THE INFLUENCE OF PEDAGOGICAL CONDITIONS ON THE DEVELOPMENT OF PRIMARY PUPILS' PRACTICAL NATURAL SCIENCE COMPETENCE

VPLYV PEDAGOGICKÝCH PODMIENOK NA VÝVOJ PRAKTICKEJ PRÍRODNO-VEDECKEJ KOMPETENCIE ŽIAKOV NA PRIMÁRNOM STUPNI VZDELÁVANIA

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Abstrakt

Príspevok je venovaný problematike získavania praktických zručností žiakov základných škôl v prírodných vedách v procese štúdia prírodných vied na základnej škole. Odhaľujú sa základné prístupy k organizácii vzdelávacieho procesu v súlade s požiadavkami štátneho štandardu základného vzdelávania.

Autori prezentujú pedagogické stratégie vytvárajúce podmienky na zmyslové vnímanie edukačného materiálu v súlade s vekovými charakteristikami a schopnosťami žiakov základných škôl, riadenie výchovno-vzdelávacieho procesu zameraného na získavanie praktických zručností na základe algoritmov psychickej činnosti, čo znamená zvýšenie úrovne autonómie žiakov, využívanie kognitívnych úloh s cieľom uprednostňovať praktický charakter prírodovedných predmetov v školách, využívať integrovaný prístup v procese formovania praktických zručností z prírodných vied), ktorých realizácia by mohla prispieť k dosiahnutiu efektívnych výsledkov pri získavaní praktických zručností v základných školách. Boli definované štyri úrovne formovania vyhľadávacích schopností žiakov: počiatočná úroveň (1,0 – 3,5 bodu); reprodukčná úroveň (3,6 – 6,5 bodov); konštruktívna úroveň (6,6 – 8,5 bodov); kreatívna úroveň (8,6 – 12,0 bodov).

Kľúčové slová: mladší žiaci, prírodné vedy, základná škola.

Abstract

The article is devoted to the problem of the formation of practical knowledge of primary schoolchildren of natural sciences in the process of studying natural science in primary school. The basic approaches to the organization of educational process in accordance with the requirements of the State standard of primary education have been revealed.

The authors present pedagogical conditions (organization of sensory perception of educational material in accordance with the age features and abilities of primary schoolchildren; management of the educational process aimed at the formation of practical knowledge of the practical nature on the basis of algorithms of mental activity, which implies an increase in the level of autonomy of schoolchildren, the use of the system of cognitive tasks for the purpose of formation of schoolchildren's practical character of natural sciences; realization of the integrated approach in the process of formation of practical knowledge of natural sciences), the realization of which in the complex would contribute to the achievement of effective results in the formation of effective practical knowledge in primary schoolchildren. Four levels of the formation of schoolchildren's search abilities have been defined: the initial level (1,0 –

3,5 points); reproductive level (3.6 – 6.5 points); constructive level (6,6 – 8,5 points); creative level (8.6 – 12.0 points).

Key words: primary schoolchildren, natural knowledge of practical character.

Formulation of the problem.

Education of the younger generation is an important indicator of the society development. At the legislative level, new approaches to the organization of the educational process have been represented in the National Doctrine of Ukrainian Education Development for XXI century, the new edition of the Laws of Ukraine "On Higher Education", "On Education", the State Program "Teacher", the Concept of "New Ukrainian School" and others. They provide drastic restructuring of the education system, taking into account the current trends of socio-cultural development of the society through the acquisition of higher education autonomy, ensuring the flexibility and dynamism of the educational process, oriented towards the formation of a competent person.

The task of modern, renewed national school is to train students with strong knowledge of a practical nature. After all, without the knowledge formed to the level of readiness for creative activity in new educational situations and in practice, primary school pupils associate learning with great difficulty.

Analysis of recent research and publications.

The analysis of psychological and pedagogical literature demonstrates that some of the competence formation problematics has been reflected in the studies on: the process of knowledge mastering by schoolchildren (P. Galperin, V. Davydov, I. Lerner, O. Matiushkin, V. Onyshchuk, V. Palamarchuk, P. Podkassisty, M. Skatkin and others); use of knowledge by pupils (V. Grinev, B. Ishchenko, F. Kovtunova, N. Menchinskaya and others); the relation between learning and development of pupils in the educational process (L. Zankov, M. Zvereva, A. Polyakova, other scientists); formation of general educational and research abilities (Yu. Babansky, T. Baibar, N. Koval, O. Savchenko, A. Usov, and others); I. Zharkov studied the essence and internal patterns during the formation of practical natural science competence among primary schoolchildren. Nevertheless, the study of psychological and pedagogical conditions, methods which ensure the effectiveness of this process at elementary school are required.

Pedagogical and psychological works reveal the peculiarities of the formation of intellectual skills among elementary schoolchildren, aimed at mastering such mental operations: analysis and synthesis (G. Vergeles, G. Lublin); comparison (G. Kagalniak, O. Savchenko); generalization and concretization (V. Davydov, V. Kogan and G. Rothstein); proof (G. Ovchinnikov) and others. Since each of the types of educational skills and abilities of pupils does not exist independently of each other, but has certain connections and interacts with others, these studies broaden the scientific knowledge of the mechanism of formation of students of elementary classes of natural sciences of practical practical character.

The aim of the article is to show the influence of the didactic conditions on the process of the effective practical knowledge formation.

Research results

The formation of effective practical natural science knowledge among primary school pupils should be based on the unity of curricula, textbooks and other didactic support. In order to examine the state of the problem under study in the modern teaching practice, we have conducted a questionnaire of teachers-practitioners in Pasika secondary school No. 1, Svalyava district, Zakarpattia Oblast.

The questionnaire has focused on the attitude of primary school teachers to the necessity of development the practical natural science competence of pupils, and the skills which can be used in this context. The survey has included teachers working under the current curriculum at primary school.

The results of the questionnaire give grounds to conclude that only 12.5% of the interrogated primary school teachers believe that in order to achieve the full results of learning it is necessary to form students' knowledge of practical nature. The insufficient understanding of the term "knowledge of a practical nature" by teachers has also been revealed. This is due to the fact that teachers do not use enough means to form effective practical knowledge of pupils and to organize the process of applying knowledge in new educational situations. In general, under practical nature, teachers mean the creation of problematic situations (37.5%), the use of didactic games (62.5%), rebuses (12.5%), puzzles (12.5%), pedagogical means, which are used for the knowledge formation of practical nature, but all these activities need additional approaches.

The important information has been obtained on the basis of the problematic issue analysis "What types of pedagogical work do you use to develop practical knowledge skills among primary pupils?" The quantitative analysis statistics of teachers' answers have been presented in Table 1.

Table 1: Results of questionnaire survey among primary school teachers at Pasyki secondary school of I-IId levels, Svalyavsky district, Transcarpathian region

Types of educational work that contribute to the formation of practical natural science competence	**Practice**		
	always (%)	**sometimes (%)**	**is not practiced (%)**
Analysis and comparison of the studied bodies of nature, phenomena, processes	75%	25%	0%
Understanding of basic characteristics	87,5	12,5%	0%
Establishment of cause-effect relationships	62,5	37,5%	0%
Systematization and generalization in the form of tables, circuits	37,5%	62,5	0%
Independent formulation of conclusions	12,5	75%	12,5%
Using of geographic maps	12,5%	87,5	0%
Realization of independent practical tasks	12,5%	87,5	0%
Exercising according to the model and analogy	25%	75%	0%
Implementation of research tasks	12,5%	75%	12,5%

On the basis of theoretical analysis of case data, we have identified the pedagogical conditions favourable for the formation of practical knowledge among primary school pupils, which boast the effectiveness of this process according to I. Zharkova [3, p. 10].

1. Formation of knowledge by pupils begins with the perception of characteristics, object properties and phenomena of nature. That is why, in our opinion, the basic condition for the effective formation of natural science knowledge among primary pupils is the organization of sensory perception of educational material in accordance with the age features and possibilities of primary school children.

Live perception forms the sensory experience of a child and plays an important role in learning activities. Without perception, there can be no assimilation of knowledge. After all, from the perception of the new educational material, the primary understanding of the new depends on the concepts formed in children mind, and further work will depend on assimilation and application. Our own pedagogical experience confirms the opinion of psychologists that at stage of primary perception there activates the process of long-term and detailed preservation in the memory of individually perceived image. Therefore, it should be remembered that the first perception must be absolutely precise, clear and complete, otherwise all inaccuracies are firmly embedded in memory, and errors are very difficult to eliminate in further work.

Age peculiarities of children are reflected in their object perception and phenomena of nature. Therefore, the problem of natural sciences teaching is especially topical for primary school. The younger is pupil the harder it is to distract from insignificant features disturbing from the perception a complex subject or natural phenomenon, and allocate exactly those that are relevant.

During the period of study at primary school, the perception of junior pupils undergoes quantitative and qualitative changes. According to G. Kostiuk [2], quantitative changes consist in increasing the perception speed, the number of objects perceived, in expanding the volume of their memorization, etc. Qualitative changes activate certain transformations of the structure of perception, creation of new features, which signify an increase in the cognitive process. That is, during study at elementary school there's a transformation of mind. Mainly, if pupils study the subject in order to act adequately, they need to perceive it correctly. Students begin to analyze and synthesize objects of perception deeply. Primary schoolchildren are gradually accustomed to subordinating their perception and attention to a certain goal – the arbitrariness, stability, and purposefulness of perception increase.

Students' acquisition of new material requires sensory perception of objects and phenomena of the surrounding reality. The long-recognized and important role of visual aids in teaching as a mean of meaningful and solid natural knowledge have been recognized. F. Kiselyov believes that the pedagogical value of these aids in the process of forming the natural sciences competence lies in the fact that "... thanks to the outer visual perception students create a correct idea of the objects of nature" [4, p. 63]

At the same time, it is advisable to use different means of explanation in the primary classes which should be supported by visual aids. The brightness of the first impression can bring positive effect on perception and understanding of the essential features of the object or the phenomenon of nature. Therefore, the material offered to schoolchildren should be designed in a way that does not overload the work of child's senses and contribute, to a large extent, to the necessary dismemberment of the perceived objects. Routine material, which does not contribute to the identification of basics is difficult to study.

The best form of visibility in the process of natural knowledge perception is the direct observation of objects or phenomena. However, not all of them can be observed by students. Due to the large size or distance criteria of the studied objects, it is necessary to use their copies or images. All means of clarity that have been recommended can be used in the lessons of natural science. In particular, T. Baybara [1, p.122] divided those means into two groups: for direct and indirect perception, with the following subdivision into subgroups.

Visual aids should correspond to the psychological, developmental and educational goals of training. Pupils should easily identify the main, essential features of the object, establish intra-conceptual or interpersonal relationships, and comprehend them. In the mean of clarity there should be nothing superfluous, that diverts the attention of pupils from the main. In the process of perception, a significant role is given to the combination of verbal and visual means. For primary pupils this is a prerequisite, without which their perception becomes unproductive.

Effectiveness of new educational material should be accompanied by activity of the students. The younger is pupil the more practical activity should be used at classes. Pupils should physically cooperate with the object to analyze it: touch and manipulate with it, which is also characteristic of an adult – that is to get acquainted with natural objects not only through mental, but also through live activity. Practical actions with subjects give an opportunity to more fully include in the perception of the motor analyzer, to know the properties of objects and interrelations that are not perceived directly, but reveal only during contact:

1. Practical contact with the objects being studied activates the attention, increases interest in the study of nature. In addition, practical work motivates children to creative thinking, students learn to conduct experiments (both reproductive and creative), make conclusions and generalize.

2. Mental activity of students is required for successful formation of knowledge, that is: analysis, comparison, synthesis, abstraction, etc. Therefore, the formation of practical natural science competence is based on the algorithms of mental activity used at practical classes, that will lead to the increase in the level of autonomy and students' activity.

In psychological and pedagogical literature, various ways of managing mental activity of students in the process of knowledge formation have been considered. The most common are two directions: the direct and indirect supervision.

Scientist N. Koval [5] has found that organization and control of cognitive tasks implementation is carried out in a direct way, and includes four phases:

- at first stage, pupils are explained the significance of the method, the action sequential it is composed of;
- at second stage, pupils reproduce the techniques;
- at the third, its structure is fixed in the process of performing the cognitive tasks;
- at fourth stage, pupils use the assimilated methods independently, in new educational situations.

In turn, the essence of the indirect way of supervising mental activity of students is that

"children are offered various tasks in a sequence that would ensure the development of each particular operation – a component of specific reception of mental activity" [5, p. 24]. It means that the indirect way of managing pupils' activities is through the content of teaching and selected methods which encourage students to identify the functions, structure of mental activity in the overall educational content independently. Supervising of mental activity in this case is carried out through cognitive tasks.

3. Since activation of mental activity is carried out through cognitive tasks, there should be a purposeful use cognitive tasks as a mean of forming the practical natural science competence.

It should be noted that pedagogical literature recalls different definitions of "cognitive tasks". Thus, N. Koval [5] considers that cognitive tasks are a set of problematic questions, logical tasks, the fulfillment of which requires a certain level of pupils' autonomy.

I. Lerner [7] and O. Savchenko [8] shared a common opinion on the definition of the category. They noted that cognitive tasks are the tasks which require various methods of search activity and lead to the formation of new knowledge of the object and activity. According to I. Lerner [7], the main feature of cognitive tasks is that the student, having all the necessary data, can't obtain the result directly – they need to find information and carry out practical and mental operations in a certain sequence independently. According to O. Savchenko [8], the peculiarities of cognitive tasks are a wide range of application in different situations; clear regulation of the content-procedural complexity at lesson; topics; variety of assignments; possibility to assimilate; the relevance of method and task.

The basic principle of pedagogical conditions which favor the development of practical natural science skills is organic unity of content, its procedural and motivational components of learning.

The integrated content component consists of the assimilated basic natural science concepts, conclusions, facts, evaluation and methods, cultivation of a new, own knowledge and tactics – all these are guaranteed by primary school program.

Processed component combines skills, which enable students to solve cognitive tasks. For the decision of cognitive tasks of a certain type, an appropriate algorithm of mental activity of students should be used and it must correspond to the age characteristics of primary school children. To ensure the implementation of practical activity by junior pupils, it is necessary to take into account the character of their search skills, which presupposes a generalized way of solving new cognitive tasks.

The motivational component involves the formation of curiosity, interest, steady positive attitude towards educational and cognitive activity among pupils; formation of internal

necessity to overcome difficulties and solve problems independently. During the training, there was chosen educational material that can be interesting to the students.

Scientists distinguish the following cognitive tasks which develop primary practical natural science competence:

I**.** Tasks to identify the objects through comparison and contrast. The comparison can reveal common and distinctive features, properties of objects and phenomena of nature. Comparison is the most elemental, but rather essential mental operation, an important part of the student's analytical and synthetic activity. Without comparing objects and phenomena, it is impossible to distinguish the characteristic features of subjects and phenomena being studied. This method is carried out in two basic forms: comparison and contrasting. Comparison is aimed at identifying the essential features common to a number of objects (swallow and ostrich - their body is covered with feathers), and contrasting – as a form of comparison is aimed at establishing distinct objects and phenomena, determining its essential features and properties (oak and boletus – plants with different structure).

By degree of completeness, we distinguish between complete and partial comparison. Complete one requires the establishment of both similar and distinctive features, and partial comparison – distinguishes only similar or only distinctive features. The results of studies have indicated that pupils of primary school are able to apply these types of comparisons.

We have determined that, while fulfilling the cognitive tasks of comparison, junior pupils could compare the various features, properties, modes of action, states, which were concrete and abstract, visual and imaginary by the perception nature.

In the process of the experiment, the students followed the action algorithm, namely:

- comprehensive analysis of the object, the allocation of its features;
- identification of similarities and differences;
- definition of essential features;
- revealing the features through comparison or contrasting;
- making conclusions based on comparison.

The exchange of experience with practicing teachers has proved that most of them constantly use the method of comparison for a deeper comprehension of the material being studied. The example can be the following types of tasks for comparison:

II. Tasks in which you need to compare objects based on self-found features.

1. To determine on what basis these plants were grouped. Name each group:
    - Radish, tomato, sunflower, carrots, beets, beans;
    - Dandelion, cornflower, chicory, saffron, horsetail.
2. To determine similarity between outwardly dissimilar objects, on the basis of the indicated essential features:
    - Consider the bee and the fly. Determine why they belong to insects?
3. Tasks that presuppose alike objects which can be confused:
    - River and creek have shores and channels. How to distinguish them?
4. *Tasks for partial comparison, which require the establishment of similarity or differences:*
    - On the basis of the indicated signs determine which minerals have been mentioned.

What do they have in common?

a) solid brittle substance of brown color, consisting of plant remains, lighter than water, burns with a dim flame;

b) solid black substance, consisting of plant residues, heavier than water, burns with a bright flame.

5. Tasks for full comparison, which require the establishment of objects' similarities and differences: "Consider the herbarium of wheat and barley. Compare the plants according to

the plan: plant height; shape of the root and leaves; character of stems and flowers; what are the fruits; length of ears. What are the common and distinctive features of plants? "

The fulfillment of the mentioned cognitive tasks contributes to a deeper understanding of similarities and differences that favors transfer of the acquired knowledge.

III. Tasks for the classification of organisms and phenomena of nature by essential features.

Classification consists in combining certain objects into groups (classes) in accordance with the most significant features and connections inherent in objects of a certain kind, and distinguishing them from objects of other type. A special place in schooling the pupils has been classified, which requires the assignment of individual objects or phenomena to the corresponding group. Such classification involves identifying essential, common features, relations between objects or phenomena, as well as general concepts, laws; the assignment of individual items to the general notion, law or rule.

In the process of solving cognitive tasks of classification pupils must master the algorithm of the action sequence:

- comprehensive analysis of the object, the allocation of its features;
- determining the essential features in accordance with the educational objectives;
- synthesis of essential features;
- correlation of the essential features of the object with essential features of the class (group);
- formation of the conclusion about the possibility of object reference to a certain class (group).
- At the lessons of natural science it is expedient to use the following task types:

1. Tasks aimed at determining the object by the indicated features.

Matching the correct variant:

A large flat land – is ...	* mountain
The longitudinal depth with steep slopes is ...	* plain
Hill on the plain land is ...	* ravine
Raised area of the land surface is...	* hill

2. Tasks of excluding unnecessary objects (signs, properties, etc.):

- Find a plant which does not belong to the deciduous: birch, hazel, juniper, oak, chestnut, nut.

3. Tasks that involve the allocation of objects to the groups through independently established essential features: divide the listed plants into groups and fill in the table: hazel groats, spinach, spruce, plantain, birch, blackberries, wheat, maple, wild rose.

Plant groups	Representatives
1.	

4. Tasks to establish the essential features and identify the object independently:

- Identify the description of the year. What signs would you include?

"Colorful leaves fall from trees: yellow, red, orange, and sometimes green. The days are shorter and the nights are longer. Birds begin to fly south, seeking for warmer lands. Gloomy, but rather great time".

IV**.** The tasks of establishing cause-and-effect relations.

Independent identification of cause-and-effect relations is a complex search activity. It combines and integrates many mental techniques: analysis of the material, the comparison of its individual parts, synthesis, allocation of essential features and links, theoretical generalization.

For the development of thinking it is necessary to constantly increase the complexity of causal relations on the basis of the following algorithm:

- comprehensive analysis of the object or phenomenon, identification of its features;
- definition of essential features;

- comparison of essential features;
- search for a cause or effect and its explaination;
- the formation of conclusion.

Accordingly, the following types of cognitive tasks can be used to establish cause-and-effect relations:

1. The tasks to determine the cause/effect in the statement: make up one sentence inserting "because" option between the two. Define dependence between clauses: "Birds fly away in warm lands. There are no insects in winter".
2. Tasks of making the individual judgments about the cause/consequence of a certain dependence:
   - Why doesn't squirrel hibernate in winter?
   - Complete the sentence:

   With the onset of the fall swallows, cuckoos, stork have nothing to eat, so …
3. Tasks to formulate detailed judgments about the cause or effect of complex dependencies:
   - What happens if all insects are destroyed?
   - Why do you need to protect animals?
4. Tasks to identify the cause/effect in the given case study.
   - The body of birds is covered with feathers, which protects them well from the cold, so why do most birds fly away to warmer lands?

V. Tasks presupposing the use of analogy as a mean of transferring the mode of action.

This task type is close to the tasks of comparison. They involve the formation of judgments about the features or properties of one object, or mode of action based on its similarity to others. That is, analogy is based on the comparison operation and requires correlation and comparison with the essential features and methods. In analogy algorithm one of two objects (methods of action) has certain properties. The implementation of the analogy method allows you to transfer the well-known, defined properties, connections, from one object to another.

In the process of experiment, we have offered primary pupils to use different kinds of analogy in cognitive tasks, namely:

1. Tasks for the associative analogy.
   - Replacing the words in the first sentence, describe the beam: Gully is a longitudinal depth on the land surface, with steep slopes.
   - As in the example, describe the mountain and write down:

     Hump — Mountain

     Slight raise of the plain
     Foothill that gradually passes into plain
     Not very steep slopes
     The flat top
2. Tasks on the algorithmic analogy.
   - Describe the lake, inserting the missed words in the sentence. Describe the sea as an example:
     Lake – is _____. It has___ water. It is created in the result.
3. The task of the heuristic analogy:
   - Remember, which soil is easier to loosen: the one on which the plants grow, or the one in which they are absent. Think about how people use this phenomenon to fight the ravines.

VI. Tasks to prove the judgment.

The ability to make and prove arguments play a crucial role in the intellectual development of students, inducing them to transfer knowledge. Substantiation has a permanent structure: thesis, arguments, methods of thesis substantiation.

The sequence of actions while executing tasks of this type are as follows:

- comprehensive analysis of the object or phenomenon, identification of its features;
- allocation of essential features;
- its comparison with essential features of the concept (theses), reflecting the general situation;
- search for evidence (facts), confirming or denying the fact that is under analysis;
- relevance of thesis and arguments;
- formuation of the conclusion, substantiation from the set of arguments.

The following are the examples of cognitive tasks for the formation of the ability of primary pupils to make judgment:

1. Tasks, which require one or two known from past experience facts, testimonies, rules for the substantiation of the thesis. (Prove that tomtit is a bird).
2. Tasks of proof by analogy. (Granite is a solid stone, so it is used for construction. Prove that it is expedient to use chalk for the production of powder and chalk pencils).
3. Tasks for bringing judgments, which pupils set independently. (Prove that human life is impossible without air).

Each type of cognitive tasks involves certain techniques of mental activity, which underlie their implementation.

Summarized quantitative indicators of the 3d grade pupils' practical natural science competence at Pasyki secondary school of I – IId levels, Svalyava district, Transcarpathian region have testified the equal level of search skills in the experimental and focus classes. To confirm the absence of statistically significant differences between the levels of the formation of search abilities among students of experimental and focus classes, we have used the nonparametric criterion X2 – consent criterion. For its calculation, we've used the formula (1) [6]:

– $X^2 = \sum_{i=1}^{C} \frac{(f_E'' - f_K'')^2}{f_K''}$, (1)

– де $\sum$ – total number symbol;

– f_E'' – relative frequency of grades in experimental classes;

– f_K'' – relative frequency of grades in focus classes.

Substituting the total data, we have computed the value of criterion X^2:

$$X^2 = \frac{(14,29-14,29)^2}{14,29} + \frac{(28,57-21,43)^2}{21,43} + \frac{(35,71-35,71)^2}{35,71} + \frac{(21,43-28,57)^2}{28,57} = 4,16$$

We have compared the value of the calculated criterion X2 with its tabular value for a given level of significance [6]. Since the value X2 (4,16), found in the calculation, is lower than 7,815, this indicates that before the experiment begins, the differences that existed in the focus and experimental classes were not significant.

During 2017 – 2018 the third grade classes received preparatory cognitive tasks during educational process. Doing them, the primary pupils have learned to analyze the proposed objects, to allocate features of different character, to differentiate them on essential and insignificant criteria, to compare objects on the basis of one or two grounds, to establish causal relations, to substantiate primary judgments. That is, pupils acquired the experience of performing elementary mental operations, without which it's impossible to create common cognitive abilities. The tasks had a developing and stimulating effect on the preparation of primary pupils for the search activity, and made it possible to put knowledge into practice, apply it in new learning situations.

Control questionnaire at the end of 2017/2018 showed qualitative changes in the levels of knowledge and practical skills in natural sciences in comparison with the beginning of school year.

The dynamics of the formed knowledge of a practical nature among 3rd grade pupils has been shown in Figure 1.

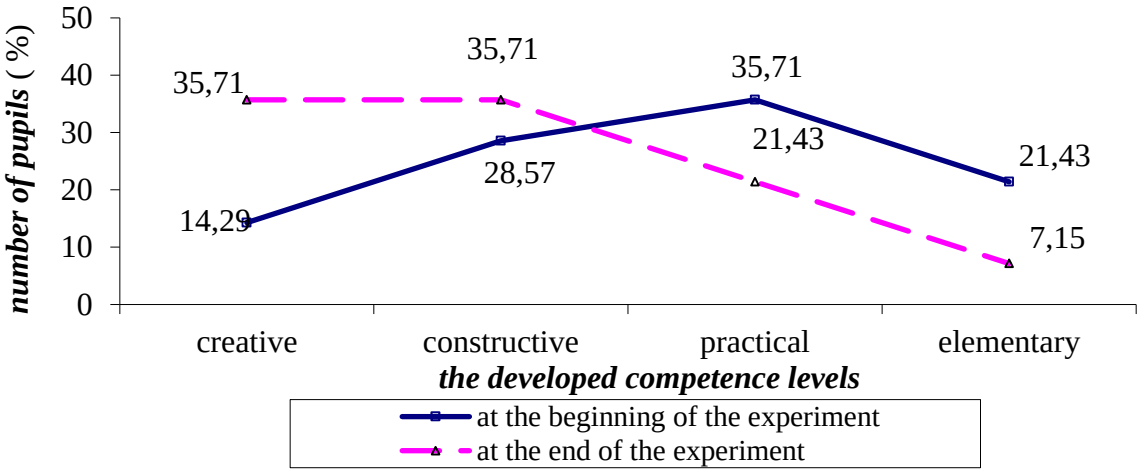

Fig. 1: The dynamics of the developed competence of pupils at the beginning and at the end of the experiment.

Thus, the obtained final result has unequivocally confirmed that the efficiency of the natural science competence formation among primary school pupils depends on the complex pedagogical methods and particular conditions of its realization. The results of the research can be used by students to develop new forms and methods for the formation of effective practical knowledge of elementary schoolchildren in the process of studying natural science and teachers-practitioners in order to improve the educational process in elementary school.

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