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Development of graphomotor skills in primary school students

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Abstract. The relevance of the study is aimed at identifying the development of graphomotor skills in modern conditions of continuous technological education of schoolchildren. In order to identify problems in children of primary grades, a comprehensive diagnosis of the level of development of graphomotor skills was carried out, which demonstrated an insufficient level of development of graphomotor skills. In primary school children of the experimental groups, coordination of hand and eye movements during writing is not well developed, children do not see the full image, go beyond the established boundaries. In the future, this can lead to significant problems not only in Russian language lessons, but also in other subjects**.**

Keywords: graphomotor skills, methodology, fine motor skills, primary grades, training.

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Introduction

The method of teaching primary school children used in most countries of the world has the main goal of acquiring handwriting skills for further learning to read and write. The correct acquisition of handwriting skills largely depends on adequate convergence between the child’s perceptual development, cognitive development, which provides certain language skills, and the timely evolution of a set of graphomotor skills, since their adequate coordination is a basic element for achieving the desired goals. [1]

The benefits of proper handwriting instruction extend beyond its intrinsic utility. Writing plays a fundamental role in the development of communication, learning, and thinking, and it also facilitates the acquisition of skills related to reading and comprehension. Writing down what is read improves children’s comprehension by providing them with an effective tool for connecting, reviewing, and manipulating key ideas in text.[2-4] In addition, the construction of meaning in writing is built around kinesthetic memory, the earliest, most powerful, and most reliable channel of learning, opening the way for handwriting to become a spontaneous exercise that allows students to pay more attention to higher-level conceptual activities.[5]

According to this importance, primary school children write by hand approximately 42% of their time in school [6-8], while unsatisfactory development of skills is observed in approximately 20% of children [9]. These distortions are usually associated with imprecise construction of symbols, incorrect alignment, inconsistent sizes, irregular spacing, with further risk of delays

in learning. The high percentage of cases with deficiencies in learning to write by hand justifies the large number of works in the literature, comprehending deviations and especially representative indicators for them [10]. In the past, intensive work has been carried out on objectification of these parameters, their normalization with the support of scales and standardization of tests to obtain data assessing the correlation of the observed skills with the motor and cognitive development of the child. However, experts do not always agree on the criteria for converting the measurements into comparable values, and digital tools are usually needed to help them measure motor skills objectively and specifically, which will allow them to truly understand the development of writing, using the obtained values to compare with the child's chronological age [11].

When a discrepancy is observed between the measured motor skills, the child's overall development, and the range of values that define normality for a given parameter, the presence of a special educational need should be investigated, and in such cases an appropriate intervention plan with a set of tasks is proposed to correct the problematic tasks being monitored. These intervention plans include tasks to improve elbow placement, arm extension, device grip, fine/gross motor skills, or control of pressure applied to paper, to name a few. The implementation of these activities, usually based on traditional approaches using paper and markers, is increasingly receiving computer support with the support of special software.

In this process, providing skills to children requires additional feedback, in which children receive instructions on correcting deviations in the mechanics of their writing. In the literature, one can often find references to the fact that adequate feedback in the processes of learning skills greatly affects the improvement of its results [12-14], and such feedback is undoubtedly more effective the closer it is to the actions performed. This is even more relevant for children with learning challenges due to the inherent difficulty in determining the nature of deficiencies and especially appropriate actions to correct them. In this regard, there is an obvious glitch in the latest computing support tools in providing such corrective feedback in real time.

Materials and methods

The research methodology used theoretical and empirical methods of scientific work: analysis of the works of scientists on the issues of the levels of development of graphomotor skills in primary school students.

The theoretical component of the study was implemented using the following methods of scientific knowledge: logical, comparison, synthesis, and system analysis. The empirical part of the study included methods of collecting, analyzing and interpreting data obtained from observations.

In order to identify problems associated with the development of graphomotor skills in children of primary school age, a comprehensive diagnosis of the level of development of graphomotor skills was carried out. This diagnosis includes several areas: determining the leading hand; determining the level of development of fine motor skills of the hands; determining the development of graphic skills. During the experimental study, the following diagnostics were adapted and used: - to determine the leading hand in preschool children, a diagnostic developed by M.G. Knyazeva and V. Yu. Vildavsky [15] was carried out. To determine the levels of development of graphic skills, a comprehensive diagnosis was carried out, including the following methods: the "Paths" method (according to L.A. Wenger) [16], the "Forest" method, the "Stitches" method (according to V. Mytatsin) [17]. At the first stage, we carried out diagnostics and determined the leading hand in preschoolers. Then, a number of methods were carried out to determine the levels of development of graphic skills in preschoolers. The obtained results were analyzed, typical graphic errors were identified, and the further course of work was determined.

Results

In order to identify problems related to the development of graphomotor skills in children of primary school, a comprehensive diagnostic of the level of development of graphomotor skills was carried out.

Determining the leading hand. 9 tests were conducted with each child, the results are listed in the table.

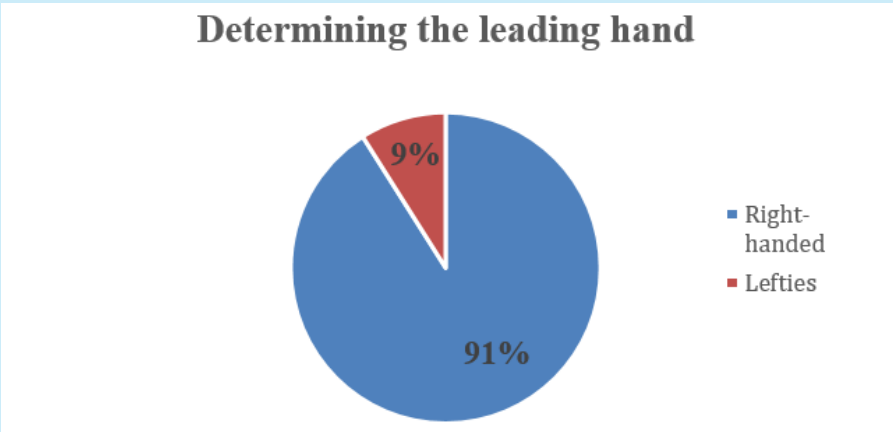


Figure 1. Leading hand determination diagram

The analysis of the conducted testing showed that in the examined group 9% (10 children) with a leading left hand were left-handed–handed and 91% (100 children) were right-handed.

To determine the level of development of graphic skills in primary school students, the following methods were selected and adapted: the "Dorozhki" method (according to L.A. Wenger), the "Les" method, the "Stezhki" method (according to V. Mytatsin). The " Stezhki" method allows determining the level of development of eye-hand coordination in a child; the "Dorozhki" method allows establishing the accuracy of hand movements; the "Les" method is aimed at establishing the accuracy and continuity of drawing lines. Thus, taken together, these methods allow obtaining a complete picture of the development of graphic skills.

Below we consider the results of surveys of primary school children in the context of each technique.

The "Dorozhki" method (according to L.A. Wenger). The purpose of this method is to determine the level of development of graphic skills and the accuracy of hand movements.

Three levels were defined:

High - the student completed the task without errors;

Average - the student went beyond the line 1-2 times;

Low - the student went beyond the line 3 or more times.

Examples of work are shown in the following figures.

In Figure 2 we see that the students hold the pencil well, the lines are bright and even, they follow the suggested direction, the tasks are completed to the end of the line, practically without going beyond the boundaries (there are minor deviations).

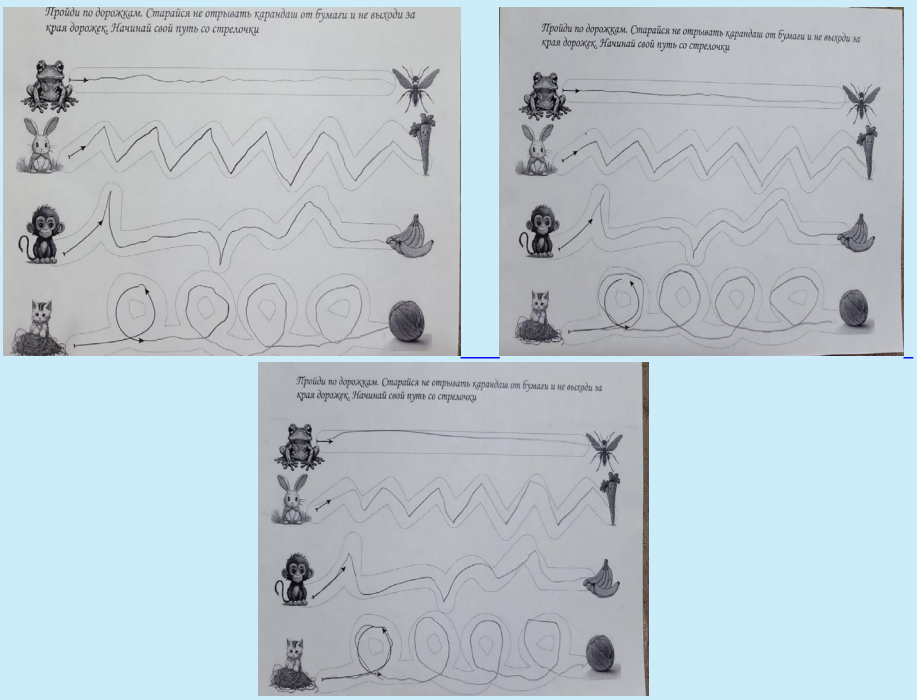
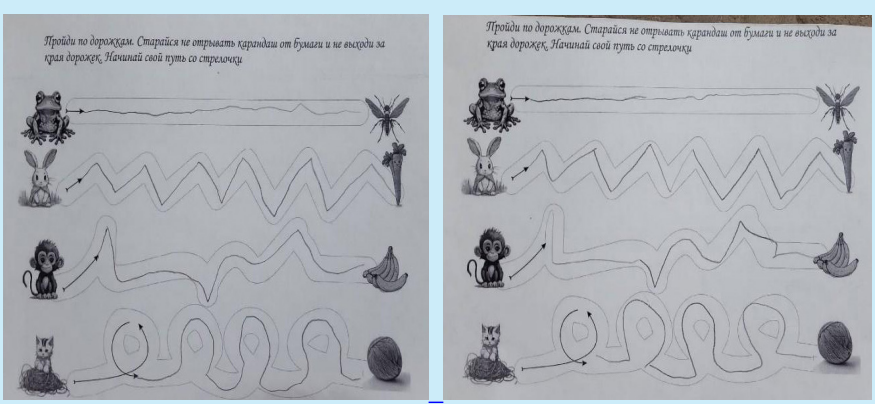


Figure 2. Works performed at a high level

In Figure 3 we see that the children completed the tasks with errors, in particular the third “path”, the children drew with an error in the direction of the line, and an interruption of the lines is also noted.



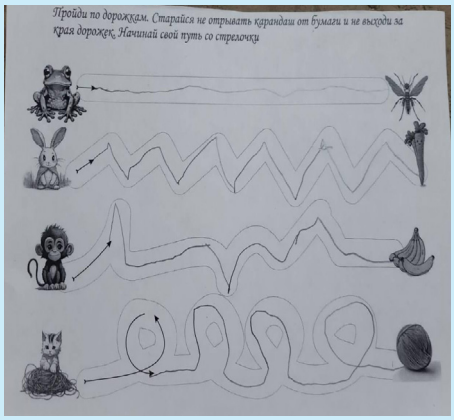


Figure 3. Works performed with defects

In 50% of the students, we found a low level of graphic skills and precision of hand movement. In the works we see that the lines are interrupted, the lines are not even (shaky lines), i.e. the child's hand moves uncertainly, there is also a partial lack of visual control, the children go beyond the established boundaries (Figure 3).

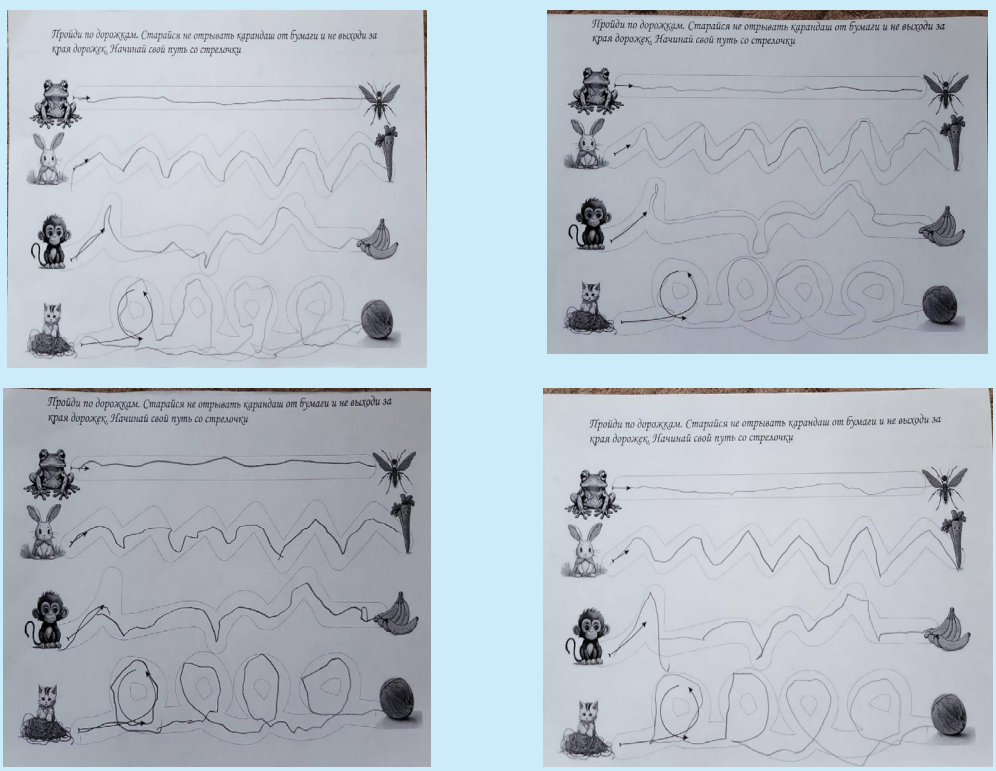


Figure 4. Works performed with errors

Based on the results of the “Paths” method, it can be concluded that most children completed the tasks correctly with some shortcomings, children do not always see the boundaries that cannot be crossed, children’s hand is unsteady when writing, which indicates an insufficiently developed graphic skill. In general, schoolchildren showed the following results, presented in Table 1.

Table 1. Results of diagnostics of children. Method «Dorozhki»

Levels of development	Group 1	Group 2	Group 3	Group 4	Group 5	Total
High level	2	3	2	2	1	10 (9%)
Medium level	9	10	11	5	9	44 (40%)
Low level	11	13	13	10	9	56 (51%)

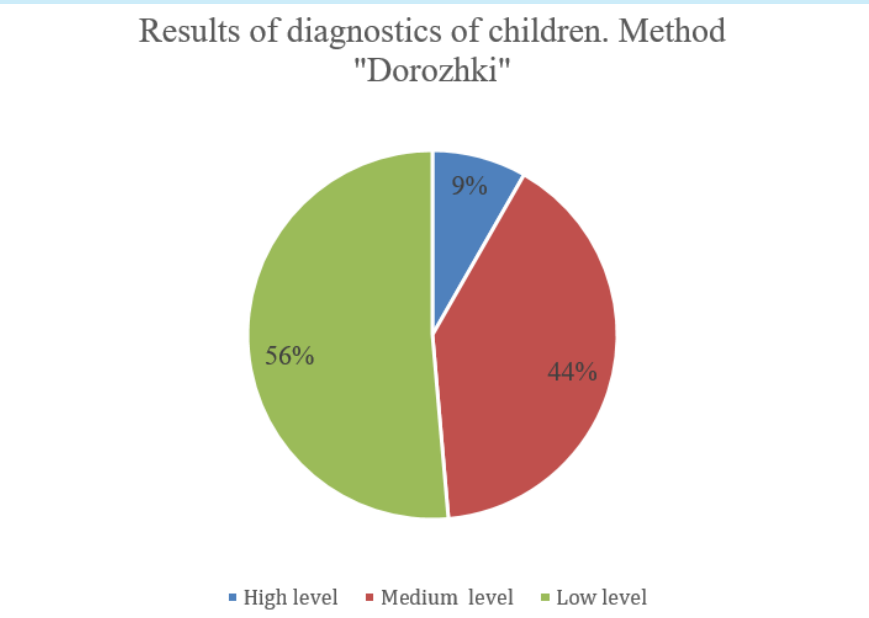


Figure 5. Diagram of diagnostics of children. The “Dorozhki” method

The next method, by which schoolchildren were examined, is aimed at establishing the levels of development of the child’s eye-hand coordination during writing – the “Stezhki” method.

The technique is a task related to connecting dots on paper or fabric with stitches. They were asked to connect the dots by stitching them.

The distance between the dots is set so that the perception of the whole image is accessible to children. The levels were determined:

High – 3 points, the child accurately connected 80% of the dots or more.

Medium – 2 points, the number of correctly connected dots 51% - 79%

Low – 1point, the number of correctly connected dots less than 50%.

A small part of the children completed the task correctly. The children's work is presented in the following pictures.

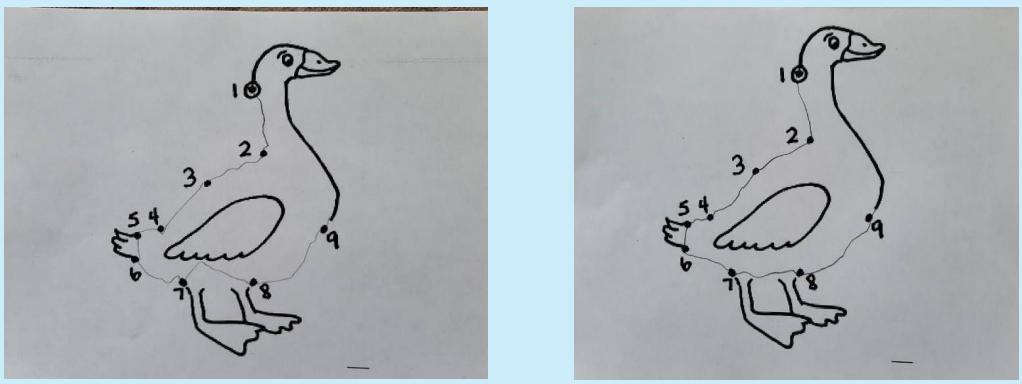
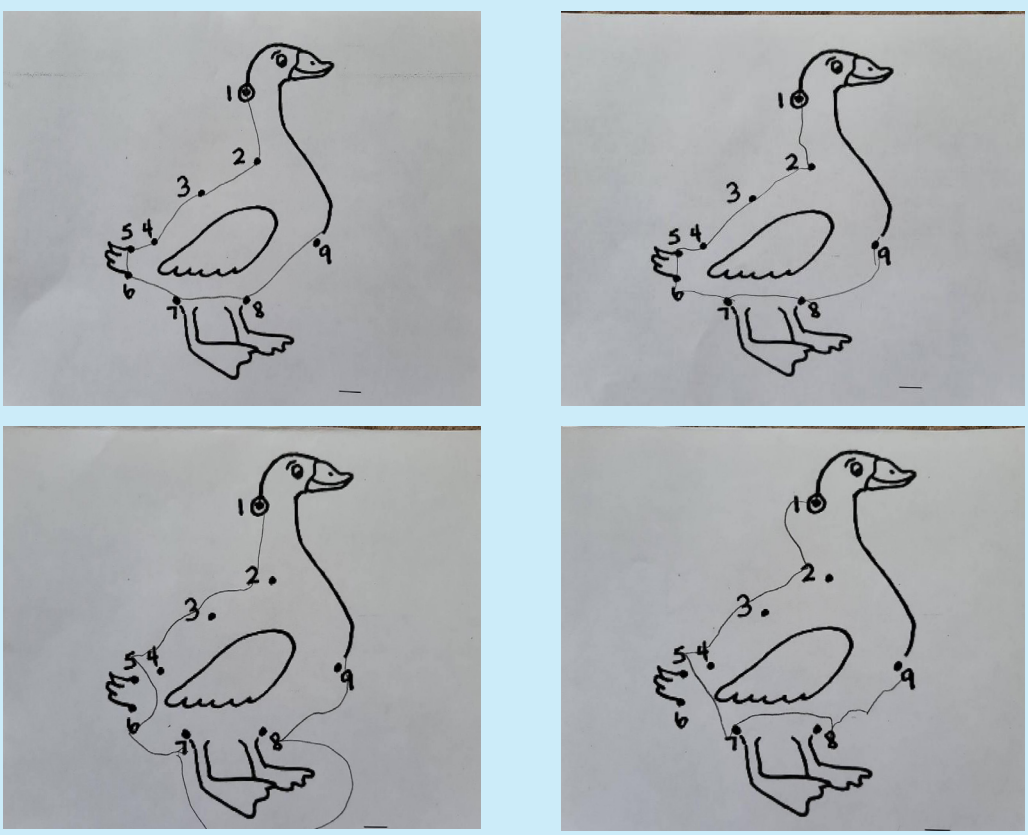


Figure 6. Successful works. The "Stezhki" method



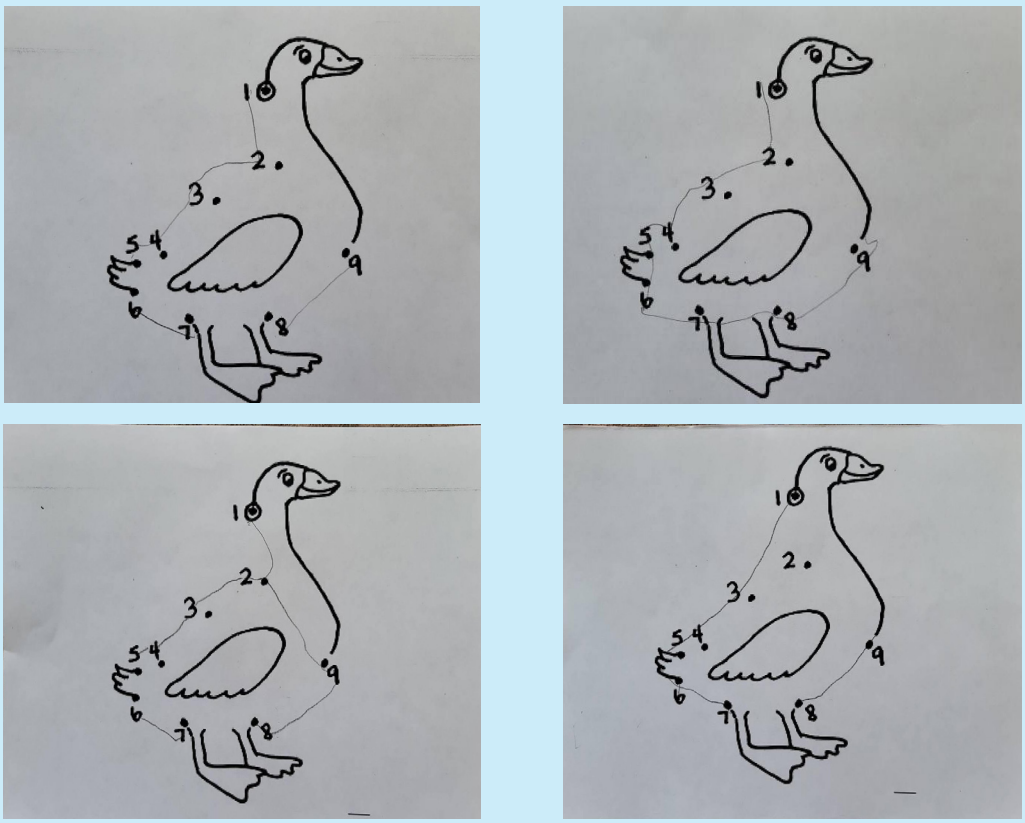


Figure 7. Works performed with errors

The results of the "Stezhki" method showed insufficient development of eye-hand coordination during writing.

Table 2. Results of diagnostics of children. Method «Stezhki»

Levels of development	Group 1	Group 2	Group 3	Group 4	Group 5	Total
High level	4	2	3	3	1	13 (12%)
Medium level	8	4	8	4	8	32 (29%)
Low level	10	20	15	10	10	65 (59%)

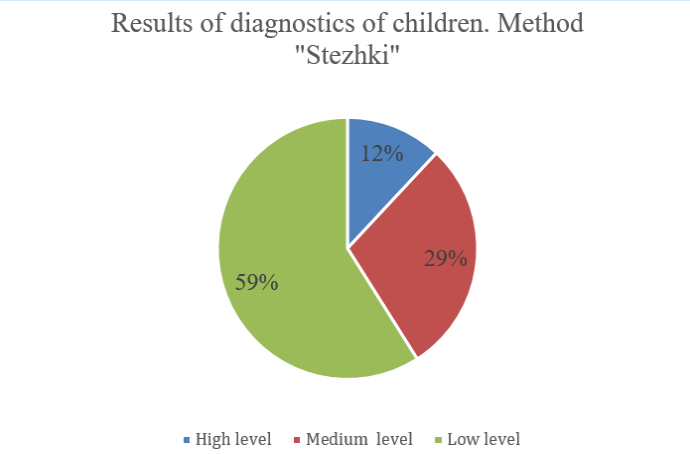


Figure 8. Diagram of diagnostics of children. The "Stezhki" method

The third method we selected, "Forest", is aimed at establishing the accuracy and continuity of writing, and controlling the coordination of movements while writing.

The students did a poor job with this task, the lines were broken and uneven, and the figure of the drawing was not always observed.

Table 3. Results of diagnostics of children. Method «Les»

Levels of development	Group 1	Group 2	Group 3	Group 4	Group 5	Total
High level	-	-	-	-	-	-
Medium level	5	3	1	4	2	15 (14%)
Low level	17	23	25	13	17	95 (86%)

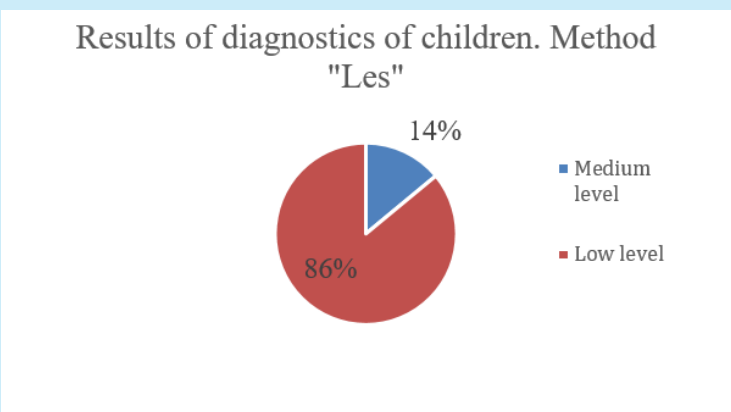


Figure 9. Diagram of diagnostics of children. The "Les" method

Based on the results of the diagnostics, we have developed a complete picture of the development of graphomotor skills in children in primary school, presented in Table 4 and in the diagram.

Table 4. Levels of development of graphomotor skills of children in primary grades

Levels of development	Group 1	Group 2	Group 3	Group 4	Group 5	Total
High level	1	1	-	1	1	4 (4%)
Medium level	7	6	8	4	7	32 (29%)
Low level	14	19	18	12	11	74 (67%)

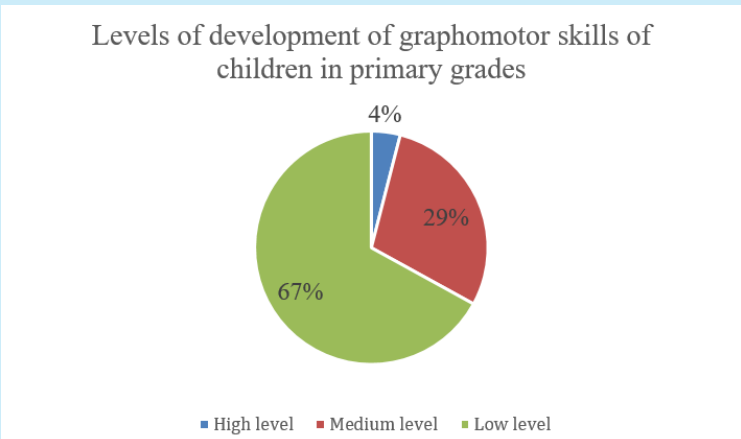


Figure 10. Diagram of the levels of development of graphomotor skills of primary school children

Discussion

At the first stage of the experimental work, we determined the child's leading hand. A.A. Vorobyova and L.N. Makarova also talk about the importance of determining the leading hand. In their article, they write that "in the process of writing, the leading hand plays an important role, and therefore, when developing graphomotor skills, this aspect must be taken into account" [18]. Special studies show that a significant proportion of left-handed children have insufficient development of motor functions and visual-motor coordination, as well as deficiencies in spatial perception and visual memory [19].

The conducted methods clearly demonstrated the insufficient level of development of graphomotor skills in primary school students. As the results showed, children draw lines uncertainly: the lines are pale in color and the writing is "shaky" and intermittent, this indicates that they do not have a good command of the writing instrument, the fine motor skills of the writing hand are not well developed. Primary school students in the experimental groups do not have sufficiently well-developed hand-eye coordination when writing, children do not see the full image, and go beyond the established boundaries. In the future, this can lead to significant problems not only in Russian language lessons, but also in other subjects. Underdeveloped fine motor skills lead to rapid fatigue when doing written assignments, illegible handwriting, insufficient writing speed at school - all

this can create a negative attitude towards learning in a child, as a result - low academic performance and low self-esteem.

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The development of fine motor skills, the development of hand-eye coordination during writing in primary school children should be carried out in a complex: first of all, it is necessary to teach the child to hold a pencil (brush, pen) correctly while drawing or writing; it is necessary to teach them to sit correctly, before starting to work with writing tools, it is necessary to conduct a finger warm-up. Various games (exercises) with small objects - puzzles, mosaics, construction sets - contribute to the development of fine motor skills. Particular attention should be paid to graphic tasks. Work on developing fine motor skills and coordination of movements must be carried out regularly, devoting 10-20 minutes a day, the tasks must be varied, colorful, preferably with a playful character, in order to maintain the interest of children. Primary schoolchildren need to learn to hatch, draw continuous lines of various thicknesses and shapes, and not go beyond the designated boundaries.

Conclusion

The results of the diagnostic tests conducted on children in primary school demonstrated an insufficient level of development of graphomotor skills. Hand-eye coordination is imperfect, which leads to incorrect perception of the image and going beyond the boundaries; children draw lines uncertainly, their handwriting is faded and is characterized by “shaky” and intermittent writing, which indicates underdeveloped fine motor skills of the hand. Fine motor skills are an integral part of every child’s life. With the help of fine motor skills, children perform everyday tasks: brush their teeth, use a spoon and fork, get dressed. Fine motor skills are also closely related to the development of memory, attention, thinking and speech.

If fine motor skills are not developed, this can lead not only to speech problems, but also to problems related to the strength and coordination of hand movements, and this will subsequently have a negative impact on the success of learning in primary school. Therefore, work on the development of fine motor skills, coordination of hand and eye movements must be carried out systematically. The types of graphic tasks recommended in the article can be systematically used within the framework of organized activities in educational organizations. The developed system of interesting, colorful graphic tasks will help to interest children and motivate them in the development of their graphomotor skills.

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Бастауыш сынып оқушыларының графомоторлық дағдыларын дамыту

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Аңдатпа. Зерттеудің өзектілігі мектеп оқушыларына үздіксіз технологиялық білім берудің заманауи жағдайында графомоторлық дағдыларды дамытуды анықтауға бағытталған. Бастауыш мектеп жасындағы балалардың проблемаларын анықтау мақсатында графомоторлық дағдылардың даму деңгейінің кешенді диагностикасы жүргізілді, ол графомоторлық дағдылардың дамуының жеткіліксіз деңгейін көрсетті. Эксперименттік топтағы бастауыш сынып оқушыларының жазу кезінде қол және көз қимылдарын үйлестіру дұрыс дамымаған, балалар толық бейнені көрмейді және белгіленген шектен шығады; Болашақта бұл тек орыс тілі сабақтарында ғана емес, басқа оқу пәндерінде де елеулі проблемаларға әкелуі мүмкін.

Түйінді сөздер: графомоторлық дағдылар, әдістеме, ұсақ моторика, бастауыш сыныптар, оқыту.

Развитие графомоторных навыков младших школьников

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Аннотация. Актуальность исследования направлена на выявление развития графомоторных навыков в современных условиях непрерывного технологического образования школьников. С целью выявления проблем, у детей младших классов, была проведена комплексная диагностика уровня развития графомоторных навыков, что продемонстрирвала недостаточный уровень разития графомоторных навыков. У школьников первых классов экспериментальных групп недостаточно хорошо развита координация движений руки и глаза во время письма, дети не видят полное изображение, выходят за установленные границы. В дальнейшем, это может привести к значительным проблемам не только на уроках русского языка, но и на других учебных предметах.

Ключивые слова: графомоторные навыки, методика, мелкая моторика, первоклассники, обучение.

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