the fundamental psychological and pedagogical problem "Training and Development" as establishing the characteristics of the formation of metasubject intellectual actions, – cognitive competencies, – among schoolchildren during the period of study in the fifth and sixth grades of basic school.

According to the provisions of the new Federal State Educational Standard for Secondary Schools [8], the mastering of curricula by children in the fifth-sixth grades of secondary school should lead not only to the assimilation of knowledge, skills and abilities in specific school disciplines, but also to the mastery of cognitive competencies of various kinds by students.

These competencies are associated with children's mastering the skills of constructing inferences of varying complexity, with mastering the ability to choose and implement effective approaches in developing methods for solving search problems on educational and non-educational material, with schoolchildren mastering the skills of planning ways to solve

problems, with mastering cognitive reflection and control skills their actions in order to correct them.

1.1.Types of knowledge

It should be noted that - in understanding the effectiveness of methods for solving search problems, in interpreting cognitive reflection, in understanding the characteristics of the formation of planning skills and in assessing the actions of constructing inferences of varying complexity - we relied on the provisions on two types of cognition developed in dialectical logic [4] and implemented in the studies of V.V. Davydov [2], [3] and his collaborators (see, for example, [1], [5], [6], [7]).

According to these provisions, a person who cognizes the surrounding reality can be aimed both at reflecting the internal connections and relations of objects and phenomena, thereby realizing theoretical, meaningful, reasonable knowledge, and at reflecting their external connections and relations, thus realizing way, empirical, formal, rational knowledge.

The first case is characterized by the effectiveness of cognitive activity, because its result is associated with the identification of the causes underlying the changes in the object being cognized, which is the basis for the development of the corresponding pattern.

The second case is characterized by insufficient efficiency of cognitive activity, because its result is associated only with the description and classification of externally presented characteristics of objects of knowledge. This approach is associated with the impossibility of revealing the reasons for the change of a cognizable object and reliably characterizing the patterns of its existence in the past, present and future.

1.2. Cognitive competencies of schoolchildren

Based on the above provisions on the content and methods of different types of cognition, an understanding of the features of cognitive competencies was developed [5], [6]. In accordance with this understanding, the development of methods for solving problems in one case is associated with the allocation of significant data relationships contained in their conditions, in the other case, the disclosure of significant data relationships that are objectively contained in the conditions of the problems being solved does not occur. The development of a solution method, associated with the allocation of significant relations, is implemented as a meaningful action, the result of which is a general method of solving problems, and the development of a solution method, not associated with the allocation of essential relations, is implemented as a formal action, the result of which is a particular method of solving problems.

Based on the above provisions on the two types of cognitive activity, we assumed that cognitive reflection can be associated with a person’s appeal in one case to the foundations of these methods and with understanding the features of their development as related to

significant relationships in the conditions of the proposed tasks. In another case, cognitive reflection may be associated with a person's appeal only to the external features of these methods without comprehending their objectively existing connections with significant relationships in the conditions of the problems being solved. In the first case, cognitive reflection is realized as a meaningful action, and in the second case, as a formal action.

When analyzing the features of planning, two approaches were considered in developing a program of action in a situation of problem solving. Within the framework of one approach, the solution of search problems includes two stages - research and execution. At the first stage, the conditions of the proposed problem are analyzed, associated with the identification of data and their relationships in the conditions, and the preparation of a plan for solving the problem. The content of planning at this stage is the determination of the sequence of all actions required for a successful solution of the problem, the development of a program for the implementation of previous and subsequent actions to solve the problem in the entire volume. It is important to emphasize that all the required actions in this case are planned before the implementation of the solution to the proposed problem.

Within the framework of another approach, the research stage associated with the analysis of the conditions of the proposed problem and the planning of its solution as a whole is absent. Drawing up a plan with this approach is carried out in parts, each of which may include one or more required actions. In this case, subsequent actions are planned only after the previous ones have been completed.

Planning, implemented on the basis of the first approach, is carried out as a meaningful action, since the action program for solving the problem is developed based on the analysis of the entire amount of data contained in the condition of the proposed problem. Planning, implemented on the basis of the second approach, is carried out as a formal action, since the program of actions to solve the problem is developed and implemented in parts, in separate links, without comprehending the content of previous and subsequent actions and their relationships within the entire set of actions to solve the proposed problem.

When developing criteria and indicators for the formation of skills in constructing reasoning when making inferences, the fact was taken as a basis that in one case the derivation of a conclusion is associated with the selection of true relations based on the correlation of all judgments that make up the task, and in the other case, deriving a conclusion from the proposed judgments is associated with highlighting false relationships, since only a part of the proposed ones correlates.

Highlighting the true relations of the proposed judgments leads to favorable conditions for demonstrating a consistently realized inference, and highlighting the false relations of

judgments leads to contradictions in the execution of the inference. In the first case, the construction of reasoning is implemented as a meaningful action, in the second case, as a formal action.

1.3. Study Characteristics

The purpose of the study was to determine the characteristics of the cognitive competencies of students in the fifth and sixth grades of the basic school. At the same time, it was based on the assumption that cognitive competencies - associated with the mastery of schoolchildren's ability to build logical reasoning, with the mastery of effective ways to solve problems of a search nature, with the mastery of the ability to independently plan ways to achieve the goal and with the development of the initial forms of cognitive reflection - are formed in schoolchildren during the specified period of study with different intensities: the most intensively is the ability to build logical reasoning, less intensively is the ability to implement effective ways to solve problems of a search nature, even less intensively is the ability to exercise cognitive reflection and control of one's actions, the least intensively is the ability to plan an achievement goals.

2. Materials and methods

2.1. Diagnostics of the method of solving problems

Determination of the characteristics of ways to solve search problems in schoolchildren of grades 5-6, in order to assess the formation of the corresponding cognitive competence, was carried out using the "Exchanges - 1" methodology. The content of the methodology consisted of eight spatial-combinatorial tasks, the solution of which was required to be carried out in a visual-figurative form, in a mental plan. Tasks from the first to the eighth gradually became more difficult: to solve the first and second tasks, it was required to perform two actions, the third and fourth - three actions, the fifth and sixth - four actions, the seventh and eighth - five actions.

At the beginning of the diagnostic lesson, children receive sheets where they should write down the solution of problems. After the distribution of the indicated sheets and forms on the blackboard, a variant of the problem of the "Exchanges - 1" methodology is presented:

MM _ _ _ 8 5
T T 8 5

Further, the children are told: "You need to do one action with the same letters, so that as a result these letters are arranged in the same way as the same numbers. For one action,

we take one mutual exchange of their places of any two letters. In this problem, you need to swap the letters M and T".

The following is the solution:

1) T M

T M

Then the second task is drawn on the board. It requires that the same letters in two actions end up in the same places where the same numbers are located:

C C H H _ _ _ 7 2 4 9
K K G G 7 2 4 9

After a joint discussion with the children of the solution to this problem - which consists in the fact that in the first action the letters H and K are interchanged, and in the second action - C and G - this solution is written on the board:

1) C K H H 2) C K G H
C K G G C K G H

Then, after answering the students' questions, the teacher distributes forms with tasks: two training and eight main ones.

FORM

Training tasks

1. LL _ _ _ 36 (1 action)

RR 36

2. B B A A _ _ _ 5 4 7 6 (2 actions)

P P O O 5 4 7 6

Main goals

1. W B R T _ _ _ 4 8 8 4 (2 actions)
W B R T 7 2 2 7

2. K W R M B _ _ _ 7 4 9 4 7 (2 actions)
   K W R M B 1 8 9 8 1

3. V K N P R S _ _ _ 8 3 2 2 3 8 (3 actions)
   V K N P R S 7 1 6 6 1 7

4. G P T N V R F _ _ _ 8 4 2 7 2 4 8 (3 actions)
   G P T N W R F 5 1 6 7 6 1 5

5. L B S R M W X H _ _ _ 4 7 8 9 9 8 7 4 (4 actions)
   L B S R M W X H 2 3 6 1 1 6 3 2

6. R P K V C F W G S _ _ _ 5 4 3 7 8 7 3 4 5 (4 actions)
   R P K V C F W G S 6 2 9 1 8 1 9 2 6

7. N M W B K R S T F W _ _ _ 1 9 2 8 7 7 8 2 9 1 (5 actions)
   N M W B K R S T F W 3 6 5 4 0 0 4 5 6 3

8. P L T V S B M X D R _ _ _ 8 2 7 1 3 3 1 7 2 8 (5 actions)
   P L T W S B M X D R 5 6 9 0 4 4 0 9 6 5

The children are told: “At the top of the sheet with tasks are the conditions of two training tasks. The conditions of the main tasks are given below. Near each task, it is indicated how many actions it needs to be solved: tasks 1 and 2 - in two actions, tasks 3 and 4 - three, tasks 5 and 6 - four, tasks 7 and 8 - in five actions.

First you need to solve two problems at the very top of the sheet - training. Write down your actions in the same way as it was on the board. Above all, do not forget that only two letters exchange their places in one action”.

Further, moving from one student to another, the teacher tells each student whether he solved the problem correctly or not. In the latter case, he explains what the mistake was.

Then the children are offered to move on to solving the main problems. Since all tasks are built on the basis of the same principle - the letters of the upper row are interchanged with the letters of the lower row - the correct solution of all tasks allows us to assert that there has been a development of a general method for solving these search problems, which is

associated with a meaningful analysis of the conditions of the problem. In the case when the first two or four main problems had the correct solution, and more complex problems had the wrong solution, this means that in the first four problems the general solution method was not applied. The same assessment will be in the case when tasks from the first to the fifth or to the sixth are successfully solved, but problems 7 and 8 are not successfully solved.

2.2. Reflection Diagnostics

Determining the characteristics of reflection of methods for solving problems in schoolchildren of grades 5 - 6, in order to assess the formation of the corresponding cognitive competence, was carried out using the “Anagram” technique.

At the beginning of the lesson, the psychologist distributes forms with the conditions of the tasks and says: “There are six letter combinations on the form. In each, you need to rearrange the letters in places so that meaningful words are obtained”.

1. A, C, O, K → _____
2. W, A, K, A → _____
3. A, K, Y, R → _____
4. D, A, B, O → _____
5. E, R, O, M → _____
6. B, O, N, E → _____

Opinions

1. All six tasks are similar.
2. All six tasks are different.
3. Tasks 1, 2, 3 and tasks 4, 5, 6 are similar.
4. Tasks 1, 3, 5 and tasks 2, 4, 6 are similar.
5. Tasks 1, 2, tasks 3, 4 and tasks 5, 6 are similar.

Further, the psychologist says: “There are six tasks on the form. Each contains a meaningless word. In it, you need to rearrange the letters in places so that you get a meaningful word. After solving these six problems, choose one of the five opinions about these problems that you think is the most correct, and circle its number. Write why you chose this opinion about the tasks”.

The proposed tasks are constructed in such a way that in the first, third and fifth tasks the anagram is converted into a word by mutual exchange of places of the first and fourth, second and third letters (i.e. by reading the proposed letter combination from right to left), and in the second, fourth and sixth tasks the way of converting anagrams is different - by

interchanging the places of the first and third, second and fourth letters (that is, by rearranging two syllables in places).

If the children, having correctly solved all six tasks, chose the fourth opinion about the tasks, then this indicates that in solving them they carried out meaningful reflection, generalizing the methods for solving the first, third and fifth tasks as built on the same principle, and the second , fourth, sixth tasks as constructed according to a different principle (for example: “... in the first, third and fifth tasks you need to read the other way around, and in others you need to rearrange the syllables ...”).

Any other opinion about the task, – the first one (for example “... in all words the letters are interchanged ...”), the second (for example: “... letters are different everywhere ...”), the third (for example: "... in the first, second and third tasks there is the letter A, and in the fourth, fifth, sixth - the letter O ...", the fifth (for example: "... in the first and second tasks the same letter is K, in the third and fourth tasks the same the letter - A, in the fifth and sixth tasks the same letter - O ... "), – associated with the generalization of tasks according to the external features of their conditions, indicates the absence of meaningful reflection in their solution.

2.3. Planning Diagnostics

Determination of the characteristics of problem solving planning among schoolchildren of grades 5 - 6, in order to assess the formation of the corresponding cognitive competence, was carried out using the "Exchanges - 2" methodology.

At the beginning of the lesson, the psychologist depicts the condition of the problem on the board:

S R P --- R S P

Then he says: “The letters on the left must be changed in one step so that they are arranged as on the right. One action is a mutual exchange of places of any two letters. In this problem, the solution is to exchange the places of the letters "S" and "R".

The following is the solution:

1) R S P

After that, the conditions of the second task are displayed, where the required location must be obtained from the initial one in two actions:

VNLK --- NVKL

The solution to this problem is collectively analyzed (first the letters B and H change, and then L and K) and it is written on the board:

VNLK --- NVKL

1) NVLK, 2) NVKL

At the same time, the attention of the children is specially drawn to the fact that only two letters change places in one action, and the rest are rewritten without changes.

It is further explained that in the first action (and, accordingly, in the second one), the other two letters can also be changed, first L and K, and then V and N:

1) VNKL, 2) NVKL

After that, the children are given forms with training and basic tasks.

FORM

Training tasks

1.NKP --- KNP (one action).
2. R K M TV - - - K R V T M (two actions).

Main tasks

1. M G V W C N K --- M V G C W K N (3 actions).
2. P L G W R S D --- G W P L D S R (3 actions).
3. L B N T --- N T B L (3 actions).
4. S R K V --- K V S R (3 actions).
5. T N L P M --- M T N L P (4 actions).
6. R D V K W --- D V K W R (4 actions).
7. N P R S T V --- R S T V P N (5 actions).
8. K L B S G V --- V S K L B G (5 actions).

Further, the psychologist explains the content of the form (points to two training tasks, four main tasks in 3 actions, two in 4 actions and two in 5 actions) and suggests solving training problems.

Then he checks the solution of these problems, considering that the most common mistake is moving (mentally) in one action only one letter, not two.

After correcting the errors, it is proposed to solve the main tasks. The lesson organizer indicates that the main problems have several options for the correct solution and that only one solution should be indicated.

If the child coped with tasks where it is required to find two and three mutual exchanges of letters in places (i.e. with the main tasks 1 - 4), and did not cope with more complex tasks (Nos. 5 - 8), then this indicates that that in solving them, he carried out formal, partial planning, outlining the subsequent action after the previous one was completed.

If the child successfully solved problems with only two, three, four, and, moreover, five exchanges (i.e., with problems 7–8), then this indicates that, when solving them, he carried out meaningful planning, which is associated with preliminary programming the entire sequence of required actions.

2.4. Diagnosis of actions of reasoning

Determining the characteristics of the logical actions of constructing reasoning among schoolchildren of grades 5 - 6, in order to assess the formation of the corresponding cognitive competence, was carried out using the “Plots” methodology, which includes 10 logical tasks of varying complexity.

1. Two boys played checkers: one won three times, the other two times. How many times did Igor win if Oleg didn't win three times?

2. Three girls Lisa, Natasha and Masha went to different schools and different classes: someone went to a sports school in the 3rd grade, someone went to a music school in the 2nd grade, someone went to a sports school in the 2nd grade. In what school and in what class did each girl study, if Masha, like Natasha, studied in the 2nd grade, and Masha and Liza studied at a sports school?

3. Misha runs faster than Kolya. Misha runs slower than Alyosha. Who runs the slowest?

4. Misha, Gena and Seryozha sculpted from plasticine: someone - a cat, someone - an elephant, someone - a dog. Who sculpted what, if Gena did not sculpt an elephant, Seryozha did not sculpt an elephant and a dog?

5. Five days in April there was different weather: April 2, 6, 8.14 and 19. On one day it was cold and dry, on the other it was cold and rainy, on the third it was warm and dry, on the fourth it was warm and rainy, On the fifth day it snowed unexpectedly. On the 2nd and 6th of April it was warm, on the 2nd and 19th it was rainy, on the 19th and 14th it was cold. What

was the weather like on each of the five days?

6. In a year, Nikolai will be 2 years older than Andrei was three years ago. Which of the guys is older?

7. A pencil is thicker than a pen and longer than a marker. A pencil is thinner than a felt-tip pen and shorter than a pen. Which object is the thinnest of all and which is the shortest of all?

8. Misha and Sasha Rogov, Misha and Sasha Belov and Misha Serov were standing on the stairs. Who stood on the next step below with Misha Belov, if both Rogovs stood across the step and both Belovs stood across the step, and three Mishas stood on the neighboring steps?

9. Guys - travelers went on a hike at the same time: Borya and Gena - from Yalta to Baku, Sasha and Vasya - from Baku to Yalta. After 4 days, Sasha was closer to Yalta than Gena to Baku, and Borya was further from Yalta than Vasya from Baku, Gena walked faster than Bori. Who walked the slowest?

10. Misha runs faster than Viti, jumps higher than Kolya and dives better than Oleg. Misha jumps lower than Vitya, dives worse than Kolya and runs slower than Oleg. Who runs the slowest, who jumps the lowest, and who dives the worst?

The tasks of this technique, taking into account the number of characters in the conditions, the number of relationships between them and, accordingly, the number of judgments that need to be correlated in the process of inference, are divided by complexity into four groups.

Firstly, tasks 1 and 2 are the easiest, training (with two characters), and secondly, tasks 3 and 4 are simple (their solution requires a correlation of two judgments), tasks 5 to 8 are more complex (their solution requires correlation of three judgments) and problems 9 and 10 are the most difficult (their solution requires correlation of four judgments).

If the student coped only with tasks 1-4 (incorrectly solving the remaining tasks), then this indicates that when solving them, he carried out the formal action of constructing reasoning.

If the student coped with tasks 1 - 8 and, moreover, with tasks 9 and 10, then this indicates that in solving them he carried out a meaningful action of constructing reasoning.

3. Results

Experiments according to the methods presented above were carried out at the end of the academic year in a group form. The first series involved 127 students of the 5th grade, in the second series - 119 students of the 6th grade. The results of processing the obtained data are presented in the table.

Table

The distribution of children among students in grades 5 and 6 who, when solving problems of research methods, carried out a meaningful construction of reasoning, a meaningful development of a method for solving problems, meaningful planning and meaningful reflection (in %).

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The distribution of children among students in grades 5 and 6 who, when solving problems of research methods, carried out a meaningful construction of reasoning, a meaningful development of a method for solving problems, meaningful planning and meaningful reflection (in %).

Classes	Meaningful construction of reasoning	Meaningful development of a method for solving problems	Meaningful planning	Meaningful reflection
5 (127 st.)	56,7*	62,9	27,5	24,4*
6 (119 st.)	69,7*	71,4	33,6	35.3*

Note: * - $p < 0.05$.

The data given in the table testify to the following characteristics of the formation of cognitive competencies during the period of schoolchildren's education in grades 5 - 6 of the basic school.

Firstly, as a result of teaching in the fifth grade, the most formed competence is associated with the meaningful development of ways to solve problems of a search nature, in particular with the choice of a general method - 62.9, the competence associated with the

development of a meaningful approach to constructing reasoning - 56.7%, to an even lesser extent - the competence associated with the implementation of meaningful planning - 27.5%, and to the least extent - the competence associated with the implementation of the tasks of meaningful reflection of the mode of action - 24.4%.

Secondly, in the sixth grade, compared with the fifth grade, the competence associated with a meaningful approach to the construction of reasoning is most intensively formed, – the number of children with such competence increases by 13.0%; less intensively, – the competence associated with meaningful reflection, – the number of children with such competence increases by 10.9%, even less, – the competence associated with the meaningful development of ways to solve problems of a search nature, – the number of children with such competence increases by 8.5% and least intensively, – the competence associated with holistic planning, – the number of children with such competence increases by 6.1%.

Presumably, as we see it as an emerging trend (since to substantiate this assumption, more large-scale surveys with the participation of schoolchildren from different regions of Russia are required), it can be argued that a more intensive (relative to other competencies) formation in the sixth grade of competence related to content reasoning is based on the fact that biology, computer science, geography and social science are studied in this class, a significant part of the content of which consists in presenting theoretical material, for the assimilation of which it is necessary to make inferences and draw conclusions.

4.Conclusion

Thus, the conducted study confirmed the initial hypothesis that cognitive competencies associated with schoolchildren's mastery of the ability to build logical reasoning and draw conclusions; with the development, selection and implementation of effective ways to solve problems of a search nature, educational and cognitive tasks; with the mastery of schoolchildren's ability to independently plan ways to achieve the goal; with their mastering the initial forms of cognitive reflection and the skills associated with it to exercise control over their actions by students, to determine and correct their methods, are formed in schoolchildren during the specified period of study with different intensity.

The ability to build logical reasoning is formed most intensively in the period under review, less intensively - the ability to implement effective ways to solve search problems, even less intensively - the ability to exercise cognitive reflection and control of one's actions, and least intensively - the ability to plan the achievement of a goal.

So, in the study, data were obtained that testify to the peculiarities of mastering by schoolchildren in the fifth and sixth grades of cognitive competencies related to: schoolchildren mastering the skills of constructing inferences of varying complexity; with

mastering the ability to choose and implement successful approaches in the development of methods for solving search problems on educational and non-educational material; with the development of cognitive reflection and skills of control over their actions, associated with the ability to exercise control in order to correct them; with the mastery of schoolchildren's ability to independently plan ways to achieve the goal.

The established facts make it possible to more concretely present the dynamics of the development of these cognitive competencies during the period of schoolchildren's education in the fifth and sixth grades. In particular, the features of the formation of the studied competencies in the sixth grade in relation to the fifth grade were determined. The experimental data show that in the noted period, the competence associated with the meaningful construction of reasoning is most intensively formed, less intensively - the competence associated with internal reflection, even less intensively - the competence associated with the general way of solving search problems, and the least intensively - the competence associated with with holistic planning.

In addition, the data obtained indicate that the cognitive competence associated with mastering the ability to choose and implement successful approaches to the development of methods for solving search problems on educational and non-educational material is formed in a larger number of children in the fifth and sixth grades of basic school, and the competence associated with children's mastering the skills of constructing inferences of varying complexity, formed in a larger number of children only in the sixth grade. The remaining two competencies studied in the study were formed in a smaller number of children in the fifth and sixth grades.

In general, the results of the study create important prerequisites for the development of further research to study the features of the formation of cognitive competencies among schoolchildren of the other grades of the basic school, from the seventh to the eleventh.

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TECHNOLOGY, ENGINEERING

UDC 338

Batkovskiy A.M., Batkovskiy M.A., Khrustalev E.Yu. Assessment of the development of the production capacity of the integrated structure of the military-industrial complex in the process of diversification of production

Оценка развития производственной мощности интегрированной структуры оборонно-промышленного комплекса в процессе диверсификации производства продукции

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Abstract. *Managing the development of the production capacity of enterprises of the military-industrial complex, which are part of integrated structures, is an important element of regulating their activities. Improving the optimality of this management is a necessary condition for increasing the efficiency of the production process at these enterprises. When developing projects for the diversification of production and production programs of integrated structures, it is necessary to take into account the existing production capabilities of their enterprises and productions. The results of the analysis of the production capacities of enterprises affect the determination of the pace of their diversification activities. In the course of the conducted research, the results of which are presented in this article, the analysis of the development of the capacities of*

enterprises of the military-industrial complex united in integrated structures was carried out. The scientific-based tools for assessing and optimizing this development are presented, the use of which in practice will increase the efficiency of the diversification activities of enterprises.

Keywords: *development, production facilities, tools, military-industrial complex, diversification, enterprises.*

Аннотация. *Управление развитием производственной мощности предприятий оборонно-промышленного комплекса, входящих в состав интегрированных структур, является важным элементом регулирования их деятельности. Повышение оптимальности указанного управления – необходимое условие роста эффективности процесса производства продукции на данных предприятиях. Разрабатывая проекты диверсификации производства продукции и производственные программы интегрированных структур, следует учитывать имеющиеся производственные возможности их предприятий и производств. Результаты анализа производственных мощностей предприятий влияют на определение темпов их диверсификационной деятельности. В ходе проведенного исследования, результаты которого представлены в данной статье, проведен анализ развития мощностей предприятий оборонно-промышленного комплекса, объединенных в интегрированные структуры. Представлен научно-обоснованный инструментарий оценки и оптимизации данного развития, использование которого на практике позволит повысить эффективность диверсификационной деятельности предприятий.*

Ключевые слова*: развитие, производственные мощности, инструментарий, оборонно-промышленный комплекс, диверсификация, предприятия.*

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Введение

Процесс принятия решений при управлении диверсификационной деятельностью предприятий представляет собой совокупность трудоемких задач, решение которых осложняет неполнота исходной информации и наличие множества показателей критериев ее оценки [1]. Данное обстоятельство обусловлено рядом тесно взаимосвязанных и взаимообусловленных факторов, анализировать которые следует на основе использования единой методологической базы. К наименее разработанным из указанных задач относится задача анализа развития производственных мощностей предприятий оборонно-промышленного комплекса (ОПК) в процессе диверсификации производства продукции [2].

Имеющиеся результаты ее решения ориентированы в основном на анализ данного процесса на отельном предприятии, а не в интегрированных структурах (ИС). Кроме того, они представляют собой разрозненные знания в форме алгоритмов решения некоторых управленческих задач и единой научной концепции не образуют. Их использование в современных, резко изменившихся условиях обеспечения национальной безопасности России стало проблематичным. Отмеченное обстоятельство препятствует эффективному решению важнейших задач, стоящих в

настоящее время перед Россией: снижению импортной зависимости; обеспечению импортозамещения; ускорению инновационного развития; военно-техническому обеспечению национальной безопасности и др. [3].

Поэтому разработка методологических основ и инструментария оптимизации процесса развития производственных мощностей предприятий ОПК в процессе диверсификации производства продукции является важным направлением развития теории управления их диверсификационной деятельностью. Особенно актуальна указанная задача для предприятий, входящих в состав интегрированных структур ОПК, которые являются локомотивом инновационного развития российской экономики. Ее решение влияет на перспективы социально-экономического развития России и обеспечение безопасности страны.

Методы и методики

Сложившаяся новая экономическая и военно-политическая ситуация требует уточнения направлений дальнейшего развития интегрированных структур ОПК и повышения эффективности их деятельности в условиях гибридной войны, развязанной против России Соединенными Штатами Америки и их союзниками. С этой целью проведено исследование, отдельные результаты которого представлены в данной статье. Его методологической основой являются труды отечественных экономистов, разрабатывающих теорию управления предприятиями [4; 5; 6]. Основными методами решения рассматриваемой задачи являются методы экономического анализа и экономико-математического анализа.

Использование при этом результатов исследований аналогичных задач зарубежными учеными без их значительной доработки невозможно, т.к. они не учитывают особенности российской системы управления интегрированными структурами оборонно-промышленного комплекса и специфику их хозяйственной деятельности.

Оценку развития производственной мощности предприятий интегрированной структуры оборонно-промышленного комплекса необходимо осуществлять как по затратам, так и по срокам готовности мощностей к выполнению производственных заданий. В качестве базового методического подхода при сравнении вариантов развития производственной мощности по срокам необходимо использовать остаточный срок службы имеющихся у них основных производственных фондов [7].

Для более эффективного использования резервов производственных мощностей предприятий ОПК, входящих в состав интегрированных структур, и их отдельных производств, необходимо оптимизировать механизм управления их развитием. Его

можно структурировать и представить в следующем виде (см. рис. 1) [8].

Рисунок 1 – Механизм управления развитием производственных мощностей предприятий, входящих в состав интегрированных структур ОПК

Результаты

Управление диверсификационной деятельностью предприятий ОПК является сложной задачей ввиду следующих обстоятельств [9; 10]:

- неполноты исходной информации;
- наличия большого числа критериев ее оценки;
- высокой размерностью решаемых управленческих задач;
- специфики моделей, описывающих деятельность предприятий.

Особую сложность представляет решение данной задачи применительно к предприятиям, входящим в ИС, т.к. при этом требуется обеспечивать координацию их деятельности в рамках общих программ развития интегрированных структур [11].

Для структуризации и формализации управления диверсификационной деятельностью рассмотрим ИС, в которую входят предприятия, обозначенные

индексами $i=1,2,...n$. На каждом из них может быть несколько видов производств, обозначаемых индексами $j=1,2,...m$. Представим, что максимально возможный выпуск в год продукции j-го вида в на i-ом предприятии ОПК составляет v_j^i. Указанная величина определяет мощность j-го вида производства на i-ом предприятии. Минимальный объем выпуска данной продукции характеризует «узкое место» рассматриваемого предприятия, которое можно определить, используя следующую зависимость:

$$v^i = \min_j v_j^i,\ i=1,2,...n \qquad (1)$$

где v^i - минимальный объем выпуска продукции в натуральном выражении на предприятии ОПК, входящем в интегрированную структуру («узкое место» рассматриваемого предприятия); v_j^i - производственная мощность j-го вида производства на i-ом предприятии ИС ОПК.

Для определения суммарной мощности всех предприятий интегрированной структуры ОПК можно использовать следующую зависимость:

$$V^{ИС} = \sum_{i=1}^{n} v^i = \sum_{i=1}^{n} \min_j v_j^i \qquad (2)$$

где $V^{ИС}$ - суммарная мощность всех предприятий ИС ОПК.

Минимальный объем суммарного выпуска продукции j-го вида производства на всех предприятиях ИС ОПК («узкое место») равен:

$$v_j = \sum_{i=1}^{n} v_j^i,\ j=1,2,...m \qquad (3)$$

где v_j - суммарная мощность интегрированной структуры ОПК j-го вида производства продукции.

На уровне интегрированной структуры ОПК ее максимальные производственные возможности определяются суммарной мощностью наиболее дефицитного вида производства на всех предприятиях структуры:

$$\hat{V}^{ИС} = \min_j v_j = \min_j \sum_{i=1}^{n} v_j^i \qquad (4)$$

где $\hat{V}^{ИС}$ - максимальные производственные возможности интегрированной структуры ОПК по наиболее дефицитному виду производства.

Между показателями $\widehat{V}^{ИС}$ и $V^{ИС}$ существует следующая зависимость [12]:

$$\widehat{V}^{ИС} = \min_j \sum_{i=1}^{n} v_j^i > \sum_{i=1}^{n} \min_j v_j^i = V^{ИС}, \qquad (5)$$

Производственные возможности интегрированной структуры ОПК определяются в значительной мере наличием и состоянием имеющихся на ее предприятиях основных производственных фондов. Поэтому при проведении диверсификации производства продукции на данных предприятиях часто возникает потребность приобретения нового оборудования, строительства новых зданий и сооружений или модернизации имеющихся основных производственных фондов, которые влияют на производственную мощность [13; 14]. Предприятия, входящие в состав интегрированной структуры, регулярно представляют информацию об «узких местах» своих производственных мощностей.

При проведении диверсификации производства на предприятиях ИС ОПК их «узкие места» должны ликвидироваться. Для решения данной задачи требуются инвестиции, минимально необходимый объем которых, равен [15]:

$$\Delta\tilde{J}^j\left(\Delta m^j\right) = \sum_{i=1}^{l} c_i^j \cdot \max\left\{0; \left(m^{j\prime} - m_i^j\right)\right\}, \ j = 1,2,...n, \qquad (6)$$

где $\Delta\tilde{J}^j\left(\Delta m^j\right)$ - минимально необходимый объем инвестиций для *j*-го предприятия, требуемый для планируемого увеличения его агрегированной мощности, позволяющего ликвидировать « узкие места»; c_i^j - фондоемкость производства продукции *i*-го вида производства на *j*-ом предприятии интегрированной структуры; m^j - первоначальная величина производственной мощности на *j*-ом предприятии, $j = 1,2,...n$; Δm^j - величина увеличения производственной мощности *j*-го предприятия, позволяющая ликвидировать «узкие места»; $m^{j\prime}$ - величина производственной мощности на *j*-ом предприятии после ликвидации «узких мест»: $m^{j\prime} = m^j + \Delta m^j$.

С учетом формулы (6) можно определить среднюю фондоемкость производства продукции на предприятии интегрированной структуры ОПК, учитывающую рост его мощности:

$$\overline{c}^j\left(\Delta m^j\right) = \frac{\Delta J^j\left(\Delta m^j\right)}{\Delta m^j}, \ j = 1,2,...n \qquad (7)$$

где $\overline{c}^j\left(\Delta m^j\right)$ - средняя фондоемкость производства продукции на предприятии

интегрированной структуры при повышении его мощности; Δm^j - заданная величина повышения мощности предприятия ИС ОПК; $\Delta J^j\left(\Delta m^j\right)$ - запрашиваемый объем инвестиций, необходимых для развития производственной мощности предприятия ИС ОПК; $\Delta \tilde{J}^j\left(\Delta m^j\right)$ - минимально возможный объем инвестиций, необходимых для развития производственной мощности предприятия ИС ОПК

Иногда в силу разных причин приходится пропорционально повышать мощности всех производств на предприятии ОПК. В этом случае минимально необходимый объем инвестиций для *j*-го предприятия равен:

$$\Delta J^j\left(\Delta m^j\right) = \Delta m^j \cdot \sum_{i=1}^{l} c_i^j, \ \ j = 1,2,...n \qquad (8)$$

где $\sum_{i=1}^{l} c_i^j$ - сумма фондоемкостей производства продукции отдельных производств на предприятии интегрированной структуры.

Тогда средняя фондоемкость производства продукции на *j*-ом предприятии ИС ОПК при сбалансированном развитии мощностей всех видов производств будет равна сумме фондоемкостей производства продукции его отдельных производств:

$$\bar{c}^j\left(\Delta m^j\right) = \frac{\Delta J^j\left(\Delta m^j\right)}{\Delta m^j} = \sum_{i=1}^{l} c_i^j, \ \ j = 1,2,...n \qquad (9)$$

где $\bar{c}^j\left(\Delta m^j\right)$ - средняя фондоемкость производства продукции отдельных производств на предприятии интегрированной структуры.

Для минимизации затрат, осуществляемых с целью обеспечения планируемого суммарного прироста мощности интегрированной структуры, необходимо использовать экономико-математическую модель оптимизации решения данной задачи. Она может быть представлена в следующем виде [16]:

$$\Delta J^{IC} = \sum_{j=1}^{n} \Delta J^j\left(\Delta m^j\right) \to \min_{\left\{\Delta m^j\right\}} \left| \sum_{j=1}^{n} \Delta m^j = \Delta M^{IC} \right. \qquad (10)$$

где ΔJ^{IC} - объем затрат, осуществляемых с целью обеспечения планируемого суммарного прироста мощности интегрированной структуры; ΔM^{IC} - планируемый суммарный прирост мощности интегрированной структуры.

В качестве интегрального показателя оценки эффективности развития производственной мощности интегрированной структуры ОПК в процессе диверсификации производства можно использовать показатель, характеризующий

среднюю фондоемкость производства продукции на каждом предприятии при повышении его мощности на заданную величину Δv^i [17]:

$$\bar{b}^i\left(\Delta v^i\right)=\frac{\Delta I^i\left(\Delta v^i\right)}{\Delta v^i},\ i=1,2,...n \qquad (11)$$

где $\bar{b}^i$ - средняя фондоемкость производства продукции на каждом предприятии; Δv^i - заданная величина повышения мощности предприятия; $\Delta I^i\left(\Delta v^i\right)$ - минимально необходимый объем инвестиций для предприятия при заданной величине повышении его мощности.

Заключение

При разработке данной статьи получены следующие основные результаты:

– осуществлена постановка важной экономической задачи, влияющей на эффективность диверсификации производства на предприятиях ОПК, входящих в состав интегрированной структуры;

– уточнены некоторые категории и понятия, развивающие представление о данной отрасли знаний;

– усовершенствованы критерии и показатели оценки развития производственной мощности предприятий ИС ОПК в процессе диверсификации на них производства продукции;

– разработан инструментарий оценки развития производственной мощности предприятий ИС ОПК.

Полученные результаты исследования базируются на анализе общих закономерностей рассматриваемых экономических явлений с использованием строгих математических доказательств. Они детализированы до разработки практически реализуемых моделей, которые позволяют повысить степень адекватности теории управления диверсификационной деятельностью предприятий ОПК современным условиям и новым задачам их развития.

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