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FEATURES OF FORMATION OF THE COGNITIVE ACTIVITY OF CHILDREN OF MIDDLE SCHOOL AGE USING SIMPLE EXPERIMENTS

Oksana Stupak, Maria Dyachuk

The article reveals the content of the concept of cognitive activity of children of middle preschool age, which was considered through the prism of the child's personal development and its influence on the child's intellectual sphere, therefore, cognitive activity develops through cognitive operation. The peculiarities of the use of simple experiments in the preschool education institution, which create prerequisites for the formation of cognitive activity, intuition towards nature and understanding of its meaning and acquisition of nature research skills, are analyzed. Identified components of cognitive activity: motivational, cognitive, activity, evaluative. The following practices (interviews with educators, questionnaires) and research methods were determined for pedagogical diagnosis of the levels of formation of the cognitive activity of children of middle preschool age: diagnostic method of cognitive development "What objects are hidden in the pictures?" (R. Nemov), the method of diagnosing the psychosocial maturity of children's behavior (O. Taran), the method of D. Godovikova, the method of examining the cognitive development of children by E. Strebeleva. The presented results of an experimental study of the peculiarities of formation of the cognitive activity of children of middle preschool age showed mainly an average and low level of development. The presented method of forming the cognitive activity of children of middle preschool age by means of simple experiments provided for a number of specially selected simple experiments that were included in classes from different sections of the program. The selected experiments were aimed at forming the cognitive activity of children of the middle group, and were diverse in terms of subject matter and duration. The results of observation of children after the implementation of the method showed increased interest in cognitive activities, motivation to independent search for the causes and consequences of various natural phenomena, etc.

Keywords: cognitive activity, children of middle preschool age, experiments

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1. Introduction

Preschool childhood is the optimal period for the development of the cognitive sphere of a child of middle preschool age, and the source of a child's cognitive development is the integration of knowledge and skills about the surrounding world and social experience. During life, the child acquires social experience, acquires knowledge, skills and abilities in the study of nature, transformation of surrounding objects. It is during the learning of the surrounding world, purposefully searching for answers to the questions: "what is it?", "from where?", "how?", "why?", a child of middle preschool age satisfies his/her curiosity, existing cognitive needs, forms his/her vision of the natural environment under the influence of an adult. Communication with adults, specially organized training teaches the child to establish cause-and-effect relationships and learn about the surrounding world through research activities. With this in mind, children's ideas, concepts, life values are qualitatively enriched, modified, acquire new features and turn into the child's internal property – experience.

The formation of the cognitive activity of children of middle preschool age is also not possible without the use of interactive technologies that complement the traditional methods of learning and development of children in preschool education (technologies for the development of critical thinking, LEGO technologies, game technologies, augmented and virtual reality technologies, STREAM, etc.). Their use when involving children in simple experiments allows the preschool teacher to teach the preschooler to independently discover, acquire and construct knowledge, skills, values and initiate his/her own competence in various spheres of life, to explore and transform the world based on the assimilation of values and experience.

Thus, the question of finding ways to use simple experiments in the process of forming the cognitive activity of children of middle preschool age in the conditions of a preschool education institution remains relevant.

2. Literature review

In pedagogy, the issue of formation of cognitive activity is considered in the context of cognitive activity,

as a result of learning, a reflection of the principle of activity. Scientific investigations of scientists prove that learning will be effective when preschool children show cognitive activity, realize its necessity and purpose, plan and organize their learning, demonstrate independence, self-control and self-esteem [1]. It is noteworthy, that under such conditions of children's acquisition of knowledge, the development of the preschooler's growing personality is possible in his/her own active activities to achieve the planned result.

A thorough analysis of the problem of cognitive activity is reflected in the work of O. Listopad, who defines cognitive activity as an operation or as a personality trait without separation from operation [2]. At the same time, I. Tovkach notes the expediency of taking into account the psychological and individual characteristics of preschool children during the organization of cognitive activity in preschool education institutions [3]. Taking into account the insight of S. Dovbnya and R. Shulygin [4] that the leading activity of preschool children remains play, the organization of an educational environment for the cognitive development of children of middle preschool age is considered important by T. Pirozhenko [1]. In this context, as L. Zahorodnya aptly points out [5], experimentation in the organization of simple experiments in working with preschool children plays an innovative and important role, as it not only encourages cognitive activity, but also creates conditions for the versatile development of preschool children through practical activity. At the same time, preschool education practices, through personal experience of using various methods of forming the cognitive activity of preschool children, open new ways to apply simple experiments when working with children. For example, I. Selyuk and K. Golosienko propose to use the "bizi" cube as a real game center for the development space of a modern preschool education institution, which creates ample opportunities for independent research activities of preschoolers [6]; A. Slyusar and V. Grynko reveal the secrets of the natural science laboratory, where children can take care of animals and plants, studying and researching them [7].

However, despite a significant number of scientific works, the issues of features and practical aspects of formation of the cognitive activity of children of middle preschool age by means of simple experiments remain relevant and not fully clarified [8].

3. The aim and objectives of the research

The aim is theoretically characterizing and carrying out an experimental study of the peculiarities of formation of the cognitive activity of children of middle preschool age by means of simple experiments.

To achieve the goal, the following tasks were set:

1. To describe the features of formation of the cognitive activity of children of middle preschool age based on the analysis of psychological and pedagogical literature.

2. To analyze the peculiarities of the use of simple experiments in a preschool education institution.

3. To describe the results of diagnostics of the level of formation of the cognitive activity of children of middle preschool age.

4. To characterize the method of formation of the cognitive activity of children of middle preschool age by means of simple experiments.

4. Materials and methods

Conducting a theoretical analysis of leading scientific investigations made it possible to generalize and systematize scientific approaches to the problems of forming the cognitive activity of children of middle preschool age by means of simple experiments.

32 preschoolers of middle groups and 6 teachers of the institution of preschool education "Rodyni" of the Kyiv region took part in the experimental study. In order to carry out a pedagogical diagnosis of the levels of formation of the cognitive activity of children of middle preschool groups, such methods as conversations with teachers, questionnaires and methods were determined, in particular: the method of diagnosing cognitive development "What objects are hidden in the pictures?" (R. Nемов), the method of diagnosing the psychosocial maturity of children's behavior (O. Taran), the method of D. Godovikova, the method of examining the cognitive development of children" by E. Strebeleva.

5. Research results and their discussion

The analysis of the leading modern scientific sources determined that the improvement of the cognitive activity of preschool children is considered through the prism of the child's personal development and its influence on the child's intellectual sphere, therefore cognitive activity develops through cognitive operation. Knowledge about the peculiarities of cognitive activity, its types, age characteristics and methods of its formation are determined by the necessary component of the competence of the teacher of the preschool education institution.

During the study, the *cognitive activity* of children of middle preschool age was interpreted as the active accumulation and assimilation of social experience with the help of cognitive operation, based on their own experience, motivation and desire to learn new things.

One of the effective methods of forming the cognitive activity of children of middle preschool age is simple experiments in preschool education institutions. The basic component of preschool education (2021) outlines that "research activity improves the development of a preschool child, contributes to the formation of systematic and deep knowledge about the surrounding world in relationships and dependencies. In such activities, the preschooler learns to analyze problems, demonstrates activity and curiosity, realizes his/her tasks, while interacting with other people, makes independent discoveries in the natural world" [2].

T. Sadova defines the main directions of formation of the cognitive activity of preschoolers [9]:

– "involvement of children in various forms of research and search activities;

– enrichment of the content of specifically children's forms of activity (game, visual, motor, practical, communication activity);

– purposeful development of perception as the initial stage of figurative cognition of reality through the inclusion of various analyzers for the study of the properties of an object;

- combination of cognitive activity in classes (in organized forms of activity), various unregulated types of children's activities and independent cognitive activity;
- ensuring the personal activity of preschoolers in the educational and cognitive process;
- individualization of the teacher's interaction with children according to the levels of cognitive activity;
- creation of a developmental environment that contributes to the formation of preschoolers' curiosity, cognitive interest, initiative, creative thinking, independence of cognition, etc.

During the analysis of the features of the use of simple experiments in preschool education, it was determined, that simple experiments are an important means of forming cognitive activity in children of middle preschool age. It is the organization of simple experiments of children of middle preschool age that creates the prerequisites for educating not only cognitive activity in them, but also interest to nature and understanding of its meaning and acquisition of nature research skills. An institution of preschool education fulfills the public request for the formation of a personality capable in the future, in contrast to a person-performer, to think independently, make bold and non-standard decisions, creatively relate to work in nature, skillfully solve problem situations.

According to the conclusions of L. Zagorodnaya, the basis of research activity in the institution of preschool education is the following components [5]:

1. "development of cognitive abilities and skills in preschool children;
2. the ability to navigate in the information space and use these skills when choosing the subject of experiments and researches;
3. the ability to act independently during observations and elementary experiments, transfer knowledge to new situations and be successful; the ability to integrate knowledge from different fields of science; the ability to think critically."

During the selection of research topics, one should take into account the peculiarities of the structure of cognitive activity, which includes [10]:

- 1) goal (acquiring knowledge, obtaining new information);
- 2) motive (an interesting educational situation (for organizing a game, continuing work, realizing a creative idea);
- 3) methods of activity (cognitive skills, methods of action during the transformation of objects in experiments);
- 4) conditions (how, what and when to do, phasing of work);
- 5) a specially created developing object-spatial space that ensures the realization of the set goal (availability of equipment for individual experiments, the ability to conduct experiments independently – for the child);
- 6) the result is the acquisition of new knowledge and the formation of skills to transfer existing ones to new conditions during new types of experiments.

In the process of organizing simple experiments, it is important to solve the key task of the child's cognitive development – the formation of the personality's ability to productive thinking, the ability to overcome difficulties when solving cognitive tasks. A problem is

always the basis of research activity at the institution of preschool education for a child of middle preschool age, so its purpose is determined by the solution of emerging difficulties. The means of cognitive activity during simple experiments are: abilities, skills, methods of action, which are specific for solving a problem situation and solving a research task.

The organization of simple experiments for children of middle preschool age makes it possible to implement peculiar steps of learning about the world by a child of preschool age in STEAM education and to form cognitive activity through: creating an emotional image of an object with the help of painting, music, dance, literature; mutual complementation and comparison of impressions from objects of living and inanimate nature, activation of the child's own experience during experiments and operations with plants and objects of inanimate nature.

The implementation of the above-mentioned tasks takes place through the creation of searching situations by the teachers of the educational institution, a creative approach to the organization of children's activities that stimulate the work of imagination; encouragement and motivation to find new and creative options for solving search and research tasks, which in turn contributes to the formation of a culture of engineering thinking in preschoolers. The best condition for the formation of cognitive activity in children of preschool age is the organization of systematic observations, purposeful guidance of them by a special education teacher who realizes the goal of consistently forming knowledge in children based on the emotional interests of the child and the peculiarities of his/her thinking.

The types of experiments are determined by the method of organization: demonstration (the teacher shows the course of the experiment, step by step all the features of the experiment) and frontal (conducted by children under the guidance of a teacher of special education) and by duration: short-term (usually within the class) and long-term (involves observing the object for a certain time, recording the results for final generalization).

Therefore, the formation of cognitive activity by means of simple experiments is possible if certain requirements are met:

1. Justification of approaches to the choice of content and forms of the organization of cognitive activity, which project the chosen type of thinking and consciousness of children of middle preschool age;
2. Offering new material to preschoolers as something unusual, new, which is a contradiction to the old, then they will remember it better;
3. Application of various types of cognitive activity (design, modeling, research, experimentation, etc.);
4. Combination of innovative and traditional teaching technologies for children of middle preschool age during search and research activities;
5. Facilitation of joint research activities with children, stimulation of children's initiative and independence, responsibility for the result of work.
6. Use of mnemonic tools that stimulate the development of cognitive interest and activity of preschoolers in preschool and at home;

7. Cooperation of the educational institution with parents through online and offline technologies.

Therefore, during the organization and conduction of simple experiments in nature, the formation of the cognitive activity of children of middle preschool age takes place, the development of their intellectual and moral traits, which are necessary for the comprehensive development of children at the stage of preschool childhood, in particular, the formation of cognitive activity.

Taking into account the theoretical analysis of scientific investigations, the need for conducting diagnostics to determine the level of the cognitive activity of children of middle preschool age was determined. For this, it was expedient to single out the components of cognitive activity, which is based on the main results of scientific investigations by S. Ladyvir [11], as well as supplemented by their own systematic observations of children.

The motivational component of the cognitive activity of children of middle preschool age was reflected in focusing attention and showing special interest in the subject of research; willingness to participate in experiments of various types and duration.

The cognitive component of the cognitive activity of children of middle preschool age provided an emotional attitude to the subject or object (surprise, misunderstanding, preoccupation, joy, that is, a variety of emotions, caused by the observed or studied object); active actions, aimed at more detailed recognition of the object during the experiment, its consideration, awareness of its functions and methods of activity with its application during transformative actions during a simple experiment.

The active component of the cognitive activity of children of middle preschool age focused on systematic interest in the subject or the object of research, even in its absence, the desire to interact with it and use it creatively during simple experiments independently or under the guidance of an adult.

The evaluation component of the cognitive activity of children of middle preschool age provided for the total number of examination actions of the preschooler, as a qualitative indicator of the intensity of the examination and a parameter for evaluating actions, their diversity, timely replacement of one action by another, intellectual pauses, associated with thinking about the subject and actions with it.

Observations of children during simple experiments were used to check the level of formation of the *motivational component of the cognitive activity of children of middle preschool age*. The analysis of the data, obtained during the observations, showed that only 21 % of preschoolers showed activity in performing experiments during classes, they recorded a desire to act outside the norm. 63 % of preschoolers showed an interest in experiments, but they did not always manage to achieve successful results in this field. While 16 % of children did not show a need at all to find any solutions that would differ from the standard answers. They showed unformed value orientations towards research activity, they showed indifference to solving the problem that the actual research activity involved. The obtained data were confirmed by a questionnaire of teachers of

special education. They indicate that children are at the stage of learning the features of formulating a hypothesis, they are afraid to make mistakes due to shyness, but curiosity leads to knowledge through interaction with adults.

To diagnose *the activity component of the cognitive activity of children of middle preschool age*, the following methods of diagnosing psychosocial maturity were used: O. Taran and E. Strebeleva's method. According to the generalized data of the methods, it was found, that the activity component of the cognitive activity of children of middle preschool age is formed in 55 % of children, at a high level – in 30 % of preschoolers, and at a low level – in 15 % of children.

The cognitive component of the cognitive activity of children of middle preschool age was checked using the diagnostic method of cognitive development "What objects are hidden in the pictures" by R. Nemoj and the method by D. Godovikova. The generalized data of both methods made it possible to determine the level of formation of the cognitive component of the cognitive activity of children of middle preschool age: 23 % of children were classified as high, 50 % as medium, and 27 % of children of middle preschool age as low.

The formation of the assessment component of the cognitive activity of children of middle preschool age was checked using a test with pictures. Children were offered a test with picture answers. The test contained 6 questions that the teacher asked the child and the child had to choose a certain picture as an answer. After checking the tests, we did a follow-up interview with the children to make sure that they were consciously choosing their answers. Unfortunately, not all preschoolers were able to justify their answer. And some even talked about the fact that they chose the answer without any thought. Based on the results of the testing, we obtained the following results: 29 % of preschoolers have a high level; the average level was recorded in 58 % of preschoolers, and the low level corresponded to 13 % of children.

Generalization of the results of diagnosis of the level of cognitive activity of children of middle preschool age showed that only 31 % of children corresponds to a high level of its formation, an average level is recorded in 50 % of children and a low level in 19 % of preschoolers. The obtained results of diagnosis of the level of cognitive activity of children of middle preschool age confirmed the need for the development and implementation of an experimental method of forming the cognitive activity of children of middle preschool age by means of simple experiments.

The method of forming the cognitive activity of middle-school-aged children by means of simple experiments provided for a number of specially selected simple experiments for middle-school-aged children, and individual experiments were included in classes from different sections of the program. The selected experiments, aimed at forming the cognitive activity of children of the middle group, were diverse in terms of subject matter and duration (short and long-term): "Can ice be?", "Rainbow with your own hands", "Happy birthday, plant", "Exploring the world of insects", "Where does heat come from and what can it do?", "Experiments with the shadow", "We study water and ice", "Experiments on

the windowsill", "Experiments with starch", "Electricity works and surprises", "We experiment with air", "Salty Experiments", "Ancient Ice Cream Recipe", "Secrets of Evergreens", "Keep Balance", "In Search of a Source of Energy", "In an Underground Laboratory", "Focuses with Water", etc.

In order to create the proper conditions for the implementation of the technique, a corner of search and research activity in the middle group was also supplemented with: materials for experiments with starch, salt; glass flashlights for shadow experiments; tweezers and gloves, disposable cups, dyes (yellow, green and red) – for experiments with plants; ensuring the integration of experiments and operations (selection of fiction, cartoons and videos for interest in the future experiment and consolidation of the acquired knowledge).

We take into account that the main feature of the period of preschool childhood is the active development of figurative forms of knowledge of reality – attention, perception, memory, thinking, imagination. It is for their formation this middle preschool age creates optimal opportunities, ensuring the development of cognitive activity. Accordingly, the basic task during the implementation of the methodology was the stimulation and enrichment of imaginative forms of the cognitive activity of middle-school-age children in the preschool institution and at home by parents during joint activities.

Children of middle preschool age, while solving problem situations, decided how to overcome difficulties during experiments and, based on imaginary characters, learned to help them, to find the correct solutions to the given tasks of search and research activity. Children should systematically watch cartoons about Fixers who explore the environment in order to be more motivated to conduct simple experiments. During walks with children, attention was focused on which of the observed objects in nature could be a subject or an object for future research (separate pebbles, dry leaves were the basis for further work after the walk). The special equipment of the corner of search and research activity also helped children, because they got acquainted with new materials and equipment as part of the implementation of STEM-education, children solved linguistic and logical tasks during experiments and after they were carried out, played interesting games and exercises.

Children of middle preschool age were happy to participate in simple experiments, which somewhat expanded the framework of the current program in the preschool institution, however, it also made it possible to form the appropriate competencies in children (natural sciences, ecology, etc.). Preschoolers reacted positively to new materials and equipment, especially those, with which they had not worked before during simple experiments. Many children said that they later recreated the individual experiments, conducted at the preschool institution under the guidance of the teacher, at home with their parents.

During the implementation of the method of formation of the cognitive activity of children of middle preschool age, the following results were observed:

1) increased motivation to conduct experiments and participate in classes that include research activities;

2) desire to learn the essence of phenomena and to master new methods of activity has increased;

3) increasing physical, moral and willpower efforts to achieve the set goal of a simple experiment;

4) motivation for active participation in each other's experiments;

5) attentive observation of the course of the experiment, its stages, because more consciously began to see in the stages of the experiment the course of actions that ensures successful activity and obtaining the desired result;

6) demonstration of a systematic interest in the subject, even in its absence, a desire to interact with it and use it creatively, in particular, the equipment that was used during the experiments could be quite creatively beaten during the subsequent experiments

7) emotional attitude to experiments and its subjects or objects (surprise, misunderstanding, preoccupation, joy, that is, a variety of emotions, caused by the observed or researched object); active actions, aimed at more detailed recognition of the subject, its examination, awareness of its functions and methods of activity with its application;

8) deepening cognitive activity after simple experiments by means of fiction, television, watching cartoons, videos, online games, etc.

So, the implemented method of forming the cognitive activity of middle-school-aged children during the observation of children's behavior demonstrated an increase in interest in cognitive activity, motivation to independent search for the causes and consequences of various natural phenomena, etc. The preliminary results can confirm the effectiveness of the implementation of the method for middle preschool children and can be recommended for implementation in the work of preschool education institutions. At the same time, the next stage of the research is considered to be a re-diagnosis of the level of formation of the cognitive activity of children of middle preschool age using the same methods as at the beginning of the experimental study.

The limitation of the study is the age category of children as middle preschool age, so we see the prospect of further research in expanding the age range to older preschool children.

6. Conclusions

The conducted research made it possible to determine the following conclusions:

1. The cognitive activity of children of middle preschool age is defined as the active accumulation and assimilation of social experience with the help of cognitive operation, based on one's own experience, motivation and desire to learn new things.

2. The main goal of conducting simple experiments in preschool education is the formation of a system of propaedeutic scientific concepts, research abilities and skills, the development of which will allow a child of middle preschool age to feel the joy of discovering new knowledge, get to know him/herself and the world around him/her, and form natural and ecological competence.

3. The generalization of the results of diagnosis of the level of cognitive activity of children of middle pre-

school age showed that only 31 % of children correspond to a high level of its formation, an average level is recorded in 50 % of children and a low level in 19 % of preschoolers.

4. The method of forming the cognitive activity of middle-school-aged children by means of simple experiments provided for a number of specially selected simple experiments for middle-school-aged children, and individual experiments were included in classes from different sections of the program. The selected experiments were aimed at forming the cognitive activity of children of the middle group, and were diverse in terms of subject matter and duration. In

order to create the proper conditions for the implementation of the methodology, a corner of search and research activity was also added to the institution of preschool education in the middle group. The analysis of the implemented methodology showed an increase in children's interest and enthusiasm in search and research activities.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this study, including financial, personal, authorship, or any other, that could affect the study and its results, presented in this article.

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Oksana Stupak*, Doctor of Pedagogical Sciences, Associate Professor, Department of Pedagogical and Psychology of Preschool Education, National Drahomanov Pedagogical University, Pyrohova str., 9, Kyiv, Ukraine, 01601

Maria Dyachuk, National Drahomanov Pedagogical University, Pyrohova str., 9, Kyiv, Ukraine, 01601

**Corresponding author: Oksana Stupak, e-mail: stupak.oksana.ua@gmail.com*