

Technologies for Teaching Literacy to Children with Visual Impairments of Preschool Age

Sakhatova Nafisa

2nd year basic-doctoral student of the special pedagogy department of the National Pedagogical University of Uzbekistan named after Nizami, Uzbekistan

Received: 14 June 2025; **Accepted:** 10 July 2025; **Published:** 12 August 2025

Abstract: This article analyzes the pedagogical and psychological foundations of teaching literacy to children with visual impairments of preschool age, appropriate educational technologies, methodological approaches and teaching aids. The relevance of developing effective methods of teaching literacy in a modern inclusive education system, taking into account the special needs of these children, is substantiated.

Keywords: Visual impairment, preschool age, literacy teaching, special pedagogy, inclusive education, Braille, adaptive technologies.

Introduction: In modern society, every child should have the right to equal education. In particular, the education of preschool children with visual impairments requires special attention. Preschool age is the foundation of personality formation, during which the child's speech, cognitive, emotional, motor and social activities develop rapidly. Visual impairments complicate the child's perception of the environment, imagination, independent movement, and most importantly, the processes of learning to read and write. Visual impairment directly affects the psychophysiological development of the child. In this category of children, various peculiarities are observed in spatial imagination, motor skills, attention, speech and emotional stability. The absence or reduction of information received through vision leads to the active development of hearing, touch and other sensory organs. In such children, hearing and tactile sensitivity are formed as the main compensatory mechanisms.

In the process of teaching literacy, along with the development of children's thinking, memory, imagination and attention, it is also important to stabilize their emotional state, increase the level of social adaptation. This requires an individual approach to the choice of educational technologies.

The preschool education system has a state, social character and solves important social issues:

all-round development of children with visual

impairments;

prevention of impaired development of the blind and visually impaired;

correction and protection and strengthening of their health.

Educational organizations for children with visual impairments in the Republic of Uzbekistan were established in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 117 dated June 18, 2010. In accordance with the Resolution, preschool educational organizations are intended for children with severe visual impairments - blind, amblyopic and strabismus, and visually impaired. It is intended for admission to educational institutions from 2-3 years old, 6-8 people per group. 4 main tasks can be identified in the activities of kindergartens for children with visual impairments. Their implementation ensures not only the ability of children to master general education programs, but also the correction and compensation of secondary developmental defects.

Approximately 285 million people worldwide suffer from visual impairments, 39 million of whom are completely blind (World Health Organization, 2023). [1] In Uzbekistan, according to data from 2024, more than 18 thousand children have varying degrees of visual impairment. [2]

Preschool literacy preparation is important for all children, but for children with visual impairments, this process requires special approaches and technologies. Modern research suggests that with appropriate early intervention, up to 85% of these children can achieve normal intellectual development. [3]

L.S. Vygotsky believed that children with visual impairments develop their other senses through a "compensation" mechanism. [4] This theory led to the development of a multisensory approach.

Maria Montessori's sensory education methodology has been adapted specifically for children with visual impairments. The effectiveness of teaching through tactile materials and movement games has been proven. [5]

Brambring and Troester (2001) studied the development of 200 blind children in a study conducted in the Netherlands over a period of 5 years. The results showed that children who were tactilely stimulated at an early age developed language 40% faster⁶.

Hatwell and Martinez-Sarocchi (2003) studied the development of spatial imagination in children with visual impairments in France. They found that children's ability to understand geometric shapes improved by 60% with the use of audio-tactile technologies⁷.

Nielsen (2006) analyzed the social development of 150 blind children in Denmark. The study showed that structured educational programs significantly increase children's adaptive abilities⁸.

Scientists in our republic have also conducted research in this area. Today, the results obtained on the effectiveness of inclusive work in educational institutions are encouraging. Leading representatives of the field have been conducting both theoretical and practical research and recommending new forms of teaching.

Preschool education specialists develop literacy by constantly introducing children to oral and written language, relying on previous knowledge and language experience. Pictures, games, and the printed word, combined with oral language, help your child understand the symbolic image that underlies preschool reading and writing. It is advisable for his teacher to use a variety of interesting and engaging

strategies in the classroom to develop preschool reading.

Making literacy a part of every day is very beneficial. It is also important to use safe experiences and direct experiences that allow children to explore their world. Each child learns and develops language skills at their own pace, but all young children need:

- * Opportunities to develop and practice developing skills;
- * Encouragement and praise for effort;
- * Understanding that continuous learning is a family value;
- * Parents and other caregivers help plan developmentally appropriate learning activities;
- * A dedicated space for reading and practical activities.

To prepare a child for successful learning in school, it is necessary to create appropriate conditions for him to master all the riches of his native language. The development of a child's speech largely depends on his psyche, healthy, vigorous growth, moral qualities, ensuring the normal implementation of the curriculum, and the uniformity of the manuals. These issues should find their solution in preschool education and be focused on educating children to speak fluently in their native language. To develop the mental processes of children, it is necessary to develop their speech: The child's ability to understand the meaning of each word should correspond to his free expression in his speech. A child who has adapted to the system of concepts learns to speak and express his thoughts in a concentrated manner.

From the earliest years of a child, the simplest types of activity are the basis for the formation of his personal abilities, characteristics, and attitude to the surrounding world. Children use the acquired knowledge and developed mental abilities in various games and work. All this affects the development of the child's personality, forming in him an interest in the new content of activity. The nurturing and development of needs, feelings, motives, and goals during preschool age reaches a level that allows the child to transition to regular schooling.

Categories of children with visual impairments and their psychophysiological characteristics

Vision	Description
Completely sighted (blind)	Vision level of 0.05 and below
Low vision (partially sighted)	Vision level between 0.05–0.3
Visual impairment (functional impairment)	Asthenopia, strabismus, amblyopia, etc.

Visual impairment significantly affects the child's perception of the environment, self-awareness, motor activity, language and speech development, social adaptation and emotional state. Therefore, their psychophysiological development has its own characteristics.

The development process of children with visual impairments in preschool age has its own psychophysiological characteristics, which significantly affects their cognitive activity, speech development, motor acts, emotional state and social adaptation. Limited vision prevents the child from receiving the main part of the information coming from the external environment. As a result, compensatory mechanisms, namely hearing, touch, smell, etc., are actively developed in these children (Khamidova, 2022).

The process of receiving information in children with visual impairments occurs mainly through auditory and tactile (touch) analyzers. Children of this age often have overdeveloped auditory sensitivity, which helps them perceive the environment through sounds. Tactile sensitivity is especially important in the process of getting acquainted with tactile writing (for example, Braille). However, due to the lack or limited ability to see, they face significant difficulties in spatial orientation, shape and color perception (Usmonova, 2021).

Visual impairment has a significant impact on the child's cognitive processes, in particular, thinking, memory, attention, and imagination. Abstract thinking develops poorly, and imaginations based on real objects prevail. Their auditory memory is more developed than visual memory. Attention stability is very low, and it quickly fades, especially in a new or distracting environment. Due to the lack of visual foundations, children's imagination is usually based on auditory and kinesthetic experiences.

Motor functions in preschool children with visual impairment are also limited to a certain extent. Particularly noticeable difficulties are observed in gross motor skills, maintaining balance, orientation in space and fine movements (for example, holding writing instruments, feeling shapes). Such children have great difficulties in forming spatial concepts, which leads to the slow development of their skills in planning movements and free movement in the environment. The speech development of children with visual impairments also has its own characteristics. These children may have a limited vocabulary, since they cannot directly observe many objects and phenomena. Problems are observed with the phonetic aspect of speech, especially with the correct pronunciation of sounds. Semantic development is also slow in understanding words that depend on the experience gained through vision (for example, "light", "mirror", "blue color"). As a result, their communicative competence also decreases.

The stage of teaching preschool children to read determines their level of readiness for school. In children with visual impairments, this process is accompanied by a number of problems:

- Inability to receive education through visual stimuli;
 - Inability to imagine letters in terms of form;
 - Limitations in spatial orientation (insufficient formation of concepts such as left-right, up-down, front-back);
 - Weak development of fine motor skills;
 - Incompatibility of simple didactic tools;
 - The need for supporting methods in speech and auditory activities.
- Therefore, it is necessary to use special methods and technologies in the educational process, adapting them to the individual needs of children.

Technologies for teaching literacy

1. Teaching literacy based on the Braille alphabet	Braille is a tactile writing system with a 6-dot structure designed for blind and partially sighted people, through which letters, numbers and symbols are felt using special points. This writing system teaches children to recognize letters by touch, form words and sentences, read and write. Special braille devices, Braille machines, tactile alphabet cards are the main tools of this technology.
2. Audio technologies	Technologies that organize learning through hearing facilitate the process of learning literacy in children.

	Through audio books, speech synthesizers, QR-code textbooks, mobile applications, children learn letters, words and texts by hearing. These technologies are especially important in eliminating problems with speech development.
3. Tactile technologies	Tactile materials are materials that stimulate children's sense of touch through embossed letters, shapes, objects, etc., and teach them to recognize, distinguish, and write letters. Letter cards made of wood, plastic, fabric, or rubber, shape stencils, and letter models with constructions are among the tools in this category.
4. Computer and digital technologies	Digital tools, including screen readers (JAWS, NVDA), Braille monitors, touch-sensitive Braille tablets, and mobile applications (e.g., Voice Dream Reader), allow children to learn to read and write in an interactive environment. These technologies also encourage independent learning.
5. Game and activity-based technologies	A playful approach is very effective in teaching children with visual impairments to read. Literacy skills are gradually developed through sound-emitting toys, sound cubes, embossed letter cards, and audio-logical games. This method increases children's motivation and ensures their activity.

The following technologies play an important role in teaching literacy to blind or partially sighted preschool children:

a) Teaching through the Braille system

Braille is the main literacy technology for these children. The teaching process is carried out step by step:

Introducing the elements of dot-based writing

Recognizing letters and signs

Reading and writing simple words

Working with simple texts

b) Using tactile-didactic materials

Using specially designed tactile letters, geometric shapes, and pictures, the child learns letters by hearing, touching, and expressing them. This method provides visual compensation.

c) Computer and mobile technologies

In recent years, it has become possible to strengthen children's literacy skills through Braille players, voice screen readers, and special game programs. For

example, using programs such as NVDA and JAWS, the child learns to analyze texts by hearing.

d) Integrated game technologies

Playful learning is especially important for preschool children. Sound games, special sensory boards, musical alphabets and didactic cards attract children's attention and facilitate learning.

The process of teaching literacy includes the following stages:

Speech preparation - development of phonemic hearing, differentiation of sounds and letters.

Tactile preparation - increasing finger sensitivity to understand dotted writing.

Teaching Braille letters - independent understanding and memorization of each letter.

Developing reading and writing - working with short texts, stories.

An individual approach, motivation, and the use of multisensory methods are important in teaching.

The process of teaching literacy to children with visual impairments of preschool age requires a specific step-by-step approach. These stages are organized taking into account the level of psychophysiological development of the child, the type and degree of visual impairment, as well as the available compensatory capabilities. At each stage, methodological tools are selected, based on an individual and differentiated approach.

1. Speech preparation stage

The first stage of the literacy training process is aimed at forming speech preparation in the child. The main tasks are the development of phonemic hearing, differentiation and pronunciation of sounds, and expansion of vocabulary. Since children with visual impairments have limited opportunities to learn words through visual images, it is necessary to support their speech development through auditory, motor, and tactile sensations.

The following methods are used at this stage:

- Auditory-motor exercises - saying sounds by hearing and expressing them with movement;
- Object-word association - learning their names by getting acquainted with real objects;
- Sound games - interactive activities aimed at identifying the beginning, end or content of words.

2. Tactile preparation stage

The development of tactile (perception by touch) skills is important for children with visual impairments. In particular, skills such as finger sensitivity, distinguishing the structure of objects, and understanding their

location are necessary when learning Braille. At the tactile preparation stage, work is carried out on the child's hand motor skills, fine movements, and sensory sensitivity.

The following methodological approaches are used:

- Tactile differentiation exercises - distinguishing smooth, rough, soft, hard surfaces;
- Contour recognition - naming shapes by feeling them with your hand;
- Working with large copies of letters and shapes - familiarization with large and raised letters for children with poor vision.

3. Braille teaching stage

At this stage, children begin to master the basics of Braille. The Braille system is based on a combination of six dots and includes a tactile image of each letter, number or symbol. Initially, letters are taught separately, then they move on to the stage of recognizing them in words and sentences.

The following are important in teaching Braille:

- Introduction to letters - feeling and naming each letter with your fingers;
- Learning to write on a Braille board - exercises in writing letters using a slate and stylus;
- Reading simple texts - reading Braille copies of short words, sentences and stories.

When teaching Braille, lessons should be enriched with visual and game elements that increase children's interest.

4. The stage of strengthening reading and writing skills

At this stage, the child consolidates letters and words and moves on to independent reading and writing activities. Learning activities are expanded by working with texts: the skills of understanding the text, telling its content, and answering simple questions are formed. Also, errors in pronunciation and writing are worked on.

Methodological approaches at this stage include:

- Textual methods – reading, analyzing and retelling a story;
- Written tasks – dictation, independent writing exercises;
- Audio learning technologies – listening and learning through the use of audio books, sound files.

5. Formation of socio-communicative skills

The process of teaching literacy includes the development of not only technical skills, but also social and communicative competencies. The child is guided to form the skills of expressing his/her opinion,

answering questions, working in a group, and independent thinking.

Methodology for teaching literacy to preschool children with visual impairments

Stage	Main tasks	Methods and tools used	Outcome/Skill
1. Speech preparation	Develop phonemic hearing	Auditory-motor exercises, sound games	Correctly distinguish and pronounce sounds
2. Tactile preparation	Increase finger sensitivity	Tactile differentiation exercises, working with shapes	Feel objects and letters
3. Braille teaching	Master Braille letters	Braille board, stylus, special books	Independently read and write letters
4. Reading and writing development	Develop text comprehension and writing skills	Audio books, dictation, independent writing exercises	Understand and express text
5. Social and communication skills	Formulate ideas, teach communication	Group exercises, interactive games	Develop social and speech skills

CONCLUSION

Technologies for teaching literacy to preschool children with visual impairments should be developed in accordance with their physiological and psychological characteristics. The integration of the Braille system, tactile tools, audio programs and game technologies in teaching literacy provides high efficiency. Cooperation with parents, defectologists and speech therapists plays an important role in the educational process. Education organized in this way ensures the further socialization of children and their readiness for educational activities.

REFERENCES

- Azimova, M. M. Nogironligi bo'lgan bolalarni pedagogik reabilitatsiya asoslari. Toshkent, 2015.
- Bekmirzaeva, N. A. Ko'rish imkoniyati cheklangan bolalarni maktabgacha yoshda o'qitish metodikasi. Toshkent: Fan va texnologiya, 2018.
- G'aniyeva, D. S. Maktabgacha yoshdagi nogiron bolalar uchun pedagogik texnologiyalar. Toshkent: Ilm-fan, 2020.
- Karimova, S. A. Brayl yozuvi va uning ta'lim jarayonidagi o'rni. Toshkent: Pedagogika, 2017.
- Mametova, N. T. Ko'rish nuqsoni bo'lgan bolalarni rivojlantirishda innovatsion metodlar. Toshkent: O'qituvchi, 2019.

Sultonova, F. K. Nogiron bolalarni inkluziv ta'limda o'qitish metodikasi. Toshkent: Ilmiy nashr, 2021.

UNESCO. Inclusive Education for Children with Visual Impairments. Paris: UNESCO Publishing, 2017.

World Health Organization. World Report on Vision. Geneva: WHO Press, 2019.

Yusupova, L. R. Maktabgacha yoshdagi ko'rish nuqsoni bo'lgan bolalar uchun o'quv metodikasi. Toshkent: Fan, 2016.

Zokirova, M. M. Nogiron bolalar uchun maxsus pedagogika. Toshkent: O'zbekiston davlat jahon tillari universiteti nashriyoti, 2018.