

DIFFERENTIATED LEARNING FOR CHILDREN WITH RIGHT HEMISPHERIC BRAIN ORGANIZATION

APRENDIZAGEM DIFERENCIADA PARA CRIANÇAS COM ORGANIZAÇÃO DO CÉREBRO HEMISFÉRICO DIREITO

APRENDIZAJE DIFERENCIADO PARA NIÑOS CON ORGANIZACIÓN DEL CEREBRO HEMISFÉRICO DERECHO

Maryam KORENEVA¹
Konstantin YADROV²
Victor VITTENBEK³
Galina IVANOVA⁴
Natalia KOLESNIK⁵

ABSTRACT: The purpose of the study is to develop and approbate the Model “Teaching first-graders with right-hemispheric perception using the ‘School of Russia’ educational and methodological complex” and test its efficiency; to create an educational Project “Teaching first-graders with right hemispheric perception the techniques for mastering and memorizing educational materials in the conditions of blended learning”; develop practical recommendations for scientific and pedagogical workers on the peculiarities of working with left-handed students. The empirical study confirms the hypothesis that the use of the specialized Model “Teaching first-graders with right-hemispheric perception using the ‘School of Russia’ educational and methodological complex” by the teacher and the mastery of a particular method of memorizing educational materials by the students contributes the development of spatial representations in children, their phonetic and phonemic hearing, and the skills of coherent written expression.

KEYWORDS: Left-handed children. Manual asymmetry of the brain hemispheres. Elementary school age. Voluntary regulation of activity. Mental development.

¹ Moscow Region State University, Moscow – Russia. Associate Professor of Department of Primary Education. ORCID: <https://orcid.org/0000-0002-2942-5243>. E-mail: 03121961@mail.ru

² Moscow Region State University, Moscow – Russia. Associate Professor of the Department of Preschool Education. ORCID: <https://orcid.org/0000-0002-4297-2268>. E-mail: yadrov@inbox.ru

³ Moscow Region State University, Moscow – Russia. Associate Professor, Head of the Department of Primary Education. ORCID: <https://orcid.org/0000-0003-1467-8886>. E-mail: v.vittenbek@mail.ru

⁴ Moscow Region State University, Moscow – Russia. Professor of the Department of Primary Education. ORCID: <https://orcid.org/0000-0001-6429-1335>. E-mail: ivgp@mail.ru

⁵ Moscow Region State University, Moscow – Russia. Associate Professor of the Department of Psychology of Personal Development. ORCID: <https://orcid.org/0000-0001-8175-9622>. E-mail: nat.kolesnik@list.ru

RESUMO: O objetivo do estudo é desenvolver e aprovar o Modelo “Ensinar alunos da primeira série com percepção do hemisfério direito usando o complexo educacional e metodológico ‘Escola da Rússia’” e testar sua eficiência; criar um projeto educacional “Ensinar aos alunos da primeira série com percepção hemisférica correta as técnicas para dominar e memorizar materiais educacionais nas condições de ensino híbrido”; desenvolver recomendações práticas para trabalhadores científicos e pedagógicos sobre as peculiaridades do trabalho com alunos canhotos. O estudo empírico confirma a hipótese de que o uso do modelo especializado “Ensinar alunos da primeira série com percepção do hemisfério direito usando o complexo educacional e metodológico ‘Escola da Rússia’” pelo professor e o domínio de um método particular de memorização de materiais educacionais pelo aluno contribui para o desenvolvimento das representações espaciais nas crianças, sua audição fonética e fonêmica e as habilidades de expressão escrita coerente.

PALAVRAS-CHAVE: Crianças canhotas. Assimetria manual dos hemisférios cerebrais. Idade do ensino fundamental. Regulação voluntária da atividade. Desenvolvimento mental.

RESUMEN: El propósito del estudio es desarrollar y aprobar el Modelo “Enseñanza de estudiantes de primer grado con percepción del hemisferio derecho utilizando el complejo educativo y metodológico de la ‘Escuela de Rusia’” y probar su eficiencia; crear un Proyecto educativo “Enseñar a los estudiantes de primer grado con percepción hemisférica derecha las técnicas para dominar y memorizar materiales educativos en las condiciones del aprendizaje combinado”; desarrollar recomendaciones prácticas para trabajadores científicos y pedagógicos sobre las peculiaridades de trabajar con estudiantes zurdos. El estudio empírico confirma la hipótesis de que el uso del modelo especializado “Enseñanza de estudiantes de primer grado con percepción del hemisferio derecho utilizando el complejo educativo y metodológico ‘Escuela de Rusia’” por parte del maestro y el dominio de un método particular de memorizar materiales educativos por los estudiantes contribuyen al desarrollo de las representaciones espaciales en los niños, su audición fonética y fonológica, y las habilidades de expresión escrita coherente.

PALABRAS CLAVE: Niños zurdos. Asimetría manual de los hemisferios cerebrales. Edad de la escuela primaria. Regulación voluntaria de la actividad. Desarrollo mental.

Introduction

The new reality of today’s education system in Russia is teaching children with developmental features as an individual variant of the norm. A special group of children in this category is those with the right hemispheric lateral organization.

The distinction between left- and right-handed people is arbitrary. However, manual asymmetry is still one of the most understudied problems in pedagogy and psychology. Manual asymmetry refers to a difference in the distribution of functions between the brain hemispheres which affects human mental activity. “It should be remembered that the brain with any

hemispheric specialization always works as a unit, and the development of interhemispheric interaction lays the foundation for the development of intelligence” (GLOZMAN, 2009).

Any of the human mental abilities, including the ability to learn, is associated with the activity of certain parts of the brain. Neurobiological maturation of human brain structures always “precedes” its functional maturation. Therefore, the development of these or those aspects of the human psyche directly depends on the maturity of the associated brain substrate (GLOZMAN, 2009).

Research by Ulings, Bogolepova and Malofeeva (1998) establishes that right-handed people have stronger connections between brain hemispheres, whereas left-handed people have stronger connections within each hemisphere, meaning that their left hemisphere functions more independently.

Studies by Semenovich (2004) prove that particular psychological factors in left-handed people are associated with completely different brain areas: the opto-agnostic area is associated with the left temporal area and the phonemic area – with the parietal structures of the brain. This points to the fact that the development of the brain during ontogenesis occurs differently in left-handed people, and, accordingly, their mental functions and interfunctional connections are ranked differently (not like in right-handed people).

Having a different brain organization, left-handed people start facing difficulties as early as in elementary schools, given that all currently available educational and methodological complexes, teaching methods, and the educational material used are “oriented” on the mechanisms of operation of the left-brain hemisphere (with less involvement of the right one!).

The most appropriate age for research is elementary school age since this period is characterized by the greatest sensitivity to educational and upbringing interventions. Furthermore, as they start studying at school, younger students experience a radical change in the conditions and rhythm of their lives and the usual list of duties and acquire a new predominant need – obtaining new knowledge.

One of the critical components of educational activities for left-handed people is the opportunity for them to master the required volume of knowledge in a “special” way with the activation of right-hemispheric perception.

All of the above serves as a starting point for the present study.

Methods

The purpose of the study is to develop and approbate the specialized Model “Teaching first-graders with right-hemispheric perception using the ‘School of Russia’ educational and methodological complex” and test its efficiency, as well as to organize the practical implementation of the educational Project “Teaching first-graders with right hemispheric perception the techniques for mastering and memorizing educational materials in the conditions of blended learning” by a team of specialists.

The study addresses the following *objectives*:

1. conducting analytical and pedagogical analysis of Russian and foreign scientific literature on the problem under study;
2. detecting “special” learning difficulties of left-handed first-grade school students in the core disciplines and carrying out a comprehensive specific correction of these difficulties;
3. developing the Model “Teaching first-graders with right-hemispheric perception using the ‘School of Russia’ educational and methodological complex”; implementing in practice the educational Project “Teaching first-graders with right hemispheric perception the techniques for mastering and memorizing educational materials in the conditions of blended learning”;
4. analyzing the results of approbation; developing practical Recommendations for scientific and pedagogical workers on the specific features of working with left-handed elementary school students.

Both in daily life and in learning, left-handed children are characterized by unconventional judgments and actions, flexibility, incorporation of ambivalence into any rules, and criticism of existing authorities and truths. These children have an aesthetic sense and tend to be creative (EMELIANOVA, 2010b; SOBOLEVA, 2007). However, while right-handed children learn and consolidate concepts and skills in the learning process at an involuntary level, left-handed children have to “invent” inconceivable external conscious means to learn and master the same concepts and skills, that is, a left-handed child is constantly inventing their own ways of learning the world and consolidating skills.

A peculiarity of children with the leading left hand is their atypical mental development. Back in 1985, Simernitskaia (1985) found that left-handed children have weaker interhemispheric connections of symmetrical centers of the right and left-brain hemispheres. Furthermore, the interaction between different zones in their right hemisphere is less

differentiated and selective. For this reason, left-handed people always have a complex of prominent peculiarities in the development of the bioelectrical activity of the brain.

Since the dynamic parameters are not fully incorporated in the activities of a left-handed individual, their kinetics develop discontinuously; the motor components of the functions form later, and all of this together leads to some dynamic difficulties in children (difficulty in movement, delayed development of speech and memory, significant difficulties in mastering writing and reading, i.e., all the types of work that require the cooperation of brain hemispheres!).

In addition, left-handed people initially lack a spatial-temporal coordinate system. This is reflected in the phenomenon of “mirrored” writing. According to Makarev (2003), the frequency of “mirroring” in left-handed children is about 85.0% and starts to decrease only by the age of 10-11.

In the cognitive sphere, left-handed children also have a very unstable level of voluntary regulation. For example, in the sphere of attention, the processes of volitional regulation of action are developed poorly, which manifests in frequent exhaustion and reduced attention span. In auditory verbal memory, there are only “traces” of short-term memory, yet the stability of voluntary regulation and control of mnemonic activity is preserved (left-handed people are able to perceive and hold in memory certain visual images!).

Left-handed people also experience significant difficulties in performing calculations due to their pronounced impulsiveness and underdevelopment of self-control. Thus, in left-handed people, all the existing processes are developed at a low level (due to a certain mental activity) and require effort and the use of external conscious means (while right-handed people successfully “function” in the external world forming and fixing their skills at the involuntary level).

The predominance of right lateral organization in a child also affects the development of phonemic hearing. Hearing in left-handed children is formed much later than in right-handed children. As a consequence, any defect in the oral speech of a left-handed child is directly reflected in the written speech. That is the reason why dyslexia and dysgraphia are common in left-handed individuals. The main cause of this is a disorder in the interaction of the secondary temporal lobe fields with the displacement of the postcentral function to the right hemisphere. All this causes late maturation of phonemic hearing and sound-letter word analysis (SHOKHOR-TROTSKAIA, 2003).

Thus, education in a mass school is quite a serious stress for left-handed children taking into account their capabilities. A prolonged state of stress, according to French child psychiatrist

Revol (2009, p. 113), increases dyslexia in children. Consequently, the school environment acts as a peculiar brake on the mental development of left-handed children, and the process of learning is complicated by the methods of testing and teaching (as none of the modern educational methods take into account the individual features of the verbal activity of left-handed people).

In the meantime, Moskvina and Moskvina (1998) find that right hemispheric dominance is associated with involuntary memory and attention, and left hemispheric dominance is associated with voluntary types of memory and attention. Accordingly, in lessons, left-handed students should be required, first and foremost, to use their voluntary types of memory and attention, and their school performance itself should be evaluated in terms of their ability to memorize and reproduce what they have heard or read.

Currently, more and more teachers are using test forms of control, which imply, first and foremost, perception of the conditions of the task through the instruction and conscious performance of the task, that is, active work of the left hemisphere. This suggests that general intelligence assessed by tests is left hemispheric intelligence (DRUZHININ, 1999), which is completely unsuitable for children with the right hemispheric lateral organization (since these children better perceive information through visual or kinesthetic channels in practical activity, while theoretical material is difficult for them to grasp).

Thus, specialized pedagogical work with left-handed students should be conducted on several fronts:

- development of spatial representations,
- formation of phonetic and phonemic hearing,
- development of the skills of coherent written expression.

The second objective of the study is solved through the selection of students and detection of their special educational needs.

In view of the results of theoretical analysis, the study focuses on assessing the detected difficulties of left-handed children at the very beginning of their education.

The sample for the study is formed using the methods of pedagogical observation (the method of studying the products of learning activities) and F. Kretschmer's recommendations on determining the dominant hand in children as they complete various actions (the method of lateral preference detection): all pupils in the class were offered the tasks to water flowers, push a balloon with a stick, pull a book from a shelf, open a zipper, and draw a pattern and a circle. Out of 35 children, five children (three boys (60.0%) and two girls (40.0%) consistently used their left hand and made the movements easily and accurately. Thus, left-handedness was

confirmed in these children. In the process of working with left-handed children, the Diagnostic toolkit described below was used to assess their mental development.

The level of development of spatial perception.

Task 1. The “Drawing a pattern” method testing the development of spatial perception.

Objective: To determine the state of spatial orientation in a left-handed child.

The student is given a blank sheet of ruled paper and a series of instructions to follow.

Instructions: “Please draw a square in the middle of this sheet, then draw circles of equal size above the square and below the square at equal distances from it. Draw a triangle to the left of the square and a rectangle to the right. Under the rectangle, draw an oval.

Evaluation of results:

- the student follows instructions correctly, the location of objects is correct, there are no difficulties (2 points) (high level);
- the student follows instructions with the help of an adult, is confused about the location of objects (1 point) (average level);
- instructions are practically not executed (0 points) (low level).

The level of development of fine motor skills:

- the ability to coordinate movements
- ability to regulate and control motor acts

Task 2. The “Labyrinth” method assessing the development of fine motor skills.

Objective: To determine the state of graphic skill, fine motor skills, and hand-eye coordination in an elementary school student with lateralization.

The student is given a sheet of paper with a labyrinth drawn on it. Instruction: “Lead the way through the labyrinth from point to point without touching the lines and without taking your hand off.”

Assessment of results:

- the line is smooth, without breaks, a small number of touches on the boundary lines (2 points) (high level);
- the line is uneven, with breaks, a large number of touches on the borders, tremor (shaking) (1 point) (average level);
- very slow movement, the line is uneven and torn, strong tremor (0 points) (low level).

The level of memory development of an elementary school student with lateralization.

Task 3. The “Memorizing 10 words” method (A. R. Luria) testing the development of memory.

The method is used to assess a child’s memory (in this case, administered on children

with lateralization).

The instruction consists of several steps.

Instruction 1: “Now I am going to read you 10 words. Listen carefully. When I finish reading, immediately repeat as many words as you remember. You can repeat them in any order – the order does not matter.”

The experimenter reads the words slowly and clearly. Then, the experimenter continues the instruction (second stage).

Instruction 2: “Now I am going to read the same words again, and you have to repeat them again, both the ones you already named and the ones you missed the first time, all together, in any order.”

Then the test is repeated 2-4 times without additional instructions. The experimenter simply says, “One more time”.

If the subject says any extra words, the experimenter makes sure to note this.

If the child tries to insert any lines during the test, the experimenter stops them. No talking is allowed during the test.

After repeating the words 4 times, the experimenter moves on to other tests, and at the end of the experiment, i.e. about 50-60 minutes later, asks to reproduce the words again (without a reminder).

The words used: les [forest], khleb [bread], okno [window], stul [chair], voda [water], brat [brother], kon [horse], grib [mushroom], igla [needle], med [honey].

Assessment of word sound analysis.

Task 4. Method for assessing the sound analysis of words (N.M. Trubnikova).

The sound analysis of words is assessed in left-handed children using N.M. Trubnikova’s speech chart. From this methodical aid, the following tasks are taken: a) to determine the number of sounds in a word; b) to determine the number of syllables in a word; c) to find the place of a sound in a word; d) to identify successively each sound in a word; e) to form a word from syllables; f) to form a word from sounds. Quantitative assessment parameters are determined for each direction of the study, and qualitative indicators of task performance are specified. Quantitative assessment is carried out on a three-point scale, taking into account task performance.

Interpretation of data:

3 points (high level) – correct performance;

2 points (average level) – 1-2 errors;

1 point (low level) – 3 and more errors.

Attention development level

Task 5. The “Put the signs” method assessing the attention development level.

The test task in this method is designed to assess a child’s switching and distribution of attention. Before starting the task, the child is shown a drawing and told how to work with it. The work consists in putting a tick, line, plus, or dot in each of the squares, triangles, circles, and rhombi shown at the top of the sample, i.e., a check mark, a line, a plus, or a dot, respectively.

The child works on the task for two minutes without breaks. The overall attention switching and distribution index is calculated using formula

$$S = (0.5N - 2.8n) / 120$$

where S – attention switching and distribution index;

N – the number of geometric shapes looked through and marked with the corresponding signs within two minutes;

n – the number of mistakes made in the task.

Conclusions about the level of development are made as follows:

10 points – very high;

8-9 points – high;

6-7 points – average;

4-5 points – low;

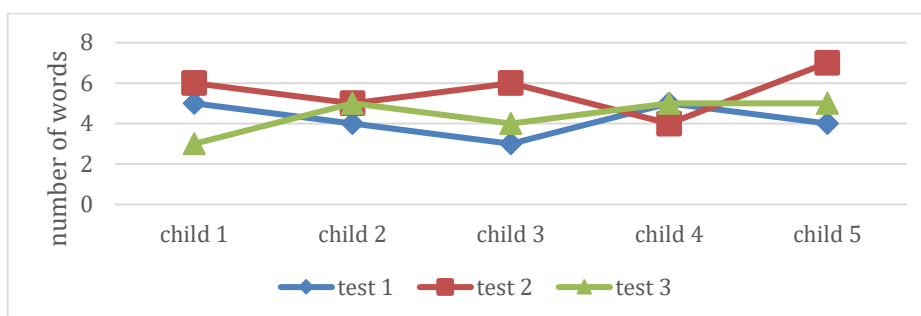
0-3 points – very low.

Results

Results of the study of the educational needs of left-handed children:

As a result of the administered method (“*Memorizing 10 words*”), we obtained the following data (Figure 1).

Figure 1 – The number of words reproduced by left-handed students in the conducted tests (ascertaining stage).



Source: Prepared by the authors

The first three assessments test the level of memorization in children with right hemispheric lateralization. The constructed memory curves reflect the peculiarities of their memory: the greatest number of words are named at the 2nd attempt, while at the 1st and 3rd attempts, the number of words named decreases. These findings point to a lack of attention stability in left-handed students.

To assess the level of attention in left-handed children, we employed the method “Put the signs” (generalized results are given in Table 1).

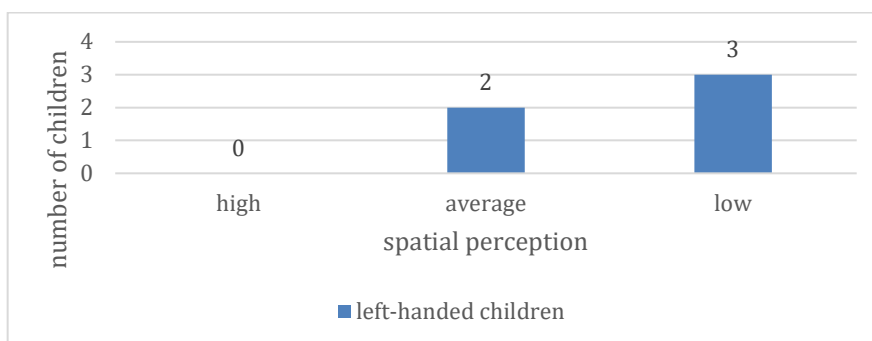
Table 1 – Generalized results of the study of attention switching and distribution in left-handed elementary school students (ascertaining stage), people

Subjects	Attention switching and distribution level				
	Very low	Low	Average	High	Very high
Elementary school students with lateralization	1	1	3	0	0

Source: Prepared by the authors

As can be seen from the table, some left-handed younger schoolchildren demonstrate a low level of attention switching and distribution (two people – 40.0%), the remaining three students (60.0%) show the average level of attention, meaning that the S index falls in the range from 0.50 to 0.75.

Figure 2 – Presents the results of the study of spatial perception in left-handed students

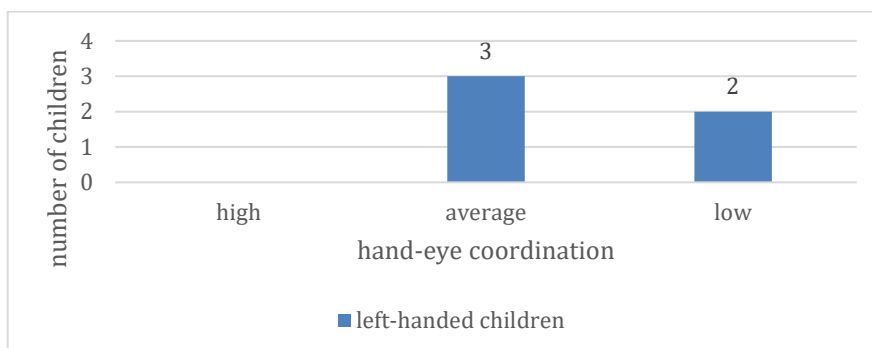


Source: Prepared by the authors

As demonstrated in the figure, most children (three people, 60.0%) have a low level of spatial perception. These children have difficulties drawing geometric shapes on a sheet of paper (confuse right and left, different geometric shapes).

Figure 3 reflects summarized results of the assessment of fine motor skills and hand-eye coordination in younger schoolchildren with the right hemispheric lateral organization.

Figure 3 – Results of the study of hand-eye coordination of the left-handed elementary school students (ascertaining stage).



Source: Prepared by the authors

Analyzing the results of the “Labyrinth” task assessing graphic skills, fine motor skills, and hand-eye coordination, we can see that left-handed students are at the average and low level of development according to the employed method (uneven lines with breaks, a large number of contacts, some children have tremors, movements are very slow).

The results of the study of word sound analysis in left-handed junior school students are presented in Table 2.

Table 2 – Results of the examination of sound analysis skills in left-handed elementary school students (ascertaining stage)

Subject	Calculating the amount of		Finishing the words bara..., negu..., samo...	Sequentially singling out each sound in a word	Forming a word from	
	Sounds	Syllables			Syllables	3-5 sounds
Child 1	Calculated	Did not understand the instruction	Finished the words	Singled out sounds	Did not understand the instruction	Formed words from 3-4 sounds
Child 2	Calculated	Did not understand the instruction	Finished the words	Singled out sounds	Formed words	Could not form a word
Child 3	Did not calculate	Did not understand the instruction	Finished the words	Singled out sounds	Formed words	Formed words from 3-4 sounds
Child 4	Did not calculate	Did not calculate	Finished the words	Singled out sounds	Formed words	Could not form a word
Child 5	Calculated	Calculated with additional instruction	Finished the words	Singled out sounds	Formed nonexistent words	Formed words from 3-4 sounds

Source: Prepared by the authors

The most difficult task for left-handed children is to determine the number of syllables in a word. Four students (80.0%) could not cope with this task, because in most cases they did not understand the instructions and started counting sounds. Only one child (20.0%) successfully counted the number of syllables in a word, but only with additional instructions and an example.

Thus, the conducted experimental study of left-handed elementary schoolchildren at the ascertaining stage reveals a low intensity of cognitive processes and their underdevelopment. Therefore, our work with left-handed pupils as part of the study had to address the following tasks:

- to develop attention concentration and attention span in the special children as part of educational work; if possible, to reduce their increased distractibility; to level out difficulties in shifting attention.

- to “balance” the memorization processes in left-handed children (since their long-term

memory capacity is found to be low, and their memory processes limited). For this purpose, special students were repeated the material several times with the use of visual aids.

- to improve the level of hand-eye coordination and spatial perception in left-handed children, since all the assessed parameters at the ascertaining stage are low or average.
- to alleviate difficulties in sound-letter and sound-syllable analysis.

Thus, the ascertaining stage of the study demonstrates that students with the leading left hand have qualitative peculiarities and a different level of formation of cognitive processes.

Further in the process of research, we created the necessary conditions for the learning of these children and set specific *objectives*:

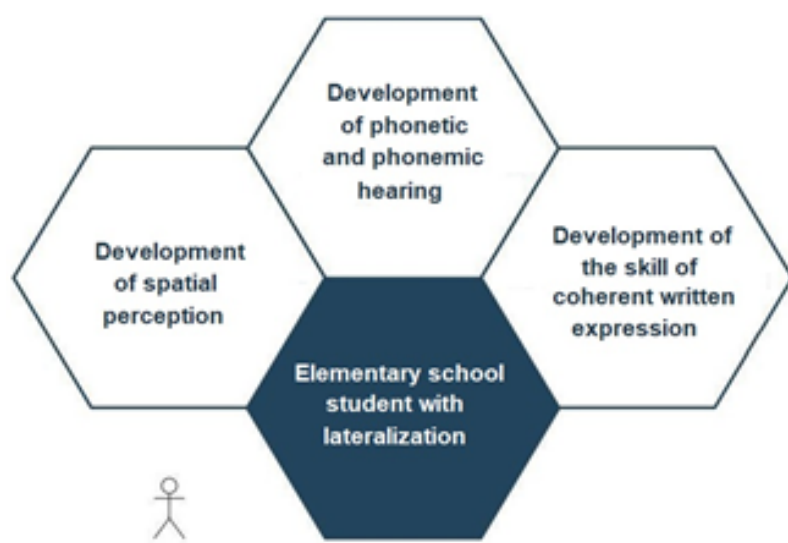
- to improve the level of development of graphic-motor skills in left-handed students;
- to form their voluntary self-regulation;
- to form visual and spatial perception in left-handed students;
- to develop fine motor skills and coordination of hand and finger movements;
- to develop visual-motor integration;
- to expand their linguistic notions.

To ensure the efficiency of the specialized correction of difficulties faced by left-handed students in the core school disciplines, we needed to create specific *pedagogical conditions*:

a) A team of scientific and pedagogical staff and parents of children participated in the correction of the specific difficulties experienced by students with right hemispheric lateralization in mastering school subjects. In this, the effectiveness of the students' learning process was contingent on both the comprehensive development of their own personality and on the activity and role of the family in the life of the child. Each person involved in the work with children performed certain functions.

In the course of the study, we developed a specialized Model "Teaching first-graders with right-hemispheric perception using the 'School of Russia' educational and methodological complex" (Figure 4). The work was conducted simultaneously in several areas: the development of spatial representations, the formation of phonetic-phonemic hearing, and the development of the skill of coherent written expression.

Figure 4 – Model “Teaching first-graders with right-hemispheric perception using the ‘School of Russia’ educational and methodological complex”.

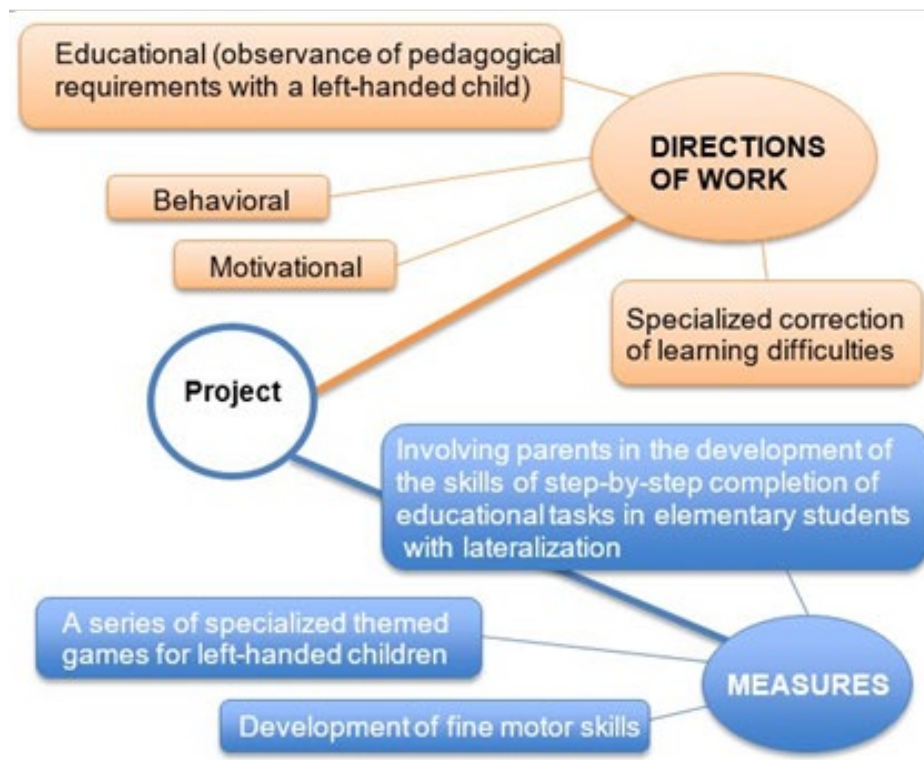


Source: Prepared by the authors

b) The alleviation of difficulties faced by left-handed students in educational activity relied on “engaging” the cognitive, emotional-volitional, and activity components with the use of the Model for the specific correction of difficulties. This, in turn, contributed to the formation of a certain “technique” in left-handed children for mastering and memorizing educational material. As a result, in their mastery of knowledge, skills, and abilities, students have reached an independent level of work with the learning material.

c) In the course of working with left-handed children and their parents as part of the study, we developed and employed the educational Project “Teaching first-graders with right hemispheric perception the techniques for mastering and memorizing educational materials in the conditions of blended learning” (Figure 5).

Figure 5 – Project “Teaching first-graders with right hemispheric perception the techniques for mastering and memorizing educational materials in the conditions of blended learning”.



Source: Prepared by the authors

In carrying out the educational process working with left-handed students, the teacher, too, had to have a certain level of necessary knowledge, be prepared and creatively active. As part of working on the educational Project “Teaching first-graders with right hemispheric perception the techniques for mastering and memorizing educational materials in the conditions of blended learning”, we used the integrated Model of the educational process developed by professor, Mikliaeva (2015). This model allowed us to account for all the organizational aspects of an educational institution with consideration of the characteristics of teaching core disciplines in 1st grade. The model also helped to organize the independent activities of left-handed students with their peers and adults. The whole organization of cognitive training in left-handed children was built on the basis of practical knowledge of the world, which was provided by the educational Project. It was the Project activity in action that allowed us to form the ability of special children to cooperate in the step-by-step study of educational material; to develop their cognitive needs; to teach them the skills of learning activity; to teach children to think critically and make independent decisions when performing educational tasks.

In educational practice, when working with left-handed students, we used a combination of several types of Projects (playful, creative), applying different forms of organization of work with students (experimentation with educational material, modeling).

In forming and developing left-handed students' skills in mastering the educational material, we used didactic games and all aspects of children's motor-play activity. All of this together helped special children to master the educational material. Students learned how to comprehend the information they received and formed their own attitudes toward the learning process.

d) In working with left-handed students, the teacher presented educational material in stages, i.e., the volume of the material was split into a certain system of actions in the form of sequential operations, which ensured that children with right-hemispheric lateralization perceived all the material in stages (in this, the teacher defined the stages of completing the task in strict order).

e) When teaching left-handed children, bright and colorful methodological material was necessarily used to engage children's visual perception and spatial thinking;

f) In order to alleviate the rapid fatigue of students, teachers practiced alternating the involvement of these children in a variety of activities (for example, using visual aids, sound recordings, organization of elements of laboratory studies when presenting new material in the lessons).

g) To reduce the distractibility of left-handed children, they were not seated next to restless, active, easily excitable peers.

h) The teacher also monitored the child's sitting position when writing: special children had to sit upright, not touching the table with their chests; their feet stood on the floor on the support, their head being slightly tilted to the right. In class, left-handed children always sat to the left of their neighbor at the desk, so that the right hand of the neighbor did not interfere with their writing; the desk lamp (when doing lessons at home) had to be placed to the right of the child;

i) In addition, the teacher always monitored the correct position of the child's hands: the hands should lie on the table so that the elbow of the left hand slightly protrudes over the edge of the table, the hand being free to move along the line from top to bottom, and the right hand should lie on the table and hold the sheet.

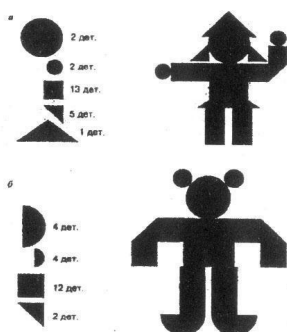
j) Quite an important task was also teaching left-handed pupils to grip the pen correctly: the pen was placed on the middle finger, on the upper part of the fingernail. The nail phalanx of the thumb held the pen, and on the top of the index finger the pen was placed at a distance of 1.5-2 cm from the writing ball, and the teacher controlled the movement of the fingers. In the process of writing, there was a movement from left to right (the direction of the pen was to the left, and the movement of the fingers was to the right).

k) The teacher also taught the left-handed student proper orientation in the notebook by positioning it in a specific way (the notebook was tilted to the right so that the bottom right corner of the page on which the child was writing was pointing toward the middle of their chest, since left-handed children find it difficult to navigate in a notebook, in a line; in such cases, the teacher marked the left side of the sheet with a colored pencil).

When the pedagogical conditions of work with left-handed children were observed, we carried out specific corrective work aimed at right-hemispheric perception.

In the course of correction, we employed gamified techniques – *tasks for practicing visual-spatial perception*:

Figure 6 – “Make a figure out of the parts”



Source: Prepared by the authors

2. “Put in the missing letters”.

Note. From familiar short words one may gradually move on to unfamiliar, more difficult words.

KARASI

_ aras _

k _ _ _ i

_ _ r _ _ _

LAMPA

_ a _ pa

l _ p _

_ _ m _ _

3. “Write the words in a column”: *lampa, solntse, krokodil, etc.*

4. “Choose and underline those combinations of letters and words that correspond to what is written before the line.”

SE
SHA
ON
KOT
MAK
SLON
CHASY
DVER
KOMOK
PALETS
SE ES SO SE ES SO SE ES SO SE ES SO
SHA ASH AM ASHCH SHA SHCHA AP TSA ASHCH ASH
NO OP OT PO ON NO ON PO OP NO PO ON
TOK OTK KOT KIT TAK NOT NOK KTO KOT
KMA MOK KAM MAK LAK NAK KAM ZHAK MAK
NOSL LOSN SMON SOLN LOSM SLON SLOM
UASY CHASI CHESY CHOSY CHASY CHAS CHYSA
DREV DRER DRIVER DVER DOVER DVER
KOKOM MOKOK KOOMK KOMOK KOLOK
TALETS PAMETS NALETS PALETS MANETS PACHEL

5. “This text is written backwards. Try to read each line from right to left.” (The task is intended to help focus attention on correct writing and reading and promote training in visual perception.)

.aknohzevdem ilsenirp ukintohkO
,iaslitums en konohzevdem ,ytanmok v vapoP
.ondobovs aibes lavovtstvuchop a
.akabos aichintohkh alshov ontemazen utanmok V
,airevz eivtstusirp aliauhcop uzars anO
.metsog miknelam dan ukiots alaleds i
an lertoms i logu v aislibaz konohzevdeM
imylz ukabos uiuhsvidohtdop onneldem
.imaknezalg

In order to maintain a favorable psychological climate when working with special students, the teacher was:

- taking into consideration the emotional features of each child (increased emotionality).

This required the teacher to be more responsive and attentive to a special child when assessing their performance;

- maintaining constant feedback with the student (because left-handed children cannot learn something without understanding it). All left-handed students learned the material strictly in a strict sequence, as skipping or misunderstanding something caused them to lose the thread of reasoning.

The school psychologist was also engaged in lessons aimed at psychomotor correction of left-handed children, their mastery of spatial representations, and the development of fine motor skills. A sample lesson plan is presented in Table 3.

Table 3 – Thematic plan of lessons

Nº	Direction of work	Theme
1	Development of fine motor skills.	Development of fine motor skills of hands. Finger exercises with verbal accompaniment. Development of the skills of using writing utensils. Outlining along the inner and outer lines of a stencil. Development of hand-eye coordination (mosaics, small objects). Coloring. Hatching with and without a stencil.
2.	Development of visual perception and visual memory.	Formation of the prototypes of planar geometric shapes. Grouping of objects and their images by shape. Development of visual-agnostic functions. Recognition of objects in noisy images. Finding common and distinctive features of two objects. Didactic instrument – “Find the same one”. Modeling geometric shapes from parts according to a template.
3.	Development of spatial perception and spatial orientation.	Orientation in one’s own body. Finding the right (left) leg (arm). Determining the location of objects in space (right-left, top-bottom). Orientation in the room according to the teacher’s instructions. Orientation in a line (order of succession). Spatial orientation on a sheet of paper (center, top, bottom, right, left side).
4.	Development of visual tracking. Development of graphic skills.	Development of visual tracking in the top-down direction. Development of visual tracking in the direction from left to right. Development of visual tracking in the direction from the left. Development of visual tracking in the circular direction. Choosing the correct tracking direction (horizontal arrangement) Choosing the correct tracking direction (vertical arrangement) Choosing the correct tracking direction (circular arrangement)

5.	Development of letter-sound analysis	Working with a word and a letter Performing arithmetic operations with syllables Reading deformed text Locating a letter in a word Learning to name a sound in a word according to its location (first, second, after a certain sound, before a certain sound).
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Source: Prepared by the authors

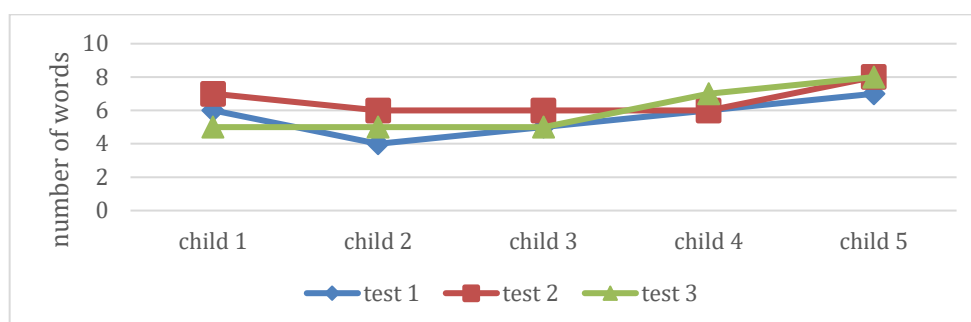
All the tasks of providing support for children with right-hemispheric perception were efficiently addressed with the mandatory participation of their parents. The employed forms of organizing pedagogical and psychological support for families bringing up left-handed children were *consultative assistance to parents* and *educational work*, which was carried out in various forms (familiarizing the parents with the peculiarities of development of left-handed children and their education and upbringing).

In addition, a special Leaflet was developed for the parents of left-handed children.

Analysis of the results of approbation of the program of psychological and pedagogical support for left-handed elementary school students.

Below we provide an analysis of the results of the study (control stage) after the implementation of the Model “Teaching first-graders with right-hemispheric perception using the ‘School of Russia’ educational and methodological complex” and the educational Project “Teaching first-graders with right hemispheric perception the techniques for mastering and memorizing educational materials in the conditions of blended learning” (Figure 7 shows the results of the assessment of students’ memory).

Figure 7 – Number of words reproduced by left-handed students in the three tests (control stage).

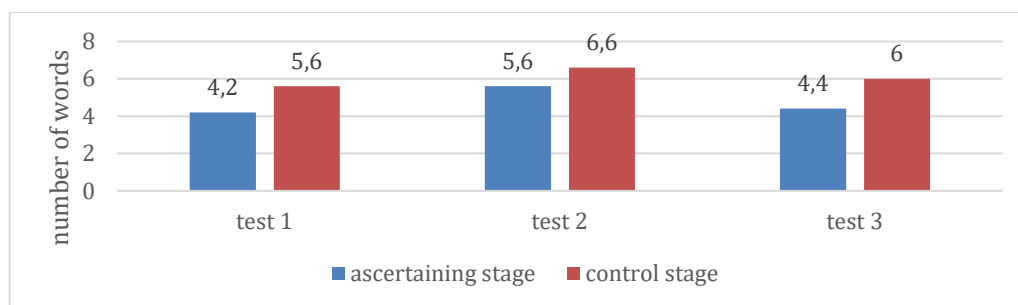


Source: Prepared by the authors

The figure demonstrates that students’ results improved at the control stage (a higher number of words reproduced by children in the three tests).

Figure 8 presents a comparison of the average amount of words reproduced by left-handed schoolchildren at the two stages of the experiment.

Figure 8 – Comparison of the results of memory tests (number of words reproduced) at two stages of the experiment (average values).

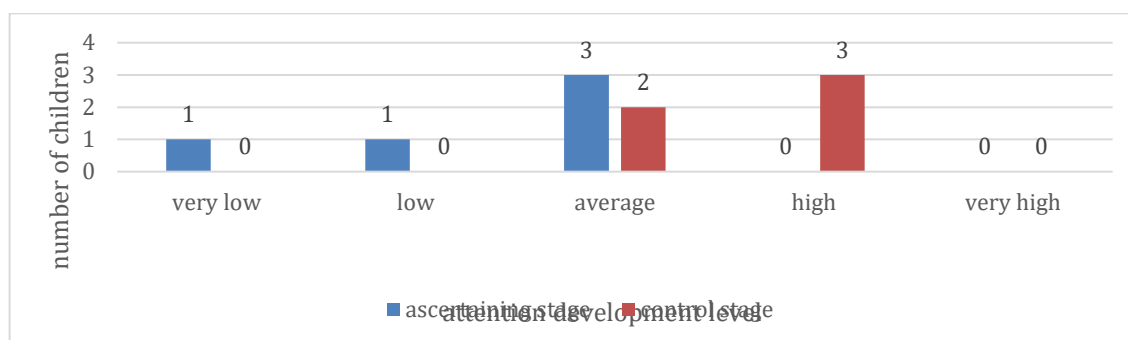


Source: Prepared by the authors

The obtained data show that the average amount of words reproduced by left-handed children is much lower at the ascertaining stage compared to the control stage. While at the ascertaining stage, the number of reproduced words averages at 4-5, at the control stage, it is 5-6 words.

Let us proceed to compare the results of attention tests at the two stages of the study (Figure 9).

Figure 9 – Comparison of the results of the study of attention switching and distribution in left-handed elementary school students at two stages of the study (people)

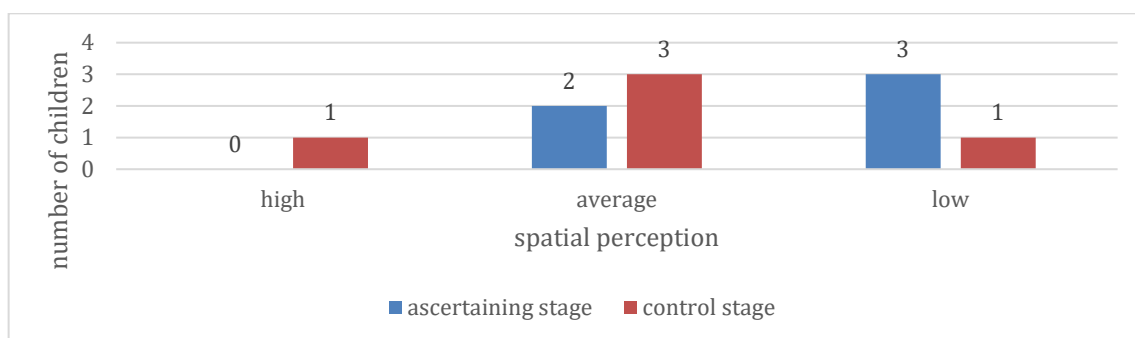


Source: Prepared by the authors

Data in Figure 9 demonstrate that while at the ascertaining stage, the left-handed children show the low and average levels of attention switching and distribution, at the control stage, the results are considerably better. The children display average and high levels of development of attention.

Figure 10 provides the results of the assessment of spatial perception in younger school students with lateralization.

Figure 10 – Results of the study of spatial perception in left-handed elementary school students at two stages of the study

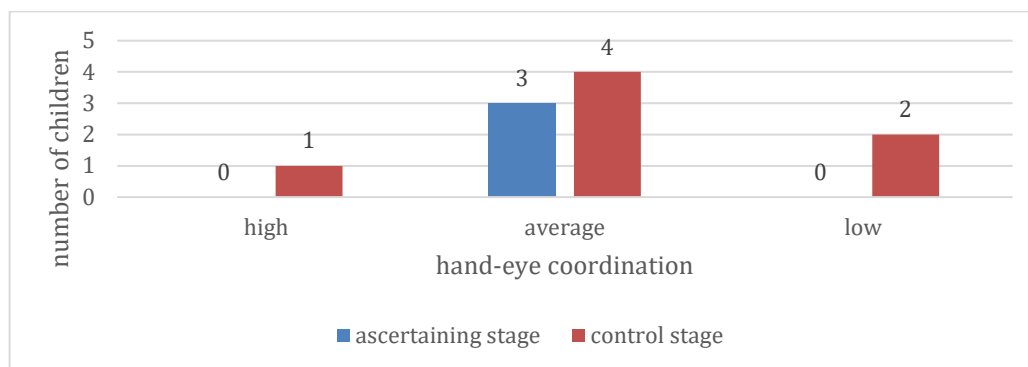


Source: Prepared by the authors

Comparing the assessments of spatial perception in left-handed schoolchildren at the two stages of the study, we note much better results at the control stage – the children show a higher level of development of spatial perception.

Figure 11 shows summarized results of the assessment of fine motor skills and hand-eye coordination in left-handed elementary school students.

Figure 11 – Results of the study of hand-eye coordination of left-handed schoolchildren at two stages of the study

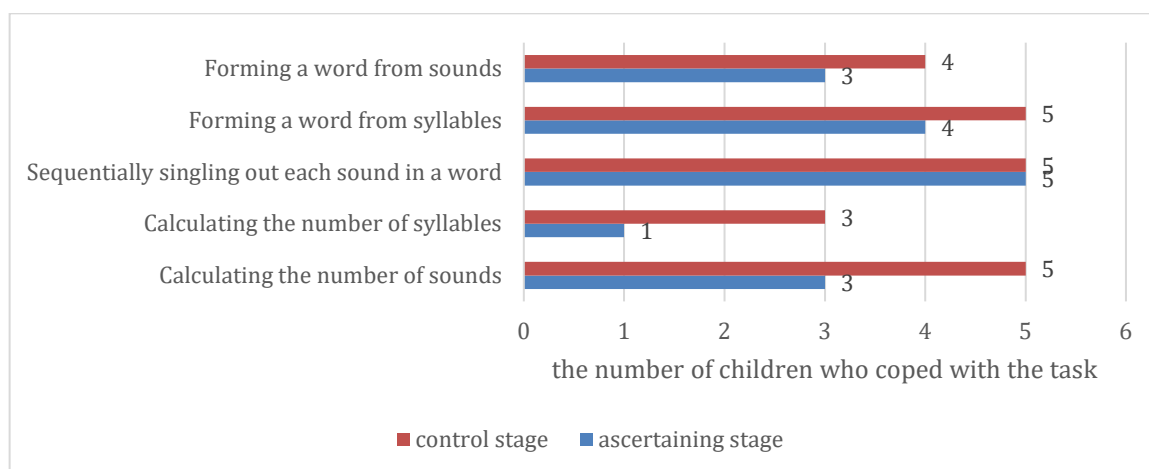


Source: Prepared by the authors

Data from Figure 11 show a positive dynamic in the development of hand-eye coordination in left-handed schoolchildren at the control stage of the study.

The results of comparing the level of sound analysis in left-handed elementary school students in the control experiment are presented in Figure 12.

Figure 12 – Results of the study of sound analysis of words by left-handed children at two stages of the study.



Source: Prepared by the authors

Based on the compared results of the assessment of sound analysis in students with right-hemispheric perception (in the course of the ascertaining and control experiments), it can be concluded that the children show qualitative changes in the development of sound analysis (being at the high level). As demonstrated, five of the proposed tasks are performed at 100% by the subjects at the control stage (although tasks 1 and 2 remain difficult for children).

Thus, the conducted study proves that specific targeted correctional work with left-handed students in the educational process contributes to the development of the basic components of mental functions, makes them “balanced”, and has a polymodal effect on the child’s development and learning.

Data processing is performed using qualitative and quantitative analysis to determine the effectiveness of targeted psychological and pedagogical work with younger left-handed students. As a result, the key components of the Model “Teaching first-graders with right-hemispheric perception using the ‘School of Russia’ educational and methodological complex” are identified and it is confirmed that successful training of left-handed children requires comprehensive work of a team of specialists with the obligatory use of the Project “Teaching first-graders with right hemispheric perception the techniques for mastering and memorizing educational materials in the conditions of blended learning”.

Conclusion

The learning and upbringing of elementary school students with right-hemispheric perception reveal their peculiar educational needs, which constitute a very special area of pedagogical and psychological work that requires specialized training and high professional mastery from every person involved in teaching these children. Only specially trained teachers and psychologists (with the obligatory participation of parents) have the competence necessary for the proper realization of the rights of left-handed people to full education in a mass school setting.

Analysis of the state of this research problem in scientific literature shows that the pedagogical corps of the mass education system is neither technologically nor personally (to date) prepared to work with left-handed people. Traditional secondary education still virtually ignores the problem of teaching children with right-hemispheric perception.

Regarding the difficulties of realizing the integrated form of learning for left-handed elementary school students, the main reasons for failure may include: unpreparedness of pedagogical staff to work with children with developmental peculiarities as an individual variant of the norm; imposing the usual pace of learning on children with right-hemispheric perception; lack of a special correctional and developmental environment; lack of use of modified forms of education for special children, taking into account their needs. It should be added that to provide for the educational process, a school teacher must have special competencies in such professional activities as: educational, correctional and developmental, diagnostic and analytical, consultative, constructive and organizational, social and adaptive, psychoprophylactic, and cultural and educational.

For this reason, the concept of constructing the system of secondary education (to work with special children) for school teachers and psychologists should be based on certain Recommendations:

- reliance on the professional principles of the work of teachers and psychologists;
- competency-based approach to forming the content of professional training and personal development of teachers and psychologists;
- hierarchical organization of the development of professional and personal readiness of teachers and psychologists in the mass education system to implement special Programs (as variants of the norm of learning), for example, Program “Differentiated learning of first-graders with right-hemispheric and left-hemispheric perception in elementary school”.

Thus, the challenges of the modern rapidly changing world “push” the pedagogical

science and practice to develop new directions of work, such as “*right-hemispheric*” pedagogy.

Designing a content framework for the learning and developmental features of children with right-hemispheric perception helps to realize the deep potential of each child.

The above-described design and content foundations of educational and correctional work with students with a leading left hand give new meaning to the educational and upbringing process in modern schools.

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