

Полевикова О.Б., Швец Т.А. The child developing with the use of lego / О.Б.Полевикова, Т.А.Швец // Kontynent europejski wobek wyznan wspolczesnosci, Tom 3, R.Kordonski, A. Kordonska, L.Muszynski (red.), Lwowski Uniwersytet im.Iwana Franki, Lwow-Olsztyn 2018, s.353 – 369.

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THE CHILD DEVELOPING WITH THE USE OF LEGO

One of the main issues in our knowledge of preschool learning that if the child's activity is creative, it makes her think and become attractive. This activity is associated with the creation of a new, the discovery of new knowledge, the discovery of new opportunities, and this is a strong and effective incentive to engage in the construction of Lego, the implementation of the necessary efforts to overcome the difficulties.

Lego are specially developed and designed in such way that the child in the process of an interesting game is able to get the most information about modern science and technology and master it. Some sets contain the simplest mechanisms for studying in practice the laws of physics, mathematics, computer science.

The Lego company has become the world's largest toy company (J. Davidson, 2014)³ and it produced more than 60 billion bricks in 2014 alone. Lego products are sold in more than 140 countries, making it one of the most widely available toys in the world (Bartneck C., Min Ser Q., Moltchanova E., Smithies J., Harrington E., 2016)⁴.

Genevieve Smith has investigated that for children Legos means to build whole universes to their idiosyncratic specifications. For parents, Legos seem like the vegetable your kid actually requests and then eats in heaping mounds — a toy that's also a building block for future creativity, a mechanics lesson that doesn't feel like schoolwork, a wholesome embodiment of Scandinavian craftsmanship, something tactile in a world that is increasingly pixelated⁵.

The extraordinary popularity of Lego is explained simply - this fun is suitable for people of all ages, the mind, inclining, temperament and interests. For those who like accuracy and calculation,

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³ J. Davidson, Lego is now the largest toy company in the world, <http://time.com/money/3268065/lego-largest-toy-company-mattel/>, [10.03.2018].

⁴ C. Bartneck, Q. Min Ser, E. Moltchanova, J. Smithies, E. Harrington, Have LEGO products become more violent, <https://doi.org/10.1371/journal.pone.0155401>, [10.03.2018].

⁵ G. Smith, Lego is the perfect toy even if no one can really agree on what kind of toy it is anymore, <https://www.thecut.com/2016/12/lego-is-the-perfect-toy.html>, [10.03.2018].

there are detailed instructions, for creative people - unlimited possibilities for the creation (two simplest bricks Lego can be made in 24 different ways). For curious - the educational project Lego, for collectives - the possibility of joint construction.

The way of development and improvement of each person is unique. The task of education in this case is to create an environment that facilitates the child's ability to reveal its own potential, will allow it to act freely, discovering this environment. The role of the teacher is to organize and equip the appropriate educational environment and encourage the child to become aware of the activities.

The course of studying the basics of robotics in a kindergarten is aimed at:

- assistance to children in individual development;
- motivation for knowledge and creativity;
- stimulation of creative activity;
- development of self-education abilities;
- attachment to universal values;
- organization of children in joint activities with a teacher.

Basic educational goals:

Classes in design, programming, research, communication in the work process contribute to the versatile development of preschoolers. Integrating of various educational lines in the Lego training course opens up new opportunities for implementing new competences for preschoolers, mastering new skills and expanding the range of interests.

The requirements for the Lego - design in our work was simple enough. We taught children to create structures based on the instructions. But even this allowed not only to develop the children's skills of designing, but also to solve other educational tasks. Using Lego, we asked children to realize simple, clear and attractive tasks for them, deciding which they learned and developed thoroughly.

Learning Objectives:

1. Cognitive task: development of cognitive interest of children of preschool age in robotics.
2. Educational task: the formation of skills and design skills, the acquisition of the first experience of solving design problems, familiarity with new types of constructors Lego WeDO 2.0, Lego duplo.
3. Developmental task: development of creative activity, autonomy in making optimal solutions in different situations, development of attention, operational memory, imagination, thinking (logical, combinatorial, creative).
4. Educational task: education of responsibility, high culture, discipline, communicative abilities.

Expected results:

- formation of a stable interest in robotics and educational lines of the comprehensive program of kindergarten: cognitive, speech, artistic and aesthetic; social development;
- formation of the ability to work according to the proposed instructions;
- formation of the ability to creatively approach the solution of the problem;
- formation of the ability to bring the solution to the readiness of the model;
- formation of the ability to express thoughts in a clear logical sequence, defend their point of view, analyze the situation and independently find answers to questions by logical reasoning;
- formation of ability to work on a project in a team, effectively assign responsibilities.

Forms of summing up the implementation of training:

- competition of kids structures on the basis of kindergarten;
- joint project activity of children and parents;
- joint project activity of children and educators.

Before the beginning of the constructive activity, the children discussed what exactly they would simulate, what is the purpose of this or that design, whether it helps a person in solving certain tasks. Therefore, children developed social skills: autonomy, initiative, responsibility, mutual understanding and necessary for interaction with other children. In Lego, the design involved the participation of parents, which could affected the development of children's abilities and the identification of their talents.

Children were taught to adhere to safety. In addition, they constantly monitored that their desktop was in order, and all the details of the designer in the right amount lay in their places.

Classes on Lego-designing were mainly aimed at the development of the personality of a child of preschool age, its cognitive, visual, communicative, design, and creative abilities.

In early childhood, a child learned the environment through a fun and exciting game, in the form of a cognitive game learned a lot of important and necessary.

In the younger preschool age in the process of constructing a child learned to create and build, not only what is depicted in the diagram, but also to translate into their own fantastic stories, fantasies, create unusual things. The child learned to design with Lego instructions, maps of activity, from memory and on its own plan, focusing on the plane and in space. The variety of elements of the Lego designer contributed to the involvement of each child in the learning process, which, in turn, contributed to the development of curiosity for life and encouraged learning.

A child of the senior preschool age studied the basic principles of the operation of simple mechanisms, engineering, planning their own building and its strength, revealing its potential, and fantasizing.

The artistic and aesthetic direction of educational activity in Lego - the design was realized at the design and transformation of ready-made models, when not only the designer can use, but also paper, pencils, any material for creating a holistic image of the work.

In defining the forms and methods of organizing various types of children's activities, we took into account the features and interconnection of the game and the design. The training developed in the preschoolers the independence of thought, initiative, wit and ingenuity in solving constructive tasks that were formed through the needs of the game.

Lego classes used the main types of design: by example, by model, by conditions, by the simplest drawing and schematic diagrams, by design, on the topic.

Construction by example. It was that the children were offered samples of buildings, made of details of building materials and designers, and showed ways to reproduce them. This form of training provided children with a direct transfer of ready-made knowledge, methods of action based on imitation. Such a construction was difficult to directly associate with the development of creativity. Design based on the example, which was based on imitative activities, was an important educational stage, where we solved the tasks that ensured the transition of children to self-search activity of a creative nature.

Construction by model. The example was demonstrated to children as a model, the educators were describing the individual components of its elements. This model had to be recreated from the existing building material by children. Thus, in this case, the child offered a certain task, but did not give a way to solve it. The type of design on the model complicated the design on the model.

Construction under conditions. The children determined only the conditions under which the structure should conform and which emphasized its practical purpose without giving an example of the construction, drawings and methods of its construction, The task of constructing in this case was expressed in terms of conditions and was of a problematic nature, since, the ways of their solution were not given. In the process of such a design, children formed the ability to analyze and based on this analysis to build practical activities rather complex structure. Such a form of organization of learning contributed most to the development of creative design.

Construction on the simplest drawings and visual diagrams. The modeling nature of the activity in which of the real objects and the external and individual functional features were reproduced with the use of building details, which created opportunities for the development of internal forms of visual simulation. As a result of such training children formed thinking and cognitive abilities.

Construction by design. It had the great influence on the deployment of children' creativity and the manifestation of their independence: they decided what and how to design by themselves.

This form is not a means of teaching children to create ideas, it allowed to use their knowledge and skills which were received earlier.

Construction by topic. Children were offered a general theme of designs, and they created plans for specific buildings, products, materials and methods for their execution by themselves. This form of construction is very close in its nature to the design of the plan, with the only difference that the children's plans here were limited to a certain theme. The main purpose of organizing the construction of a given topic - updating and consolidating knowledge and skills, as well as involving children in new subjects.

Lego design is an effective educational tool that helped to unite the efforts of all participants in the educational process (educators, parents and children). In a joint game with parents the child became more enthusiastic, able-bodied, purposeful, emotionally sensitive.

The development of abilities for designing activates the child's mental processes, gives birth to interest in the creative decision of the tasks, creates ingenuity, independence, initiative, the desire to find new and original, volitional qualities. Children in the course of various activities create visual models. This is painting, designing, plot-role-playing, etc.

Designers are the category of useful toys, which play an important role in the comprehensive development of the child. As you know, they produce patience and perseverance, calm down and help to master the ability to think abstractly and to know the environment. Designers develop small child motility and logical thinking.

All this suggests that the designer can capture a child of any age category, and it will always be very useful.

Lego is attractive because it can be picked up depending on the needs of the child at a certain age, and all the details are compatible with each other, which allows them to find application in new, non-standard models. Designers of this type are quite diverse, but, based on common features, they can be classified.

Lego-design is a kind of modeling creativity-productive activity. With its help, educational tasks can be solved in the process of an exciting creative game in which there will be no losers, as each child can handle them.

The innovative and multifunctional technology of Lego not only provides the realization of the basic activities of children of early and preschool age. Subject activity and games with compound and dynamic toys at an early age, cognitive-search, communicative, playful and constructive in the preschool age, but also promotes the development of mathematical abilities in

preschool children. In a joint game with parents, the child becomes more plodding, workable, motivated, emotionally responsive⁶.

Robotics is an applied science engaged in the development and operation of intelligent automated technical systems for their implementation in various spheres of human activity.

Innovative and multifunctional technology Lego not only provides the implementation of the main activities of children of preschool age - play and constructive, but also is a means of development of constructive activity of children.

Lego sets have details of various shapes and sizes that allow them to be easily differentiated and create thematic compositions, develop visual perceptions. Through the game with Lego children not only learn, but also relax.

The construction of the LEGO designer is an effective means of developing the mathematical knowledge of preschoolers. The construction is developing intensively in the preschool due to the need of the child in this type of activity.

Constructive activity occupies a significant place in preschool education and it is a complex cognitive process that in results promotes the intellectual development of children: the child learns practical knowledge, learns to highlight essential features, establish relationships and relationships between details and objects.

Lego classes in designing, programming, research, and communication in the work process contribute to the diverse development of preschool education.

Classes in designing, programming, research, as well as communication during the work contributed to the versatile development of pupils. The preschool children' development of robotic designing took place in 4 stages:

1. At the first stage of work, there was an acquaintance with the designer and instructions on the assembly, study of the technology of connection of parts.

2. At the second stage, the children learned to collect simple designs according to the models.

3. In the third stage, we were faced with the task of introducing children to the programming language and pictograms, as well as the rules of programming in the computer environment.

4. Stage of improvement of models proposed by developers, creation and programming of models with more complex behavior. Young designers explored how the model had an impact on

⁶ О. Б.Полевикова, Т. А. Швец, Презентация «Основ робототехники в дошкольном образовательном пространстве», Дошкольное образование: опыт, проблемы, перспективы: материалы IX Междунар. науч.-практ. семинара, 2018 г., с. 246-247.

the model's behavior: they replaced parts, tested, evaluated its capabilities, created reports, held presentations, invented scenes, scripts and played performances, using their own models⁷.

Pedagogical theory and practice show that the design as a subject-practical activity of the child corresponds to its interests and needs, develops thinking, forms the ability to search for ways to solve constructive tasks by themselves.

Throughout preschool childhood, children's experimentation is developing, which is a special form of search activity. Childhood experimentation shows the child's independence, which is aimed at obtaining new information, new knowledge (cognitive function of experimentation), on receiving products of activity (productive function of experimentation).

The interaction of cognitive and productive functions of constructive activity ensures the process from mastering knowledge to their application in practice. By acquiring knowledge and skills in the process of cognitive activity, the child directs its activity on its subject. Practical activity has another subject: in a moment of transition from cognitive activity to practical knowledge of the subject of activity turn into a means of its implementation. This understanding allows us to consider each type of construction as an independent activity.

Under the design of children it is understood to create the product of various designs and models from the building material and details of designers, the manufacture of products made of paper, cardboard, various natural (moss, branches, cones, stones, etc.) and improvised materials (cardboard boxes, wooden coils, rubber tires, old metal items, etc.).

In scientific-methodical literature, two types of designations are distinguished: technical and artistic. In technical design, children mainly reflect real objects; invent products in association with the images of fairy tales, films. In this case, structural and functional features are modeled. This type of construction includes design from building material, design details, large modules, and computer design. In the artistic - the children, creating images, not so much reflect their structure as they express their attitude, transmit the character, using the color, texture, form. By the artistic type of design include the construction of paper and natural materials. It should be emphasized that computer design, as well as the creation of designs from the improvised material, Lego models can have both technical and artistic orientation.

Each of these types of design influences on cognitive and intellectual development of children of the senior preschool age. When children are working with building material, the combination of different shapes (cubes, bricks, prisms, plates, etc.), they build structures, which are reflect their impressions of the surrounding world.

⁷ Ibidem, c. 248.

Preschool age is characterized by intense development of the sensory-emotional sphere. On the basis of emotionally positive attitude to the process of knowledge, children are better and well acquire knowledge and skills. Nature provides the necessary conditions for studying the properties of an object, since it provides an opportunity to perceive it in sight, touch, and hearing. Therefore, in the process of constructing from natural material, the perception and imaginative thinking, imagination, fantasy and cognitive independence of the child develops.

A child, who opens the world around itself, is a child who seeks to act in it. If a child produces a long and productive work, it works diligently with its hands, and memory, thinking and creativity are actively developing in it. It is thought that if children often make with the use of their hands, they become smarter. So, the hand develops the brain. Therefore, design as a specific activity plays an important role in the mental and cognitive development of children.

In the process of using different forms of design activities, namely design on the example; by model; under conditions; for simple drawings and visual diagrams; by design; thematic; frame, as well as free design.

The most common in the early stages of work is the design on the example. Its essence is that the structure or toy is reproduced according to the pattern and method of production. This form of learning, based on imitation, provides a direct transfer of ready-made knowledge, modes of action. Correctly organized learning with samples is a necessary and important step in which children learn about the properties of different materials, master the technique of erection of structures or drawing up of paper, learn to determine in any object its main parts, to establish their spatial arrangement, to allocate details.

The transition from reproductive to self-activity is facilitated by imitation, which is characterized by a conscious attitude to the samples, the self-application of knowledge and methods, which are known for children, in new situations. The use of samples and tasks for the reproduction and transformation of objects is a prerequisite for the formation of the knowledge and skills that is used in self-activities.

By directing of the independence of preschoolers to the selection and expedient use of parts, it is proposed to use as sample drawings, photographs reflecting the general type of construction in which reproduction is required to replace the individual parts or to transform it so that a new one is released.

Thus, in the framework of this form, the tasks are solved, which ensure the transition from the imitation of actions to independent cognitive activity.

Children should create designs according to the proposed conditions, with a special emphasis on their practical purpose (for example, a garage for cars or trucks). In the process of such a design, children develop the ability to analyze the conditions and, based on this, realize their own practical

activities rather complex structure. As our experience shows, such a form of design education is best develop cognitive autonomy only when children already have some experience of such work.

First, children should be taught to build simple patterns-drawings that reflect patterns. Thus, the modeling nature of the activity is realized most successfully.

Since preschoolers, as a rule, do not have the ability to allocate plane of projection of bulk geometric bodies, it is possible to use specially developed templates that develop imaginative thinking and cognitive abilities. With their help, children have the opportunity to apply external models of “second order” (simple drawings) as a means of self-knowledge of new objects. The easiest and most natural process is for computer design in conjunction with a practical one.

The organization of the design on the theme provides an opportunity for children on the basis of general themes of constructions, to independently implement the idea of a particular structure, choose material, method of execution. This peculiarity of design is close in its nature to the design of the design, with the only difference that the artist's idea is limited to a certain theme and is offered to adults. The main purpose of designing on a definite theme is to actualize and consolidate the knowledge and skills of children. In this form of constructive activity, children have more opportunities to show initiative and cognitive independence.

Frame design allows children to get acquainted with a simple structure frame as the central link of the structure (separate parts, the nature of their interconnection). By focusing on the proposed pattern, children easily master the general principle of the structure of the frame, learn to highlight the features of the design. The organization of frame construction requires the teacher to develop a special material. Only then, children will be able to complete the designs, corresponding to their designs and integral structures.

The following are common forms of design, such as free (self) and design by an idea. They are provide the child with the opportunity to solve all tasks independently, that is, to set the goal of activity, to plan its achievements, to get the necessary material, to realize the plan. In such a design, there are wide opportunities for the development of fantasy and cognitive independence of children.

Independent design provides a rich volume and level of knowledge, skills and experience necessary for the solution of cognitive tasks of a constructive nature. It is provides psychological setting for self-replenishment and development of constructive abilities, their improvement. In addition, it promotes the independence of the child in the organization of their practical activities; reveals emotional and value attitude towards oneself, develops faith in self-esteem, self-esteem.

In construction by an idea, the creation of the idea and its implementation is a rather difficult task for the preschooler. In order to carry out a search and independent process, the educator should formulate to children a generalized idea of the constructed objects, the ability to own generalized methods of designing, to search for new ways in the process of other forms of design - in

accordance with the model and in the conditions. The teacher brings to children the ability to independently and creatively use of the skills acquired earlier. At the same time, the degree of cognitive independence depends on the level of knowledge and skills of preschoolers (ability to embody the idea, seek solutions, not be afraid to make mistakes, etc.).

An important component of independent childhood discoveries is a way of activity that, due to repeated use in different situations, is transposed into other contexts. In this case, the teacher sets the task or uses known methods, or looks for new ones. However, the setting of specific tasks requires the teacher to organize in the classroom a focused and thorough experimentation with the material. Before the transition from reproductive activity to creative will lead to a generalized imitation, that is, a conscious attitude to the samples, the independent application of known knowledge, methods in unfamiliar situations. The teacher uses such samples, which is necessarily used in independent activity of children.

Such common forms of designing as construction of parts, construction material, design, conditions and even their own design do not contribute to the formation of creative abilities of the child, because only develop complex combinatorial skills. According to the author, the peculiarity of the constructive thinking of preschoolers is the continuous combination, interaction and mutual enrichment of mental and practical actions that have a positive factor for the deployment of further independent construction.

In teaching design, different ways of performing tasks are used: according to an example of a model executed by a tutor; by graphic representation of the model: the construction of a specific building on the proposal and the appropriate instruction on the means of the task; independent performance of the proposed. When performing these tasks, children form an idea about the external features of concrete structures and generalized notions of signs of objects of a certain type. In addition, specific and generalizations are presented about the structural components of a particular structure, their external features, location in space and the means of combining parts.

The study of design, taking into account the above-mentioned features, develops those or other abilities of children, which in unity form the basis of their cognitive independence. However, optimal conditions should be created for this. Firstly, it is necessary to fill in the new developmental content of each form of training design according to the type of design. Secondly, to provide an organic relationship between all forms of training with the aim of developing integral design subsystems that mutually enrich each other.

In the lesson on design, game motivation opens up a perspective on an interesting game, encourages children to create a gaming environment. The constructed buildings and products are used by the children in the game, as well as a gift, decoration of the premises, etc. Understanding the significance of their products brings children great pleasure.

In the constructive activity, it is decided to allocate two interrelated stages: the birth of the plan and its implementation. Independence of the child is connected with the creation of the plan, because it consists of thinking and planning the process of practical activity, in determining the ways and the sequence of its achievement.

At the same time, one should pay attention to some of the drawbacks of the child's design, namely the fuzziness and instability of the plan; the haste of performing activity, excessive enthusiasm for it (the plan is paid little attention); inability to plan a sequence of actions; the inability to pre-analyze the task. It is known that the perception of the world in most children is superficial, that is, remembered primarily by external signs of objects, phenomena, which are then reproduced in practice.

In the process of enriching the activity of new content, methods and techniques in children formed the ability to independently build new and rather peculiar images. This fact positively affects both the development of thinking and imagination, as well as on the design activity itself.

Use in working with children of Lego-designer helps to form imaginative and spatial imagination, development of creative abilities in preschoolers, mental processes (analysis, synthesis, comparison, generalization, etc.).

Ensuring the use of their own, including "manual" actions in the knowledge of various quantitative groups enable the accumulation of sensory experience subject-quantitative content.

The organization of the study of children involves the use of common actions by children in the development of different concepts. For this purpose, children are arranged in micro groups for 3-4 persons. Such organization stimulates active linguistic communication of children with peers.

Organization of various forms of interaction: "teacher – children", "children – children".

Using information and communicative technologies.

Organizational forms for social and personal development of children of preschool age in the conditions of organization of joint activity with adults and other children, independent free activity:

- speech creativity;
- conversation;
- storytelling;
- compilation of the story;
- compilation of descriptive stories;
- making tales;
- creation of creative stories⁸.

⁸ О.Б. Полєвікова, Т.А. Швець, Основи робототехніки в дошкільлі. Частина 1, Вид.група «Основа», Харків, 2018, с.41.

Lessons with Lego mainly in speech development are aimed at the ability to analyze tasks and discuss the results of practical activities (description of the design of the product, materials, a story about the course of action and the construction of a plan of activity, the construction of logically consistent statements in reasoning, justification, formulation of conclusions). They are also aimed at oral communication with the use of special terminology; use interviews to get information and draw up a storytelling scheme; the application of multimedia technologies for generating and presenting ideas.

The content of psychological and pedagogical work is aimed at the development of the child's personality based on the values of social culture, which ensure the mastery of ways of behavior, creative and active reproduction of communicative experience.

Task:

- to promote the development of skills of collective work;
- to form a feeling of sympathy for each other, the ability to jointly solve problems;
- to form skills to distribute roles, to explain to each other the importance of this constructive decision;
- to develop skills to communicate, to organize joint games, to respect your and others' work⁹.

Organizational forms for social and personal development of children of preschool age in the conditions of organization of joint activity with adults and other children, independent free activity:

- drama game;
- game-staging;
- pedagogical situations;
- conversation;
- storytelling;
- discussion of the situation;
- discussion of actions;
- common activity;
- collective creative business;
- a task.

The content of psychological and pedagogical work is aimed at the formation of physical culture of preschool children, health culture, primary values of health and healthy lifestyles in accordance with a holistic approach to human health as a unity of its physical, psychological and

⁹ Ibidem, p.42

social well-being. The child is provided with an opportunity to hold and change at his own desire a position, reach, take, hold and manipulate objects, move in space.

Task:

- to ensure the safety of children's lives;
- to ensure physical and psychological comfort of the child;
- to promote the full physical development of children;
- to develop activity, autonomy, arbitrariness, endurance, perseverance, courage, and organization;
- to develop large and small motor skills of both hands;
- to prepare the child's hand to the letter¹⁰.

Lessons with Lego in social and communicative development are mainly aimed at:

- learning the principles of working together and sharing ideas, co-learning within a single group;
- formation of ability to interact with adults and peers; Rallying the children's team based on the creation of a product of creative activity;
- ability to work in a group, take into account the opinion of the partner;
- preparation and demonstration of the model;
- ability to work in a group;
- the establishment of independence: to distribute responsibilities in their group, to demonstrate a creative approach to the solution of the task, to create models of real objects and processes, to see the real result of their work;
- unification of the children's team on the basis of creation of a product of creative activity¹¹.

Lessons with Lego in artistic and aesthetic development are aimed primarily at the use of artistic means, modeling taking into account artistic rules.

The main task of Lego - design is the process during which children learn to pick up the appropriate details and, building constructs, modify them. Any educational activity is unthinkable without the development of speech skills, so Lego - design is integrated with the educational line "Child Speech": conversation, explanation of various phenomena or description of objects. Children do not just describe their models and tell about their appointment, but also answer the questions during the construction. It develops communication skills, because in a joint activity children can not only get interested in what and how others do, but also get or give advice on how to fix, share details or even combine their models for a larger scale design.

¹⁰ Ibidem, p.46

¹¹ Ibidem, p.44

The child learns from the experience the design properties of the details, the possibility of their fastening, combining, design. At the same time, it works as a designer, knowing the laws of harmony and beauty.

Children, who are fascinated by design, are distinguished by rich fantasy and imagination, active desire for creative activity, the desire to experiment, invent. They have developed spatial, logical, mathematical, associative thinking, memory, namely, this is the basis of intellectual development and an indicator of the child's readiness for school.

Using the Lego manuals is a new type of learning with extremely effective methods for influencing the child's personality.

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