POSSIBILITIES OF A SUBJECT-DEVELOPING ENVIRONMENT AS A MEANS OF FORMING MATHEMATICAL COMPETENCIES IN PRESCHOOL CHILDREN

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Аннотация. Статья посвящена изучению проблем создания предметно-развивающей среды в условиях дошкольной организации, направленной на развитие познавательной активности и математического образования детей с дошкольного возраста.

Abstract. The article is devoted to the study of the problems of creating a subject-developing environment in the conditions of a preschool organization, aimed at the development of cognitive activity and mathematical education of children from preschool age.

Ключевые слова: математическое образование; познавательное развитие; технологии математического моделирования; пространственное восприятие; сенсорные процессы; дети дошкольного возраста.

Key words: mathematical education; cognitive development; technologies of mathematical modeling; spatial perception; sensory processes; preschool children.

At the present stage of Uzbekistan Republic continuous education system modernization at the pre – school education teachers have the power of constructing some author programs on mathematical development of the child, which, however, is impossible without a thorough knowledge of the fundamentals and techniques of mathematics theory and mathematic methodology, referring to successful experienced traditional, alternative and various approach to the mathematical training of children, defined operating by present programs for preschools and primary schools.

Relevant for the enrichment of existing and creation of new techniques and technologies in the child's mathematical development in a world of modern requirements to the republic pre – school education represents the direction associated with adapting to the specificity of childhood mathematical modeling methods.

Under the process of mathematical modeling with preschool children we understand the teacher organization heuristically oriented process of creating child models through a simple planar and space mathematical abstractions. From this perspective, the mathematical models are divided into categories according to the author's approach of researchers.

Thus, according to Z.A. Mikhailova, technology can be classified according to the action logic, highlighting: mathematic entertainment; puzzle games, tasks, didactic games and exercises.

The techniques, described by B.P. Nikitin, are classified into two types in terms of the intellectual development productivity based on imitation and heuristic laws of cognition models.

Techniques of mathematical modeling with preschoolers can be classified as follows.

1. **According to set – theoretic sense:**

• *finding of a whole number of given invariant form as a combination of various series of its class division;*

• *finding of a whole number of discrete change shape as the combination of constant classes of the partition given by initial form.*

2. **According to spatial orientation:**

• *Planar modeling on the basis of cutting the rectangle;*

• *Spatial modeling based on cutting cuboids;*

• *On the basis of materials, allowing continuous deformation (having topological features);*

• *based on the classic origami and flexagons.*

In the context of studied subjects the mathematical modeling, on the one hand, is a stage for the development of engineering skills, on the other – is a basis for creative process of the original structure modification at a bit higher logic – schematic level.

According to N.U. Bikbaeva, in the early preschool age (from 1, 5 to 3–4 years) in the development of the child to the fore role plays the process of own goal activity formation. In the middle preschool age (from 3–4 to 5 years) the main role plays the process of active obtaining activities in various ways.

After 4 years the child's action focuses on the final result. After 4 – 5 years, as it has been observed, there is an enormous interest to various intellects developing information: to letters, numbers, and sensory standards, reading.

At the senior preschool ages (5-7 years) the child is committed not only to imitate adults in their activities, but also to take part in them, properly understanding the ultimate goal.

He learns to assess the obtained result by comparing it with the standard shown in the form of visual images or in the form of a real sample. Preschooler does rather arbitrary control over the activity during the process of intermediate results production; he is interested in real results that can evaluate him, correlating it with the standard.

From this perspective, the process of mathematical modeling allows us to trace the child's logic development of cognitive abilities:

• *mastering the skills of immediate replacement of parts of circuits models of real objects – at a younger age;*

• *understanding the actions on the use of ready – made models – in middle age;*

• *understanding the actions on models schemes self – construction and construction of new models and schemes – at the senior preschool age.*

According to L.A. Wenger, Z.A. Mikhaylova, B.P. Nikitin, N.N. Poddyakova and other scientists' research, the knowledge of the child's logic development of cognitive abilities allows the teacher:

• *To see a certain stage of children's development watching their actions in the modeling and constructing;*

• *To provide a qualitative analysis of children's activities, stimulating to the search for new forms, methods, techniques, materials for further successful mathematical modeling.*

Researcher E.L. Porotskaya stresses that preschool childhood is a sensitive period for the cognitive abilities development. According to A.N. Davidchuk, mathematical modeling is an important part of children's intellectual education, aimed to the development of knowledge.

Sensory abilities are of particular importance for the child's cognitive sphere development, which are manifested in learning objects and their properties. In the context of mathematical modeling with preschoolers it is important to carry out three types of action on sensory standards:

• *Identification as establishing the identity of an object perceived quality standard;*

• *Correlation of an object with the standard, that is not solved simply;*

• *Perceptual modeling as recreation perceived quality from the standard material.*

These first steps are performed in the external plan: children put on, impose objects on each other, running their finger. In the future, they go into the inner plan that occurs "in the mind".

Besides sensory there are **intellectual abilities** in the structure of preschooler's mental development; they are necessary for solving various problems, i.e. associated with thinking. **Visual modeling action** is the basis of these abilities. They are also divided into three types:

• *Substitution action (in the early and middle age it is real items, at a senior age it is symbols);*

• *Use ready – made models (the model is given by an adult and children use it to solve the intellectual problem);*

• *Children's action on constructing models.*

Creative abilities intensively develop in the preschool period and they are associated with imagination, aimed to solving a particular problem. Imagination is productive, it expands reality, objectifies it; children with highly developed imagination have original activity products. In a sphere of mathematical modeling technology the children's creative abilities formation is based on the action of symbolization and modeling, enriching the results of their creativity.

The development of the components of cognitive abilities, sensory, intellectual and creative, goes in two directions: complicating actions on the use of problem solving and changing of given means.

Thus, preschooler's cognitive abilities development process within mathematical modeling can be considered in certain logic.

According to P. Y. Halperin, L. F. Obukhova, T. V. Taruntaeva, D. B. Elkonin and others scientists' researches, the development of mental actions in children occurs successfully in the process of mastering means on the provision of substantial relationships.

Mathematical modeling is one of these means. Learning the ways of using models, children discover the area of mathematical relations on the level of such important concepts as numbers, quantity, shape, order, classification, seriating.

Here are the **types** of problems that can be solved by primary school students on the basis of mathematical modeling skills development at preschool age.

They are made by us on the basis of analysis successive connection of existing educational programs for kindergarten and elementary school and can serve as diagnostic guidelines, to identify the level of preschool children mathematical representations development.

1. *Determine, from what the simplest geometric shapes does, shown in the drawing, figure consist; how many rectangles, triangles, circles, squares in its composition.*

2. Construct a pattern from geometric shapes.

3. Determine, whether the shapes, shown in the figure, are symmetrical with respect to the given axis.

4. Build a figure that is symmetrical to the given one, relatively symmetrical to the given axis.

5. Determine, how much (how many times) the area of one shape is larger than the other one, by a partition both shapes into equal polygons.

6. Build a sweep of the given compositions of two volume geometric shapes (except cone, cylinder).

7. Determine: whether these shapes are equal, whether they have the axis of symmetry, from which geometric shapes they consist, and if any of them are equal.

8. Fulfill the planar circuit (bulk box) with a predetermined set of geometric shapes in various ways.

Presented direction define following position to teachers, i.e. suggest the possibility of selecting children's own ways of solving educational problems and following on it in accordance with its own characteristics, leading to keep unique, multi – level and diversity of preschoolers within mathematics as a field of knowledge.

This setting directs teachers to the development of a deep scientific mathematic foundation of theory of sets, the use of unobtrusive methods and techniques that provide the efficiency of formation mathematic representations in all subjects involved in this process.

Analysis of the content of existing programs for pre – school and primary schools in the area of mathematic development, our long – term observations and experimental researches indicate the productivity of synthesis of set – theoretic approach with the study of scalar quantities and their properties.

Literature

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