PRACTICAL SITUATION OF DEVELOPING MATHEMATICAL IMAGINATION OF STUDENTS WITH VISUAL IMPAIRMENTS

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Annotation: *The article discusses the issue of developing mathematical imagination of students with visual impairments. It analyzes the specific features of the special pedagogical process, difficulties in the formation of mathematical knowledge and methodological ways to overcome them. Practical developments and recommendations are also given.*

Keywords*: special education, visual impairment, mathematical imagination, sensory perception, practical tasks, pedagogical technology.*

Annotatsiya: *Maqolada ko‘rishida nuqsoni bo‘lgan o‘quvchilarning matematik tasavvurlarini rivojlantirish masalasi yoritiladi. Unda maxsus pedagogik jarayonning o‘ziga xos xususiyatlari, matematik bilimlarni shakllantirishdagi qiyinchiliklar va ularni bartaraf etishning metodik yo‘llari tahlil qilinadi. Shuningdek, amaliy ishlanmalar hamda tavsiyalar beriladi.*

Kalit so‘zlar*: maxsus ta’lim, ko‘rishida nuqson, matematik tasavvur, sensor idrok, amaliy topshiriqlar, pedagogik texnologiya.*

Аннотация: *В статье рассматривается проблема развития математического воображения у учащихся с нарушениями зрения. Анализируются особенности специального педагогического процесса, трудности формирования математических знаний и методические пути их преодоления. Приводятся практические разработки и рекомендации.*

Ключевые слова: *специальное образование, нарушения зрения, математическое воображение, чувственное восприятие, практические задания, педагогическая технология.*

Mathematical imagination is the ability of students to generalize, store in memory and apply in practical activities knowledge about the surrounding quantitative relationships, shapes, sizes and their interrelationships. For students with visual impairments, this process has its own characteristics, since they often cannot use visual perception or use it to a limited extent.

In such students, mathematical imagination is formed under the influence of the following factors:

1. Sensory foundations of perception

2. The complexity of the process of forming abstract concepts
3. The primary role of oral speech
4. The development of memory and imagination
5. The leading role of practical activity
6. The need for a differential and individual approach
7. The importance of typhlopedagogical tools

Due to limited vision, mathematical concepts rely on other sensory organs - hearing, touch, kinesthetic (perception through movement) and speech activity. For example, when distinguishing geometric shapes, perceiving relief models by touching them with your hands is effective, and when counting numbers, using special bead counting tools is effective.

Mathematical knowledge is often based on abstract concepts. For students with visual impairments, it is necessary to gradually move from practical activities to abstraction in the formation of these concepts. For example, when learning the concept of "square", it is important to first perceive a relief square by hand, then compare it with other shapes, and then consolidate its verbal definition.

Verbal explanations and definitions play an important role in the development of mathematical imagination. The student first listens to a mathematical phenomenon, and then re-expresses it through speech. Therefore, the teacher must explain concepts clearly, concisely, and in a way that is convenient for comparison. Perception through speech encourages students to think logically.

In students with visual impairments, the process of remembering mathematical knowledge and applying it in practice is more based on hearing and intuition. Therefore, their memory and imagination functions are trained more. For example, when solving verbal problems, exercises such as imagining an event by hearing and remembering the order of numbers are of great importance.

Mathematical imagination is based on more practical activities. Concepts such as number, quantity, length, or shape are mastered through practical exercises - measuring, counting, comparing, adding and dividing shapes. This process both develops the student's thinking and forms life skills.

Students with visual impairments have different abilities, interests, and levels of perception. Therefore, an individual approach to mathematics education is necessary. For example, one student may learn faster with the help of relief forms, while another may achieve effective results with the help of audio programs.

The use of mathematical symbols based on Braille, special abacuses, relief tables, and computer programs significantly facilitates the development of mathematical imagination. These tools help to perceive abstract concepts intuitively.

The process of developing mathematical imagination in students with visual impairments is significantly different from that of ordinary students. In this process, it is important to fully use the capabilities of the sensory organs, prioritize verbal

explanations and practical activities, and widely use special typhlopedagogical tools. A properly organized educational process develops not only mathematical knowledge, but also logical thinking, memory, and creativity.

Practical activities are of particular importance in developing the mathematical imagination of students with visual impairments. Because mathematical concepts are abstract in nature, perceiving them only through hearing is often not enough. Therefore, it is important to involve students in the lesson process as active participants, strengthen perception through the senses, and relate exercises to real-life situations.

Multisensory Activities

Practical experience shows that engaging multiple sensory channels at the same time increases efficiency. For example:

Arithmetic exercises: special beaded abacuses or embossed counting tables are used in the process of adding and subtracting numbers. The student moves the beads with his hands and perceives the counting process based on his senses.

Geometric shapes: embossed circle, triangle, square and rectangle models are used. The student touches the shapes with his hands, counts their sides, and compares their angles.

Logical tasks and verbal problems

For students with visual impairments, it is of great importance to give logical tasks in a voice. For example:

Simple tasks such as “There were 5 apples in a basket. The student took 2 of them. How many apples are left in the basket?” teach imagination and counting through speech.

Questions such as “Which of the squares or triangles has more angles?” reinforce concepts of shape and quantity.

Use of information and communication technologies

In modern practice, voice calculators, special computer programs (screen readers, voice mathematical symbols) are of great help. With their help, the student learns to calculate independently, writes mathematical symbols in Braille, and then checks them using a voice program.

Group and pair work methods

Involving students with visual impairments in work with healthy peers or in group work develops the socialization and communicative skills of students. For example, one group of students counts numbers out loud, while another group places numbers using embossed cards.

Didactic games

To make practical activities interesting, it is useful to use didactic games:

“Mathematical dominoes” - placing numbers in sequence using embossed cards;

“Who will find it faster?” - the teacher gives a verbal example, and the student quickly finds the answer using a voice calculator;

“Building shapes” - assembling complex shapes using relief geometric modules.

Form of organization of didactic games

Determination of the goal

It is determined which mathematical concept needs to be reinforced or taught through the game (for example, counting numbers, differentiating shapes, adding and subtracting, measuring, etc.).

Preparation of tools

Relief cards, bead counters, special-shaped models, voice calculators or cards in Braille are prepared.

Explanation of the rules

The rules of the game are explained orally to students in a simple, clear and concise manner. If necessary, practical instructions are given.

Organization of the game process

The game can be played individually, in pairs or in groups. Tasks are given in turn so that each student can actively participate.

Discussion of the results

At the end of the game, students report their results, errors are indicated, and correct answers are reinforced. Incentive methods (praise, small gifts, scoring points) are used.

Examples of didactic games

1. “Mathematical dominoes”

Goal: to arrange numbers in a sequence and distinguish adjacent numbers.

Tool: cards with embossed numbers.

Process: students take turns placing cards, each new number should be connected with the previous number (for example, 3 followed by 4).

2. “Find the shapes”

Goal: to recognize and distinguish geometric shapes.

Tools: relief models of a circle, square, triangle, rectangle.

Process: the student is given a shape by hand. He feels it and says its name. Then he distinguishes it from other shapes. For example, “How many angles does a triangle have?”

3. “Who can count faster?”

Goal: to develop addition and subtraction skills.

Tools: a bead counter or a voice calculator.

Process: the teacher gives an oral problem: “There are 5 apples, you ate 2. How many are left?” The student calculates and says the answer quickly.

4. “Mathematical journey”

Goal: to consolidate counting, comparison and sequencing.

Tool: embossed “road map” (numbers are placed at the stages).

Process: the student “travels” on the map, finding the numbers from 1 to 10 with his hands and in the correct order. At each stage, an oral task is given.

5. “Addition-subtraction race”

Goal: to consolidate simple arithmetic operations.

Tool: embossed number cards.

Process: two students solve the problem at the same time, for example: “7–3”. The one who finds the correct card first is the winner.

Differential and individual approach

In practice, it can be seen that each student acquires mathematical knowledge in his own way. Therefore:

for students with low basic knowledge, more practical exercises are given;

for gifted students, more logical problems and oral calculation tasks are given.

Integration with life activities. Mathematics lessons should be linked to the daily lives of students. In the process of developing the mathematical imagination of students with visual impairments, linking education with life activities is of particular importance. Because mathematics is directly and inextricably linked with the daily needs and activities of a person. In order to enrich the practical experience of students, prepare them for independent life and ensure their social adaptation, it is necessary to apply mathematical knowledge in real situations.

Such integration is carried out in several main areas:

1. Calculation processes in everyday life

Students master numbers and operations through simple life tasks. For example:

Counting money units when buying products in a store, calculating the change;

Counting bread slices when eating, dividing portions;

Determining the price of a ticket in transport and making payment.

2. Studying measurement and quantitative relationships

Performing measurement activities through practical exercises makes concepts clearer for students. For example:

Teaching the concept of a meter by measuring the distance from school to home in steps;

Using units of measurement such as grams and liters when preparing food in the kitchen;

Comparing length and height by measuring the location of furniture in a room.

3. Forming the concept of time

For students with visual impairments, the concept of time is taught through speech, special clocks and practical activities. For example:

Calculating the start and end of a lesson;

Setting the agenda and following a time plan;

Determining time using special sound clocks.

4. Development of spatial imagination

The concepts of direction and distance in the environment are important in the daily lives of students. For example:

Reinforcing the concepts of “right”, “left”, “in front”, “behind” in the classroom through practical exercises;

Using spatial directions to determine the path in the home or school area;

Connecting geometric shapes with objects in life (table - rectangle, clock - circle, flag - triangle).

5. Development of independent activity

Mathematical concepts are mastered more effectively when applied in independent life situations. For example:

Comparing the price of products when shopping;

Determining the time by reading the transport schedule;

Using mathematical skills when performing daily household chores (measuring the amount of laundry detergent, calculating water).

Practical experience shows that special methodological tools, multi-sensory activities, modern technologies and real-life examples play a key role in teaching mathematics to students with visual impairments. These methodological solutions help students clearly perceive abstract mathematical concepts, develop their independent thinking, logical thinking and social activity.

CONCLUSION

The process of developing mathematical imagination in students with visual impairments is significantly different from that of ordinary students. In this process, it is important to fully use the capabilities of the sensory organs, prioritize verbal explanations and practical activities, and widely use special typhlopedagogical tools. A properly organized educational process develops not only mathematical knowledge, but also logical thinking, memory and creativity. Didactic games are not only a means of consolidating knowledge for students with visual impairments, but also an effective way to interest them in the lesson, develop independent thinking and cooperation skills. Each game should involve the senses, be enriched with oral speech, and be connected with life experience. Integrating mathematics education with life activities develops not only the knowledge of students with visual impairments, but also their social skills. This process prepares them to make the right decisions in real life situations and live independently. It also allows them to perceive mathematical concepts not as abstract knowledge, but as necessary skills that are practically applied in everyday activities.

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