FORMATION OF COLOR PERCEPTION OF JUNIOR SCHOOLCHILDREN

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Abstract: The urgency of the problem of forming the color perception of junior schoolchildren is explained by the radical reform of general secondary education in Ukraine. The concept of color sensory ability as a functional unit of color perception is defined. Qualitative levels of students' mastery of color skills in the current pedagogical experience are revealed. Educational and perceptual tasks aimed at the formation of children's color perceptual processes are described. The effectiveness of the introduced didactic influences is proved – in comparison with the control group, the participants of the experimental group showed the highest efficiency of differentiation, classification-serial ordering and verbal categorization of color properties of objects, stability of skills to reproduce exactly these properties. Prospects for further research are associated with the development of didactic support for the development of sensory processes of other modalities in younger students.

Keywords: Color perception, Color sensory ability, Educational tasks, Junior schoolchildren, Perceptual tasks.

1 Introduction

One of the components of the formation of a holistic sensory sphere in junior schoolchildren is the improvement of their color perception. The scientific basis of this problem was laid in the second half of the last century in the works devoted to the development of the theory of the development of perception by forming specific actions for the examination of various external features of the objects of reality. At the present stage, the development of color sensations is given considerable attention in scientific and methodological works on teaching children fine arts. A wide arsenal of domestic and foreign research is aimed at highlighting the medical and biological factors of functioning of color vision in students, especially in the presence of certain disorders [17, 21]. The urgency of the development of students' color sensations enhances the radical reform of general secondary education in Ukraine, updating regulations educational standards, standard educational programs, textbooks and manuals that regulate the content of education in the first grade.

We have every reason to say that the problem of color perception of primary school children is multifaceted, requires clarification of the psychological mechanisms of this type of perception and the development of appropriate ways to form it in the educational process of primary school.

The purpose of the article is to develop and measure the quality of the didactic system of forming the color perception in junior schoolchildren. The stated goal is specified in the following tasks:

- To characterize sensory ability as a functional unit of color perception;
- To identify the degree of students' mastery of color skills in the current pedagogical experience;
- To construct a system of developmental tasks aimed at improving the color perception in students;
- To check the effectiveness of the implemented didactic influences.

2 Literature Review

The defining thesis of our study is the substantiation of sensory ability as a functional unit of formation of students' color perception [4]. In psychological and pedagogical sources, skills are considered as a willingness to act on the basis of existing knowledge or as the implementation of certain actions on this basis [6]. These approaches are not contradictory, because the skill potentially exists even when a person does not act, but it is relevant in a particular activity. The second approach more accurately reflects the essence of skill as knowledge in action and is accepted by us as more adequate.

Another point in interpreting a skill is to find out its structure [13]. It usually consists of not one, but several actions, the selection of which is caused by the goal set. Therefore, we will consider skill as the implementation of a system of actions to solve a certain class of tasks based on the acquired knowledge.

First, perception is realized through a system of perceptual actions; secondly, perceptual actions are introductory (aimed at creating the primary image of the examined object) and cognitive (aimed at correlating the primary image with the sensory standards stored in memory – generally accepted samples of sensory qualities of objects); third, these actions are subject to internalization – they gradually reduce, transform and transfer to the mental plane [23, 25]. Based on these characteristics, *sensory color skill* means the implementation of a system of internalized introductory-cognitive perceptual actions based on mastered color standards and skills of their application in the examination of color features of objects of perception.

The need to form color sensory skills in junior high school students is emphasized in regulations. The State Standard of Primary Education defines the general requirements for mastering the educational field "Art". It is envisaged that children should observe the world around them, perceive works of art, and show emotional attitude to them in various ways, including colors, experiment with them, distinguish elements of the language of painting [18]. In typical programs, these requirements are specified: students need to use chromatic and achromatic colors and their shades, obtain derivatives from primary colors, determine the color scheme of works of art and student work (warm, cold, mixed), compare works of art and environmental phenomena, create visual images and verbally describe their creative idea [19, 20]. Textbooks contain a significant number of educational tasks to improve students' operations of distinguishing and reproducing colors, their systematization on various grounds, memorizing the appropriate words, names, etc. [15].

Psychological and didactic analysis of the formation of color perception in many ways complement the conclusions obtained in the research of medical direction. The significant impact of color vision deficiency on most areas of children's lives games, sports, education, health, and safety has been proven [5, 7, 8, 9, 14, 22], as well as the importance of timely diagnosis of color vision defects in students, identifying the causes of such disorders in students of different sexes [10, 12, 24], and the expediency of developing recommendations for families on the proper organization of communication with students with visual impairments, their preparation for future professions [11].

3 Materials and Methods

Scientific research was performed using leading research methods – theoretical (inductive-deductive, analytical-synthetic, comparison, abstraction and concretization) and empirical (survey, observation, study of student activities, experiment). The sample included 208 students, evenly divided into control and experimental groups. Processing of the received data was carried out by means of correlational, cluster mathematical and statistical analyzes; the homogeneity of the samples was checked by single-factor analysis of variance.

4 Results

A prerequisite for determining the rational managerial influences on the development of color perception is to measure and evaluate the quality of sensory skills of this modality, formed in students in pedagogical experience [22]. At the same time, we consider the quality of sensory skills as compliance with the requirements of the State Standard of Primary Education and curricula, measuring the quality of sensory skills as establishing numerical values that characterize their essential features, and assessing the quality of sensory skills means determining the degree of mastery of these skills.

The methodological basis of the objective characteristics of the color skills of the child's personality is the provision of pedagogical qualimetry a field of knowledge that studies the issue of comprehensive quantitative assessments of the quality of any pedagogical phenomena and processes. According to the principles of pedagogical qualimetry, the complex quality of color perception should be considered as a hierarchical multilevel set of its less generalized properties (criteria and their indicators, or second-order criteria) that have different degrees of importance. In this case, the weights of the properties of one hierarchical level are interrelated: their sum is constant, predetermined number and equals to one.

The defining criteria for the quality of color skills include the following: 1) color distinction (indicators of this factor are the quality of color distinction by their tone, lightness, saturation); 2) systematization of colors and shades of colors (with indicators of ordering colors in the spectral sequence, classification of colors into groups of basic/derivative and warm/cold, series of shades of colors by light); 3) mastering the normative names of colors (with indicators of naming colors and understanding of the corresponding words-names); 4) color reproduction of the observed objects.

The apparatus for calculating the quality of color perception is presented in Table 1.

Table 1: Qualimetric model for assessing the quality of color skills in primary school students

Criteria	Weight	Indicators	Weight	Detection of indicators	Assessments of indicators	Assessments of criteria
Color distinction (C_1)	.30	color distinction by tone (D_1)	.40	K_1	$D_1 = .40\ K_1$	$C_1 = .30\ (D_1 + D_2 + D_3)$
		distinguishing shades of colors by light (D_2)	.35	K_2	$D_2 = .35\ K_2$	
		distinguishing shades of colors by saturation (D_3)	.25	K_3	$D_3 = .25\ K_3$	
Systematization of colors and shades of colors (C_2)	.30	spectral ordering and classification of colors (D_4)	.50	K_4	$D_4 = .50\ K_4$	$C_2 = .30\ (D_4 + D_5)$
		serialization of color shades by lightness (D_5)	.50	K_5	$D_5 = .50\ K_5$	
Assimilation of names of colors (C_3)	.10	naming of colors (D_6)	.50	K_6	$D_6 = .50\ K_6$	$C_3 = .10\ (D_6 + D_7)$
		understanding color names (D_7)	.50	K_7	$D_7 = .50\ K_7$	
Color reproduction (C_4)	.30	reproduction of mixed (tertiary) colors (D_8)	1.0	K_8	$D_8 = K_8$	$C_4 = .30\ D_8$
∑	**1.0**	Quality of color skills				$C_1 + C_2 + C_3 + C_4$

Comparing the importance of individual criteria, we define it as the lowest in the operation of color names: memorizing words-names is an important but not decisive indicator of the formation of color ideas in children. Different weights are also assigned to the criteria of the second order - the distinction of colors by tone, lightness, and saturation. It is known that the most informative feature is the color tone, to a lesser extent the lightness of the tone, the minimum one its saturation.

Identification of the quality of the formation of color skills in first-graders is organized using the following series of diagnostic tasks:

1 – Distinguish colors by color tone. Cards of achromatic (black, white, gray) and chromatic colors (red, orange, yellow, green, blue, violet; red-orange, yellow-orange, yellow-green, blue-green) submitted by two identical objects, randomly placed in several rows, were subject to perception. The child was asked to find among them the same as the presented sample. The juxtaposition was considered correct if the student selected the two required objects without joining the others.

2, 3 – Distinguishing color shades by lightness and saturation. In the first case, respondents were presented paired objects that differ sharply in color red, green, blue as well as achromatic, presented in three shades of light (whitewashed); in the second the same chromatic colors, presented in three shades of saturation (darkened with gray paint). The method of diagnosing and evaluating performance was the same as in the first series.

4 – Spectral ordering and classification of colors. The following tasks were to be solved for students: to make a "rainbow" of strips, painted in the colors of the spectrum and placed in a mixture; group objects by main/derivative, warm/cold.

5 – A series of shades of color by lightness. In the first presentation, the experimenter laid out three shades of gray in descending order of light from left to right, in the second in the order of its growth, in the third – in mixed order. Each time the child was presented with three cards of red, green, and blue colors of different lightness and offered to place them according to the pattern.

6, 7 – Naming and understanding of words-names of colors [4]. In the first version, the teacher showed the color twice, but not in a row (black, white, gray; red, orange, yellow, green, blue, blue, purple), the student had to name it; in the second the teacher called the color, the student chose the two necessary cards.

8 – Reproduction of mixed colors. Gouache, brushes, a water container, palettes, and sheets of paper with four contour squares were used to perform diagnostic tasks in this series. The children were shown tertiary mixed tones (red and yellow-orange, yellow and blue-green) and asked to paint the squares in the same shades (the method of obtaining them was not reported).

The measurement results suggest that the first-graders have fully mastered the operation of distinguishing colors by color tone: the selection of objects on this basis was performed confidently, almost instantly, without errors and any attempts to add cards in other way than the specified.

Differentiation of shades of color by lightness and saturation was carried out with less accuracy, and children always chose cards identical to the sample in tone (for example, when presenting a shade of red, they never added shades of blue or green), assuming errors in determining its degree of bleaching or darkening. The obtained data confirm the fact that, in the sense of colors, the most informative for younger students is the color tone, while lightness and saturation do not yet acquire a distinctive value.

Significant complications were found in the performance of tasks for the systematization of colors and color shades. Only a small proportion of first-graders (8%) were able to correctly reflect the sequence of colors in the spectrum, no child divided the colors into primary and secondary, but all have an idea, at least in part, of warm and cold shades: yellow is usually considered warm, and rarely red falls in this category, while blue is considered cold. At the same time, there are no respondents who would classify colors quite accurately or completely incorrectly on the basis of "warm". As for serialization, first, it was performed more efficiently than classification; secondly, it

was easier for all participants of the observational experiment to arrange the shades in the gradual increase or decrease of their lightness; when constructing mixed serial series the adequacy of solutions was somewhat lower: children placed shades also mixed manifested regardless of the color tone of objects whether shades of red, green, or blue).

How high do we assess the degree of assimilation of color names by students? Most achromatic and chromatic tones white, black, blue, green, yellow, orange, red – were marked correctly by children. Difficulties were caused by the use of names of gray and purple colors: respondents either did not identify gray at all (the most common explanations – "I do not know", "I do not remember"), or used names of other colors ("dark white", "beige"); purple was denoted by blue, but never the opposite way. The understanding of the normative names of colors was quite adequate.

According to the peculiarities of reproduction of mixed colors, first-graders can be divided into three groups: those who do not reflect any of the four given tones (27%); those who reproduce one complex color (62%); those who were able to get two shades (11%). The children of the first group, comparing the samples and the available colors, did not comment on the differences between them, did not try to mix the colors on the palette and chose the color that, in their opinion, more closely matches the reproducible shade; respondents in the second group successfully reproduced the yellow-green tone, and the third group also reproduced the blue-green tone. At the same time, no one was able to accurately reflect the shades of red and yellow-orange (probably, the practice of mixing these colors was less common in the past experience of art); in most cases, children used orange paint. At the experimenter's request to attach the results to the samples and confirm their similarity, the subjects usually gave a positive answer and only one boy stated: "No, not very similar, but I do not know why".

Let us note that the reproduction of mixed colors, in contrast to their successful distinction, proved to be a difficult diagnostic task and the reasons for this need to be considered separately. In our opinion, first-graders feel these shades as monochrome, do not see their complex structure, cannot identify the leading elements and assess the proportion of each of them.

The validity of this assumption indirectly confirms the quality of naming mixed colors: instead of double names, respondents used the names of a single component (for example, yellow-green was defined as yellow or green, blue-green – as blue or green, etc.); they used the subject verbal notation "bright green", "carrot-colored", "orange", which somewhat hide the multicomponent nature of mixed shades and, rather, capture the result of a combination of several colors.

Comparing assessments of the quality of color sensory skills at the level of criteria shows a certain imbalance between children's ability to distinguish, systematize, name colors, and reproduce their complex combinations (this convincingly illustrates the multiple exaggeration of the relevant numerical indicators in the direction of differentiation). On this basis, we can say that first-graders have relatively stable and verbally established reference ideas about colors and their shades, but there is no full understanding of the systemic connections between them.

Methods of color examination are adequate in cases of distinguishing between achromatic (black, gray, white), chromatic basic primary (red, yellow, blue) and derived secondary tones (orange, green, purple). To perceive more complex colors, in particular, tertiary derivatives (red-orange, yellow-orange, yellow-green, blue-green, etc.), the perceptual operations available in children are not sufficient and, even at the level of objective approximation of objects, they do not provide analytical perception of their coloring.

The complex quality of color skills of first-graders is 0.506 relative to the ideal score of 1.0 (Table 2).

Table 2: Quality of color skills of junior schoolchildren (statement checkout, average values)

Criteria	Weight	Indicators	Weight	Detection of indicators	Assessment of indicators	Detection of criteria	Assessment of criteria
Color distinction	.30	color distinction by tone	.40	1.0	.400	.788	.236
		distinguishing shades of colors by light	.35	.665	.233		
		distinguishing shades of colors by saturation	.25	.619	.155		
ystematization of color and shades of colors	.30	spectral ordering and classification of colors	.50	.172	.086	.372	.112
		serialization of color shades by lightness	.50	.573	.286		
Assimilation of names of colors	.10	naming of colors	.50	.888	.444	.944	.094
		understanding color names	.50	1.0	.500		
Color reproduction	.30	reproduction of mixed (tertiary) colors	1.0	.212	.212	.212	.064
∑	**1.0**	Quality of color skills (control checkout)					**.506**

According to individual indicators, students are grouped into three groups - with elementary (27%), average (54%), and sufficient (19%) levels in the absence of students with a high level of formation of the analyzed skills.

To improve the quality of color skills in the educational process special educational and perceptual tasks were introduced (experimental group of junior high school students).

In the first year of primary education, didactic influences were aimed at expanding and systematizing students' color representations, enriching their vocabulary with normative names of colors. In the suggested tasks, the children chose objects by the name of the color, named the color of the presented objects; they divided colors into achromatic and chromatic, chromatic spectral and non-spectral, reflected the sequence of colors in the spectrum, divided colors into primary and derivative, warm and cold, contrasting and related; established the relationship between shades of color by light, carried out a series of shades in descending or increasing light order; obtained derived colors, bleached and darkened shades by mixing paints; they painted, performed decorative compositions from details of different colors [1, p.416–421, 3].

During the second and third years of primary school, the purpose of sensory developmental influences was to form in students a variety of ways to use reference color representations in the examination of objects of reality. By completing the tasks, students updated their knowledge of achromatic and chromatic colors, shades of color by lightness, laid out objects on matrix cards with a given order of color tones and gradation of shades; analyzed the composition of derived colors, learned information about how to obtain them; chose by name and named the derived colors, using the color wheel model, recognized them on reproductions of paintings; selected colors from the sample by subject combination of objects (put "middles" in the rings, applied "halves" to the half-rings of the given basic and derived tones), arranged color sequences without subject combination of

objects, by color representations by remote sample, verbal description of the expected results (performed applications from the details of the main and derived colors); solved tasks to establish the structure of complex colors, reproduced them, painted segments of the color wheel with them (according to the sample, imaginary images) [1, p.441-444, 2].

The didactic influences realized during the fourth year of primary education were aimed at taking into account individual-typological differences in students' color perception [16]. Groups and subgroups of fourth-graders or individual children were offered adapted sets of tasks of equal complexity, but differentiated by the degree of independence of performance, with different degrees of assistance, namely: varying the completeness (from largest to smallest) of information about their types, which are auxiliary, additional to the main ones, providing instructions on rational ways of color perception, asking leading questions, creating conditions for free choice of tasks of certain types.

5 Discussion

According to the results of the control diagnosis, it was found that all respondents both control and experimental groups confirmed the absolute accuracy of the choice of objects by color tone, found at the ascertainment stage. This gives grounds to consider the operation of distinguishing colors by their tone finally formed and to consider it as an age feature of the sensory sphere of primary school children.

The adequacy of differentiation of lightened and darkened shades of colors has increased: in the control group up to assessment of the sufficient quality of educational and perceptual achievements (more than .600), in the experimental group up to assessment of the high quality of distinguishing shades by light (more than .750) and assessment of sufficient quality of feeling of shades on saturation with attraction to high results (more than .700).

Increasing children's sensitivity to the lightness of colors provided a solid foundation for adequate serialization of their shades. Arranging objects on this basis in the gradual increase or decrease of lightness of three shades of red, blue, and green did not cause difficulties, but when composing objects in mixed manner, the individual participants of the control checkout did not accurately reflect the tones relations. However, students in the control group performed this diagnostic task with sufficient success; quite high efficiency was found in the experimental group.

Particularly noticeable ones are the differences in the assessment of the assimilation of classification combinations of colors [14]. The effect of the introduced didactic influences can be considered the correct reproduction of the spectral sequence of colors by students, their division into achromatic and chromatic, basic and derivative, warm and cold, selection of contrasting and related tones.

In addition, in the experimental group, the diagnostic task of the direct type “Divide the cards into groups of achromatic and chromatic or basic and derivative, warm and cold colors. Select a contrast/color-related pair to the card” was preceded by indirect tasks (without taking in account effectiveness), in which the recipients had to determine the basis for the classification of the presented objects: “How can these color cards be divided? In what pairs can such color cards be combined?”

Most of the students in this group performed the proposed tasks successfully, justified the decisions made, which is evidence of a deep awareness of knowledge about the types of colors. In the children of the control group, information on color structuring did not significantly expand, including mainly information on the spectral sequence and color separation along the warm/cold axis these are the arrangements students reflected more accurately than others, demonstrating persistent difficulties in systematizing colors on such grounds as achromatic/chromatic, basic/derivative, contrasting/related.

Estimates of assimilation of verbal notation of colors turned out to be close to absolute. Only in isolated cases, participants in the final diagnosis made mistakes in naming blue and purple tones (such errors were more common in control groups).

The other colors presented black, white, gray and all iridescent were named by the students accordingly, and they always understood the names they heard exactly. But under the conditions of special formation of perception, the stock of verbal characteristics of colors becomes more capacious: using the names of individual colors, members of the experimental group, as mentioned above, deliberately operated with words-names of color units, such as “achromatic”, “chromatic”, “spectral”, “non-spectral”, “basic”, “derived”, “mixed”, “contrasting”, “related”.

Significant positive changes have taken place in the reproduction of mixed tones. The control group included students who did not receive any of the four proposed colors (red-orange, yellow-orange, yellow-green, blue-green), but the number of such children decreased compared to the stage of ascertainment from 27% to 18%; 59% (instead of 62%) of persons received one given color, and 23% (instead of 11%) two colors.

In the experimental group of fourth-graders, it was not found such who would not reproduce the given colors at all, contrary to 27%, available at the time of the input diagnosis. One correct mixing was performed by 11% of students in the experimental group (despite the previous 62%), two by 50% (despite the previous 11%), three by 27%; all colors were obtained by 12% of the experimental group in the complete absence of such at the ascertainment stage.

The transition of reproductive actions from low to medium efficiency and limitation by it in the control group is obvious. Quite another way of such a transition is observed in the experimental group: from medium to sufficient and from it to the initial accumulation of high efficiency of performing of these most demanding to color perception tasks.

Ways of color inspection have significantly improved due to the introduction of the developed didactic influences. Sensory actions to distinguish spectral tones were performed by children instantly and always accurately; in addition, the successful selection of objects by color name proves the stable internalization of these operations.

Ways of differentiating shades by lightness and saturation, although performed with slightly less speed and efficiency, had a significant “field of opportunity”: if, reporting the task (“Find cards of the same color”), the researcher specified the informative features of the examined shades (“Pay attention on the tone of color and the degree of its lightness/darkening”), the students oriented in the objects of choice almost unmistakably. In case of difficulties in arranging color objects, the respondents were presented with a six-element color scheme.

For the vast majority of students in the experimental groups, this assistance was sufficient to correctly solve the problem of establishing the spectral sequence of colors, determining their classification units (let us note that we did not consider positive the results obtained under different types of assistance, maintaining “purity” of research).

In the control group, the use of this schematic illustration was not crucial, although it helped to update knowledge about individual color combinations, including warm and cold.

Representatives of the experimental group showed great awareness of the ways of color perception during the reproduction of mixed tones: in addition to a purely visual examination of the sample, they analyzed its composition (“This color is similar to red. And orange is also similar. Understood, red and orange paint should be mixed”), brought the resulting variant to the sample, determined the identity of the shades and how to achieve it (“It turned out almost this color, it is needed to add a little red paint”).

Respondents of the control group did not characterize their actions, did not notice the differences in the tone of the sample and the colored card, did not try to adjust the color scheme, because in most cases they evaluated the presented and received color as the same.

Diagnosing color skills reflects the average level of their formation in students of the control group (.540), sufficient in students of the experimental group (.736). The increase in dynamics is as follows: .034 in the control group and .230 in the experimental group (Table 3).

Table 3: Quality of color skills in junior schoolchildren (control checkout, average values)

Criteria	Weight	Indicators	Weight	Detection of indicators		Assessment of indicators		Detection of criteria		Assessment of criteria	
				KG	EG	KG	EG	KG	EG	KG	EG
Color distinction	.30	color distinction by tone	.40	1.0	1.0	.400	.400	.793	.848	.238	.255
		distinguishing shades of colors by light	.35	.668	.769	.234	.269				
		distinguishing shades of colors by saturation	.25	.635	.714	.159	.179				
Systematization of	.30	spectral ordering and classification of colors	.50	.173	.653	.086	.326	.425	.694	.128	.208
		serialization shades of colors for light	.50	.677	.736	.339	.368				
Assimilation of names	.10	naming of colors	.50	.910	.915	.455	.458	.955	.958	.095	.096
		understanding color names	.50	1.0	1.0	.500	.500				
Color reproduction	.30	reproduction of mixed (tertiary) colors	1.0	.262	.591	.262	.591	.262	.591	.079	.177
∑	**1.0**	Quality of color skills (control checkout)								**.540**	**.736**
		Quality of color skills (statement checkout)								.506	
		Dynamics of color skills quality								.034	.230

According to individual achievements in the control group, 18% of students with elementary, 59% with an average, and 23% with sufficient quality levels of color sensory skills; in the experimental – 13% with an average, 48% with sufficient, 27% with a high and 12% with a consistently high-quality level of color sensory skills.

The fact that the control and experimental groups do not belong to the same general population of respondents confirms the graphical result of one-way analysis of variance ANOVA (Figure 1). The *F-criterion* is more than one and is equal to 349.36; the significance level of the statistical inference *p* is less than 0.05 and is equivalent to 0.0000. Therefore, the group means values differ significantly among themselves.

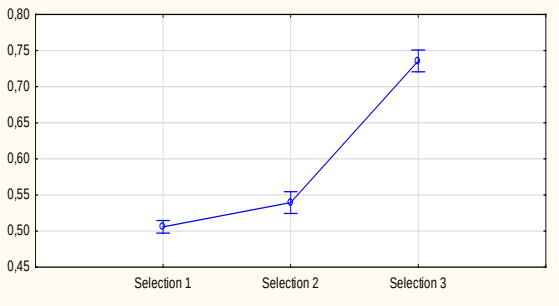

Figure 1 – Graph of similarity of the average values of sample 1 (statement checkout), sample 2 (control checkout; control group), sample 3 (control checkout; experimental group)

6 Conclusion

The conclusions of the scientific research will be formulated in accordance with the tasks.

1. It is expedient to recognize as the unit of functioning of color perception of junior schoolchildren color sensory ability – the implementation of a system of internalized cognitive perceptual actions based on mastered color standards and skills in their application in the examination of color features of reality.

2. In the traditional experience of primary education, students master color sensory skills at an average quality level. Distinguishing colors by their tone does not cause difficulties for students, but they focus less on the degree of lightness and saturation of color tone. The systematization of colors and color shades is not complete: children know little about the sequence of colors in the spectrum, the classification of colors into groups of basic/derivative, warm/cold; accurately establish the serial relations between shades under conditions of gradual increase or decrease of their brightness, but under conditions of random ordering of shades the peculiarities of relations between them are not realized.

Younger students quite understand the normative verbal designations of colors but have difficulty in naming individual colors, most often gray and purple. Students' most challenging task was to obtain mixed (tertiary) colors such as yellow or blue-green, red or yellow-orange. These colors children feel as monochrome, do not see their structure, cannot estimate the proportion of constituent elements.

3. To improve the color perception of primary school children, a system of special developmental tasks has been developed and implemented in the educational process. In the first class, the task was aimed at expanding and systematizing students' color representations, enriching their vocabulary with normative names of colors; in the second and third classes at the formation of various ways of applying the reference color representations in the examination of objects of reality; in the fourth at providing assistance in accordance with the individual-typological differences in color perception of children.

4. The introduced didactic influences proved to be effective. The positive dynamics of the quality of color sensory skills were established in both the control and experimental groups. Still, namely, in the experimental group, the increase in dynamics is more noticeable. In addition, the level structure of groups has changed. In the control sample, the respondents' distribution remained the same with the selection of elementary, medium, and sufficient levels of color perception in the absence of high. In the experimental sample, students with an elementary level of color perception were not detected at all. Students' strong migration from medium to sufficient level of color skills was recorded, and the emergence of children with high and consistently high rates of color sensory processes. In general, the experimental group participants are characterized by the highest efficiency of differentiation, classification, serial ordering, and

verbal categorization of objects' color properties; the stability of skills to reproduce exactly these properties is inherent in them.

Prospects for further research may be related to the development of didactic support for the development of children's perception of other modalities.

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Primary Paper Section: A

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