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Middle preschool age children's color comprehension development within the concept of color presentation in culture

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Abstract- Introduction. The Education State standard for preschool children introduction experience revealed a characteristic problem of organizing work on the sensory color standard comprehension development and imprinting the understanding of color within full concept of color in culture by children. The concept of a sensory standard is understood in very scholar and standardized way that are contradicted with the real perception of a color and prevent the development of its inception. The authors advise to engage the correct process of perception development through practicing games. This way allows the adult to optimally control over the process of children's learning of color elements within cultural color perception when they solve of problematic game situations. Methodologically, the author's approach is coincided with views of Vygotsky persuading the idea that it's the most important for the preschooler to personally accept a training program offered to a him/her by an adult.

Data and methods. The experimental study was carried out on the basis of kindergartens in Ussuriysk, Primorsky Territory: Municipal Budgetary Children's Educational Establishment (MBCEE) Kindergarten No. 129, MBCEE Kindergarten No. 39, MBCEE Kindergarten No. 4, 50 children of middle preschool age participated in the experiment. The authors used diagnostic techniques adapted by the authors to the tasks of this study by Strebeleva and Wenger.

Results. Evaluation of the color comprehension development at the stage of identification revealed a high level in 20% of children, an average level in 43% of children and a low level in 37% of children in the experimental group. The control experiment showed a positive dynamics of the children of the experimental group color comprehension development according to all criteria (high level - 59% of children, medium level - 37% of children, low level - 4% of children. The Student's criterion application made it possible to confirm the reliability of the differences revealed during the study. The obtained empirical value t (4) is in the zone of significance.

Conclusion. The results obtained showed the positive dynamics achieved during the study, which proves the effectiveness of the children's color comprehension development at middle preschool age, when using a game problem situations solving as a tool.

Keywords: Sensory education, sensory standard, preschool educational establishment, child's perception of color, game problem situation

I. INTRODUCTION

One of the basic characteristics of preschool age is the child's increased susceptibility to learning and mastering new things. The basis of this age specificity is the sensory development of a preschool child, on the dynamics and laws of which many theories and methods of teaching preschool children are based. Psychologists and educators are united in understanding sensory education as the basis and driving force of the child's intellectual development.

The modern interest in the issues of sensory education was promoted by the adoption in 2013 of the state standard for preschool education (FSES PE), which approved the official standards for the sensory development of preschool children. The standard directs preschool institutions to ensure the formation of ideas about the properties and qualities of objects of the surrounding world: shape, color, size, material, sound, rhythm, tempo, space, time, etc., and the development of these ideas should take place in the process of active cognitive and practical activity with elements of a game that ensures the child's experimentation with objects of the surrounding world and the accumulation of his own experience of cognitive activity.

In fact, in the FSES format, an emphasis is placed on sensory education through the active cognitive and practical activity of a preschooler, which should result in the child's mastering of the corresponding sensory standards. Meanwhile, the very concept of a "sensory standard" was initially determined by the didactic and normative tasks of sensory education, namely, the development by children, under the

guidance of an adult, of generally accepted ideas about the shape, color and other properties of objects, about which the classics of pedagogical thought wrote and, which is a kind of general pedagogical the canon of studying the laws of the process of sensory development of a child (Bogomolova, 2013).
The didactic and regulatory requirements for mastering the sensory color standard, associated with the formation of ideas about color by preschoolers, are included in the modern program content of preschool education. The technology of sensory education involves the expansion of preschoolers' ideas about color standards, gradually moving on to the formation of a system of concepts about colors and shades (Talipova and Gataullina, 2020). This approach essentially continues the well-established research tradition that goes back to Gerd, Frebel, Steiner, Montessori, Tikheeva, in which color is the most important factor in sensory education (Komarova and Razmyslova, 2001; Surina andSurin, 2003).
This article is devoted to the search for a measure of regulation by adults of the process of color comprehension development within cultural views on color in the context of a problem game situation, using the example of organizing work in a preschool educational institution to develop color comprehension by middle preschool age children. The methodology of the study is based on the position of Vygotsky (2004) that "the main and generally recognized difficulty" of organizing the education of a preschooler is the specific ability of a preschooler to learn only "to the extent that the teacher's program becomes his program".
References. In modern psychological and pedagogical literature on sensory education, research topics related to the substantiation of the special role of color in the development of a preschool child are in demand today (Khalili, 2010; Litvinova, 2014; Berezina and Knyazeva, 2016; Cheskidova, 2015; Bubnova, 2017; Shurukhina, 2016; Karaseva, 2017; Franklin, 2016). To describe the specifics of this development, Russian authors, as a rule, use the concept of "sensory standard" introduced into scientific discourse by Zaporozhets in 1986 following a large-scale joint work of the team of the Institute of Psychology and the Institute of Preschool Education on the "ontogenetic study of perception" in preschoolers. This study laid the tradition of a predominantly didactic understanding of sensory education as an adult-led process of the development of a child's activity, during which systematized samples of various properties and relationships of objects are transmitted to the child, i.e. those same sensory standards (Wenger andZinchenko, 1986).
This kind of "transmission", from adult to child, occurs, according to Zaporozhets, as "specifically human sensory learning", which involves "not only the adaptation of perceptual processes to individual conditions of existence, but also the assimilation of systems of sensory standards developed by society", which are, for example, a system of geometric shapes, a color spectrum, a generally accepted scale of musical sounds, a system of speech sounds. Then, after assimilation, the child uses the learned standards for examining the perceived object and evaluating its properties, and thus these "standards become operational units of perception, mediate the child's perceptual actions, just as his practical activity is mediated by a tool, and his mental activity is mediated by a word" (Zaporozhets, 1999, p. 539-546).
The model of “specifically human sensory learning” proposed by Zaporozhets(1986; 1999) is still the basic one for the theory and practice of domestic preschool pedagogy, which interprets sensory education as an organized adult process of mastering sensory standards by children. Many modern authors note that the “sensory standard” actually acts as a “unit of measurement”, even a kind of didactic unit used in methods aimed at introducing preschoolers to the activity and requiring the development of the necessary level of color perception.
Conceptually, these techniques are based on the idea of color as the dominant of a child's sensory development, referring to classical studies of the process of development of color perception in children in the context of mastering the basics of visual activity. So, common to the works of Blonsky, Vygotsky, Davydov, Leontev, Teplova is the assessment of children's drawing not as some kind of external activity reaction, but as a cognitive act, including the actualization of the child's ideas about color.
Similarly, in the theory of preschool pedagogy, in the works of Mukhina, Flerina, Komarova, Sakulina, special emphasis is placed on the uniqueness for a child of the experience of color recognition and operations with color in the process mastering of activity in different periods of preschool childhood. At the same time, all these authors have repeatedly emphasized the primacy of competent pedagogical guidance for the success of the process of developing the sense of color in children, starting from an early age. So, according to Mukhina(1985), this process is generally impossible without an adult, since the interest in color recognition that appears in a young child arises initially on the basis of an adult's determination of color, “bypassing his own perception”. When then, at the age of three or four, bright colors and “favorite” colors appear in the drawings to express the child's attitude to the content of the drawing.
The period of 4-5 years is of particular importance for the development of ideas about color. At this age, the child's perception becomes meaningful, the orienting action moves from manipulative to the study of

an object with the help of sight and touch, which makes it possible to highlight the essential properties of objects, their qualities and interconnections (Vygotsky, 2004; Zaporozhets, 1999). The child's ideas about the main colors and their shades are improved: children practice recognizing, naming and comparing colors, obtaining colors and shades by mixing paints, mastering the spectral sequence, learning to determine lightness and saturation in each color, using color as a means of expressing their emotional state (Flerina, 1956; Wenger and Pilyugina, 2014).

Sakulin saw the role of an adult in the fact that he, through, for example, a story and a demonstration of a sequence of spectral tones, warm and cold colors, organizes, brings into the appropriate system the color impressions received by children from the surrounding life (Komarova, 2006). One of the options for such a systematization, according to Pilyugina (2003), is the creation of a kind of "piggy bank" in the child of ideas about color (the main colors of the spectrum as standards), the shape and size of objects. At the same time, as indicated by Komarov(2007), there is no guarantee that having mastered the ability to mix paints, select tones, preschoolers will certainly resort to a variety of color solutions, they often calmly perform a drawing in one color, since the form is of greater importance for them at this stage. Therefore, the author emphasizes the need to develop color perception not only in the process of specially organized learning, but also in everyday life, in the process of observations in nature, children's games (Komarova, 2007).

However, both in practice and in a number of teaching aids for preschool education, priority is given to the didactic approach. At the same time, many teachers, psychologists and art historians emphasize the need to provide the child with freedom and independence in practical activities as a prerequisite for success in mastering the elements of color culture (Kuzin, 2005; Nemensky, 2012; Bazyma, 2007). As a response to this criticism, one can consider the emergence of studies that introduce into scientific circulation the problem of the formation of a special color culture of preschool childhood as a synonym for the free and independent activity of the child (Litvinova, 2014; Berezina andKnyazeva, 2016; Bubnova, 2017).

The concept of color culture today is used to designate that specific experience that a child acquires in the process of becoming familiar with color as the most important characteristic of the material world (Karaseva, 2017; Cheskidova,2015). In this sense, color culture is an indispensable element of sensory culture, which is formed in a child as a result of his/her mastering generally accepted ideas about the shape, color and other properties of objects (Shurukhina. 2016). Today's sociocultural influence on the sensory sphere, expressed, first of all, in the "phenomenon of globalization" (Smetanina and Sveshnikova, 2019), the process of forming sensory culture in a preschooler at the turn of the 20s-30s of the XXI century requires different approaches from the teacher than before, including and at the level of color culture.

The very concept of color, as noted by many participants in the first all-Russian congress on color held in 2019, is associated in modern humanitarian discourse with freedom, with the search for new forms of human self-realization (Griber and Schindler, 2020; Griber and Schindler, 2019). The relevant ideas are in demand today in foreign psychological and pedagogical practice, which is reflected not only by special studies (Rogers et al., 2020; Brooker and Franklin, 2016), but also, for example, the popularity of the preschool aspect of the well-known "Munsell Color System" (Munsell color system) (Munsell, 2016), as well as, in general, the abundance of Internet resources dedicated to the popularization of game methods for the development of "preschool sensory culture" (preschool sensory culture) (Wenger, 2005).

Taking into account the specifics of our time, in our opinion, the task of mastering color culture by a preschool child is most adequate play activity, assimilating the specifics of color perception and gaining personal experience of operations with flowers, in an optimal way convenient for the child. The traditional didactic game described in the psychological aspect, for example, in the works of Venger, Mukhina, and Usova, is close to the requirements for the desired game model. But, a number of authors (Bondarenko, 1991; Zaporozhets andUsova,1993; Korotkova andMikhailenko, 2002) have repeatedly drawn attention to the fact that, in the context of the task of maximizing personal experience of the child, the potential of didactic play is limited, due, first of all, to the obligatory methodological orientation towards learning (Franklin, 2016).

The pronounced educational normativity inherent in didactic play, which meets the requirements of sensory education as a whole, in our opinion, does not fully correspond to the specifics of color and does not allow the child to fully reveal his/her abilities in mastering the color culture. From the point of view of the well-known expert in the field of child psychology and color pedagogy, Ann Franklin, a prerequisite for successful color education is the possibility of a child's free speech development, which can be stimulated to this in a problematic play situation. Pitchford and Mullen (2003), Burkitt (2008), Khalili (2010), Burkittand Sheppard (2013) also point to the fundamental importance of the language

component for the emotional expression and cognitive effect of the process of color mastering by preschool children (Kudryavtsev, 1997).
By organizing the introduction of the child to the color culture by means of game problem situations, one can encourage him to become independent, activate speech manifestations, emotionality and cognitive development. In relation to preschool education, a problem-play technology has been developed and recommended for use, which suggests as one of the methods to use problem situations involving the implementation of such a game task, which helps the child to realize the contradiction between the need to find a solution and the impossibility of its implementation using pattern actions (Novoselova, 1989).

Objectives

The significance of problematic play situations is shown in the works of Novoselova (1989) and Zvorygina, who describe them as a method of enhancing the creative mental activity of children through solving an imaginary problem in an imaginary play plan using play actions, a plot and, possibly, a role. Modern authors consider the problematic game situation as a special type, realized in an imaginary plan (Gamova andBorovleva, 2014); as a game problem that needs to be solved in new ways (Glebova, 2014); as a play task containing a contradiction and even as a situation leading the child to the emergence of a "need to discover" (Nikolau andDragoy, 2017).
Thus, the analysis of the psychological and pedagogical literature available revealed the difficulty of ensuring the child's independence in the context of adult didactism and normativity, which is specific for the organization of sensory education of preschoolers. This problem is especially significant in relation to the development of cultural color comprehension, since the process of forming color perception as a condition for cognitive development presupposes freedom of the child's linguistic and emotional manifestations. The authors see the possibility of overcoming this difficulty in the use of game technologies that allow a child to master sensory standards in the most convenient and, at the same time, effective way.
On this basis, we suggested that the mandatory adult leadership role in sensory education can be mediated by a problematic play situation and the child's introduction to the color culture will be more successful than in the format of standard didactic classes. Thus, the purpose of our study was to test the possibilities of using a problematic game situation as a means of developing the color comprehension of a middle preschool child.

II. MATERIALS AND METHODS

An experimental study was carried out in case studies at kindergartens in Ussuriysk, Primorsky Territory: Municipal Budgetary Children's Educational Establishment (MBCEE) Kindergarten No. 129 Ussuriysk, MBCEE Kindergarten No. 39 Ussuriysk, MBCEE Kindergarten No. 4 Ussuriysk. The experiment involved 50 children of middle preschool age. The study was based on the "Group pictures by color" by Strebelevaet al. (2004) and "Multicolored Hoops" by Wenger diagnostic technique (Wenger andPilyugina, 2014; Wenger et al., 1978).

The ascertaining stage of the study

Revealed the level of development of color comprehension (recognition, naming) by middle preschool age children (diagnostic method by Strebeleva) and the features of determining color by ear (method of Wenger) were studied.
To assess children's comprehension of color, the following criteria were used: 1. Primary colors (yellow, red, blue) are recognized and named; 2. Recognize and name dark and light shades of primary colors; 3. Recognize and name the colors of the rainbow; 4. Determine the colors by ear and correlate with the color of the hoop.
High level of comprehension of color development: children recognize and name the primary colors; do not find it difficult to recognize and name shades of primary colors; without difficulty, they build geometric shapes that correspond to the colors of the rainbow in the established order, they call the colors of the rainbow; easily recognize the color of their hoop by ear without prompting from an adult.
Intermediate level: children practically do not find it difficult to recognize the basic colors by the pattern, and to name them; make mistakes when naming shades of primary colors; make mistakes in determining the sequence of rainbow colors and the names of intermediate colors; find it difficult to determine the color by ear and correlate the named color with the color of the hoop, but when an adult is set on the need to correct a mistake, the color of the hoop is correctly determined.
Low level: children find objects of primary colors according to the pattern, but find it difficult to name them; find it difficult to determine the shades of the primary colors and their names; confuse the names of

the colors of the rainbow, violate the sequence of colors when building a row; make mistakes when determining the color of the hoop by ear.

Development stage of the study

The purpose of the development stage of the study was to test the effectiveness of the color perception development in middle preschool age children by means of solving the game problem situations.
At the control stage of the study the level of development of color comprehension by middle preschool age children was revealed after conducting a formative study. In the course of the study, the diagnostic technique "Group pictures by color" by Strebeleva and the method "Multicolored hoops" by Wenger were used again. The assessment of the level of development of color comprehension was carried out according to the criteria determined at the stage of the ascertaining research.

At the control stage of the study

The data obtained in the control and experimental groups were processed by means of mathematical analysis using the parametric Student's test, to assess the statistical significance of the differences in the studied attribute between the two samples in the Excel function wizard.

III. RESULTS

Initially, at the ascertaining stage, the children were offered tasks according to the method of Strebeleva. As a result of the study, it turned out that over 50% of middle preschool age children find primary colors in a sample and line them up, while 69% of children correctly name primary colors. More than half of children recognize the color of the rainbow by the pattern (52%). Of these, only 40% call the colors of the rainbow. Difficulties are associated with recognizing blue and violet colors, orange and red, etc. The most attractive for children are the primary colors red and blue, as well as green and orange. Less than half of the children in research recognize (49%) and name (38%) shades of primary colors, both light and dark.
It is difficult for children to determine the color by ear. At the same time, children determine the basic colors by ear quite easily (65%). Difficulties arise in determining the shades of the primary colors (40%). Children are often mistaken in identifying light and dark shades. Only 42% of children learn the colors of the rainbow by ear. At the same time, children can easily recognize the main colors included in the rainbow by ear; intermediate colors cause difficulties.
As a result of the ascertaining research, we have identified three levels of color comprehension development by middle preschool age children. Children with a high level (20%) recognize and name primary colors, shades of primary colors, rainbow colors, build geometric shapes corresponding to the colors of the rainbow in the prescribed order.
Children with an average level of development of color comprehension (44%) recognize the main colors by a sample, while they can make mistakes when naming them, make mistakes when lining up rows of geometric shapes of basic colors with their shades and naming shades of the main colors. Children find it difficult to name the colors of the rainbow and arrange the sequence of geometric shapes in accordance with the colors of the rainbow.
Children with a low level of development of color comprehension (36%) find objects of primary colors according to a sample, while they find it difficult to name primary colors, as well as to determine shades of primary colors. They make mistakes when arranging geometric shapes in accordance with the colors of the rainbow, naming the colors of the rainbow.

Table 1. The level of development of color comprehension by middle preschool age children at the ascertaining stage of the study (diagnosis by Strebeleva)

Study stage / Level	Experimental group		Control group	
	absolute number	%	absolute number	%
High	5	20	4	16
Average	11	44	12	48
Low	9	36	9	36

Analysis of the results obtained in the course of the diagnostic technique "Multicolored hoops" by Wenger indicates that recognition of color by ear is difficult for the most children, the reason for this, in our

opinion, is the absence of a color sample, comparison with which makes it easier for middle preschool age children to identify the color.
As a result of the study, children were divided into three levels of development of ideas about color: high, medium and low.
High level children (24%) easily recognize the color by ear and correlate it with the color of their hoop without support from an adult. Average level children (44%) make mistakes when recognizing color by ear, but can correct themselves. Low level children (32%) make mistakes in determining the color and correlating it with the color of the hoop, expecting prompts from other children, or show a lack of interest in the task.

Table 2. The level of development of color comprehension by middle preschool age children at the ascertaining stage of the study (the method of Wenger)

Study stage / Level	Experimental group		Control group	
	%	absolute number	%	absolute number
High	6	24	5	20
Average	11	44	11	44
Low	8	32	9	36

An analysis of the data obtained indicates an insufficiently high level of development of color comprehension by middle preschool age children at the ascertaining stage of the study. The majority of children, both in the experimental and in the control group, belong to the middle and low levels of development of color comprehension. It was found that most children know the primary colors, but have difficulty in naming them and determining the sequence of rainbow colors, make mistakes when finding shades of primary colors, as well as colors by ear. The low percentage of children with a high level of development of color comprehension indicates the need for formative work aimed at developing color comprehension within the cultural views on color by middle preschool age children.

Development stage

The intentional development of color comprehension within the cultural views on color as a part of the child's sensory development was carried out when the child is involved in an activity of solving a problematic game situation containing a goal that the child could understand (a game task). In the process of completing such a task, the child had to solve an imaginary problem involving the direct correlation of the color of the object with the sample, designating the color with a word (naming), building and naming the colors of the rainbow in a certain order, recognizing and naming the dark and light shades of the primary colors by ear.
In accordance with the goals of each stage of the experiment game problem situations were grouped into cycles. Problematic game situations became more complicated during the experiment, thereby ensuring the development of children color comprehension. The content of problematic play situations corresponded to the age and interests of the children.
The position of the teacher changed during the development work. At the beginning of the experiment, he/she offers the child with a problem situation and accompanied its solution; further acted as a direct participant in joint activities with children, as a partner in the activity, and thereby, provided support to the child in solving game problem situations; at the end of the experiment, the teacher became the manager of the objective conditions for the child's free experimentation with color.
To conduct the experiment, we determined the pedagogical conditions corresponding to the three stages of the experiment:

– Stage 1. Selection of the content and plots of problematic game situations corresponding to typical difficulties in acquainting children with color at the ascertaining stage of the study.
– Stage 2. Making the problematic game situations and their solution more difficult in joint activities with an adult, in the process of which children receive information about color, the sequence of spectral tones, about shades of primary colors, warm and cold colors.
– Stage 3. Objective conditions are created for the independent experimentation of children with color in the process of solving problems familiar to the child or similar game problem situations.

First stage

At the first stage, the teacher selected the content and plots of problematic game situations, taking into account the age and individual characteristics of children, the specificity of the child's sensory experience, the gradual complication of the color content of problematic game situations, and used them in the work to educate preschoolers' ideas about color.

In the course of the experiment, the children were offered a cycle of problematic game situations, at first simpler, motivating to be active, to achieve the necessary emotional mood to search for options for solving problems:

“Guess who's hiding” (to train children in correlating the background color of the picture with the coloring of animals, which allows them to be invisible against the given background, to show ways of examining colors by overlay and application);

"The world through colored glass" (to train children in solving the problem of painting objects without paints and pencils, to consolidate the recognition and naming of the primary colors);

"Magic transformations" (to introduce children to the methods of obtaining shades of the primary colors and colors of the rainbow (blue, orange, violet), to show how to mix paints, to suggest finding shades of the primary colors, to ensure the discovery of intermediate colors (orange, green, purple), etc.

Second stage

At the second stage of the development experiment, the child was offered more complex game problem situations that the child cannot solve on his own, without the accompaniment of an adult. Therefore, in the joint activity of an adult with a child, the adult acted as a partner in the activity, offered the child problematic game situations; voiced the contradictions underlying the problem situation and, thereby, stimulated children to seek solutions. In a number of cases, when the child showed difficulties, the teacher's activities were accompanied by commenting: asking questions aloud, addressing children, etc. This method of working with preschoolers was proposed by Wenger. The author emphasizes that the degree of independence of children in solving a problem at this stage of work is manifested in the reproduction of actions that an adult performed in front of the child (Wenger et al., 1978). At the same time, the complication of problematic game situations allows the child to discover new ideas about color in joint activities with the teacher. Thus, the teacher encourages children to compare, generalize, draw conclusions from the situation, and compare facts.

At the second stage of the experiment, game problem situations were used:

– "Where to find the color blue" (to exercise children to distinguish between colors and shades of blue: blue, cyan, dark blue, purple);

– "What color is it?" (to train children in correlating objects with their colors; to expand children's knowledge about objects that have a constant sign of color);

– "Light and dark" (to train children in getting light and dark shades with paint and water, etc.);

– "Rainbow" (to show children the peculiarities of the rainbow, to evoke an emotional attitude to the color diversity of the surrounding world. To consolidate knowledge of the color spectrum), etc.

Third stage

At the third stage, objective conditions were created for children to independently experiment with color in the process of solving problematic game situations familiar to the child. For this purpose, the child was offered materials for play problem situations, which were used in work at the first and second stages of the study.

The subject environment was enriched: children were offered watercolors, gouache, pictures depicting various objects, didactic games to consolidate ideas about the main colors and their shades (light and dark shades). The organization of an enriched environment and the provision of materials for game problem situations to consolidate ideas about color by middle preschool age children contributed to the manifestation of interest in experimenting with color, mixing primary colors, and obtaining their shades.

The children interaction in microgroups (1-3 children) was the most important. So, in the process of jointly solving problem situations, the children practiced recognizing and naming the primary colors and determining their shades, finding colors by ear. At the same time, the children controlled the correctness of the definition of colors (recognition and naming), corrected mistakes, explained how to proceed in order to obtain the required shade and how this shade is called. As a result, the experimental group developed an environment of cooperation between children based on interest in color, expressed in the desire to create the necessary shades, accompanied by speech statements about color and options for its use in activities.

The teacher monitored the actions of children in independent activities and, if necessary, provided them support through questions, advice, actions. At the same time, the priority direction of the teacher's activity was the support of children's independence, direct teaching influence on the child was not allowed. In situations of difficulties that arise in children, the teacher encouraged the child to experiment with color, setting game problem situations, positive assessment, setting for independent actions aimed at testing assumptions, discovering ways to solve a game problem situation.

Control experiment

At the first stage of the control experiment, Strebeleva. As a result of the study, 60% of children were assigned to a high level of development of color comprehension, 36% to an average, and 4% to a low.

Table 3.The level of development of color comprehension by middle preschool age children at the control stage of the study (diagnosis by Strebeleva)

Study stage / Level	Experimental group		Control group	
	absolute number	%	absolute number	%
High	15	60	9	36
Average	9	36	11	44
Low	1	4	5	20

In the second part of the control study, we used the "Multicolored hoops" technique by L.A. Wenger. As a result of the study, 64% of children were classified as high, 32% as average, and 4% as low.

Table 4.The level of development of color comprehension by middle preschool age children at the control stage of the study (the method of Wenger)

Study stage / Level	Experimental group		Control group	
	absolute number	%	absolute number	%
High	16	64	8	32
Average	8	32	12	48
Low	1	4	5	20

Comparison of the results of the ascertaining and control studies showed a positive trend in almost all criteria in the experimental group. The data obtained in the course of the ascertaining and control studies (experimental group) are presented in the diagram.

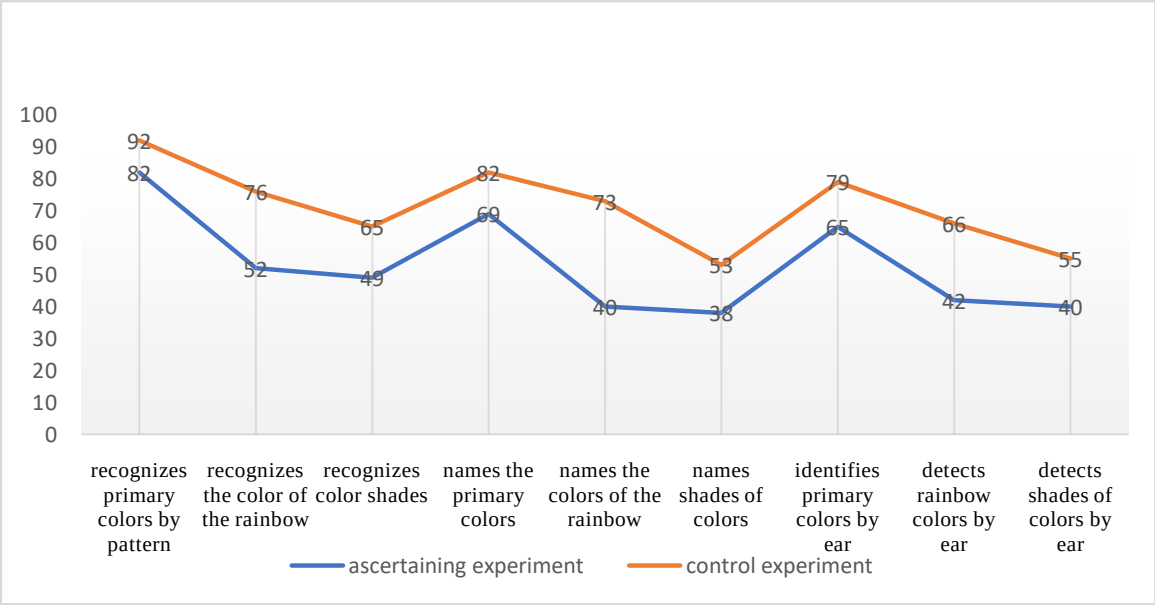

FIGURE 1.The experimental group study results

IV. DISCUSSION

To assess the significance of the differences, the data obtained in the course of the study were subjected to mathematical processing using the parametric Student's test to assess the statistical significance of the differences in the studied attribute between the two samples in the Excel function wizard. The differences between the samples turned out to be significantly different from each other. Therefore, based on the application of the Student's test, it can be concluded that the differences between the groups are statistically significant. The obtained empirical value t(4) is in the zone of significance. As a result, we can conclude that statistically significant indicators of an increase in the level of development of color comprehension by middle preschool age children.

We have revealed that most children recognize and name the primary colors, the colors of the rainbow and shades of the primary colors, determine by ear the primary colors, the colors of the rainbow and the shades of the primary colors. The positive dynamics in the experimental group has proved the effectiveness of the pedagogical conditions for the development of color comprehension by middle preschool age children. The use of problematic game situations has become an effective means of developing of color comprehension by middle preschool age children.

V. CONCLUSIONS

The results obtained showed the positive dynamics achieved during the study, which proves the effectiveness of the children's color comprehension development at middle preschool age, when using a game problem situations solving as a tool. In this regard, children learning of the color within cultural view on color will be successful if the following pedagogical conditions are met: the teacher's selection of the content and plots of game problem situations, taking into account the age and individual characteristics of children, the specificity of the sensory experience that has developed in each individual child, the gradual complication of the color content of game problem situations; the organization of problematic game situations involves joint activities of an adult with a child, when the adult acts as a partner in the activity; creation of objective conditions for independent experiments of children with color in the process of resolving problematic game situations familiar to the child.

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