Volume 3, Issue 5 May 2025 **ISSN (E):** 2938-3757

THE ROLE OF DIGITAL TECHNOLOGIES IN THE INTELLECTUAL ACTIVITY OF THE BLIND

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Abstract
In recent decades, changes in Uzbekistan's humanitarian sphere have been marked by increased attention to the social integration of people with disabilities. The state's social policy is increasingly aimed at creating equal opportunities for such individuals to participate in society and engage in socially beneficial activities. One of the most important aspects of ensuring equal opportunities for visually impaired individuals is providing them with access to information and enabling active participation in social information exchange. The process of digitalization makes these issues even more relevant. In this regard, the widespread use of digital electronic resources, especially those designed to meet the needs of visually impaired individuals and digital technology requirements, is of particular importance. This study substantiates the use of digital educational resources and computer assistive technologies in the context of interaction with the information society. The findings can be applied in academic and corporate educational institutions. The developed approaches can be utilized by various groups of developers to create their own digital learning environments.

Keywords: Information exchange, digital electronic resources, digital learning environment, computer assistive technologies, visually impaired individuals, professional education.

Introduction

Information systems in education began to be used in the mid-20th century and have since evolved from simple educational applications and information websites to complex software systems. Despite the high demand for information systems in education, several publications have pointed out that these systems lack sufficient flexibility. This is because the information-educational environment often forces users to operate within predefined processes and rigid data formats, which in turn reduces the ability to individualize instruction and adapt approaches. As a result, the number of users of such systems decreases, and participants in the educational process are less inclined to adopt them.

The solution to ensuring the necessary flexibility of a new-generation information-educational environment lies in the use of a digital learning environment. These systems serve to enhance the effectiveness and quality of education, support personalization, individualization, and flexibility of the learning process, and create opportunities for learners to express themselves.

The digital learning environment implements user modeling—that is, it provides data reflecting the user's current status (such as overall competency level, learning progress, etc.). It also includes knowledge management tools, general educational process management systems, and

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mechanisms for data collection and analysis. The system analyzes students' needs and suggests scenarios for their further development.

In the context of global informatization, a person's quality of life and social status largely depend on their ability to actively participate in social information exchange. Quick access to necessary information, the ability to process it, and the presentation of the outcomes of one's informational activity determine an individual's role in society.

However, for visually impaired individuals, participation in social information exchange is significantly limited. This is because existing information tools are primarily based on visual formats, which are not compatible with the perceptual abilities of the blind. Traditional methods of accessing information resources for the visually impaired (such as magnetic audio recordings or printed materials in Braille) require considerable time and financial resources and fail to fully meet the information needs of modern society in various areas such as education, professional activity, and others.

The "Standard Rules on the Equalization of Opportunities for Persons with Disabilities," adopted by the United Nations General Assembly in 1993, place serious moral, political, and economic obligations on states toward such individuals.

One of the most effective tools for ensuring the participation of the visually impaired in social information exchange is computer assistive technology (typhlotechnology). These specialized hardware and software solutions enable blind and visually impaired individuals to use standard computer devices and access user functionalities. As a result, they gain an effective means of independently and freely accessing mass information resources.

The widespread availability of digital technologies and the significant reduction in their cost further increase the relevance and importance of these technologies.

A necessary condition for the success of visually impaired individuals in education and professional activity is the availability of free and rapid information exchange. Therefore, the development of digital technologies serves as a crucial tool in this process.

Thus, at present, the process of computerization for the visually impaired (typhlocomputerization) holds great social significance and is becoming one of the key factors in ensuring the social integration of blind individuals. This not only contributes to the technological advancement of society but also enables the full participation of every individual in social life by creating equal opportunities that align with the principles of humanism.

The general issues related to the social integration of people with disabilities have been studied by various social scientists and psychologists. These studies focus not so much on the specific limitations arising from disability, but rather on the problems created by the unique socio-cultural status of disabled individuals in society. Scientific works have highlighted the psychophysiological and cognitive characteristics of blind and visually impaired individuals, as well as the mechanisms for compensating for visual impairments.

One of the most significant areas of research related to adapting blind individuals to society, organizing rehabilitation work, and integrating them into modern society is the work conducted by typhlopedagogists.

Researchers worldwide are conducting theoretical and practical studies on the possibilities of using digital technologies to develop special education systems. They have developed conceptual

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ideas related to the philosophy of computerizing special education. Research shows that from the perspective of defectology, the significance of using digital technologies lies in the creation of new teaching methods and the development of pedagogical technologies implemented through computer tools.

Analysis of Literature and Methodology

The issue of ensuring access to information for visually impaired individuals has traditionally been addressed through library services. The scientific study of providing information to individuals with impaired vision began in the 1960s. Key contributions to the theoretical understanding of these issues were made by K. A. Kuzoro, A. A. Lyapkova, and M. V. Nazarov. A study was conducted to explore the need for digital educational resources and information sources for visually impaired individuals, primarily involving students and specialists. The results of the study led to a high evaluation of the importance of digital technologies and electronic information sources in the education, labor, and cultural development of visually impaired individuals. According to the researchers' conclusions, providing equal opportunities for visually impaired people is one of the main principles of library services, and the conditions for implementing this principle were analyzed in library practice.

The issues of developing modern digital centers and implementing assistive information technologies for the visually impaired are among the main topics of scientific and practical conferences. For example, conferences such as "The Role of Digital Technologies in the Intellectual Activity of the Visually Impaired: Development Prospects and Applications" (Nizhny Novgorod), and "Professional Education of Visually Impaired Individuals: Problems, Experience, Prospects" (Moscow) are some of these.

To achieve the aims and objectives of this study, the following methods were used:

- Data analysis methods (retrospective analysis of scientific literature, content analysis of materials from scientific and practical conferences);
- Mathematical statistics methods;
- Empirical methods (observation);
- Diagnostic methods (interviews, surveys).

This study shows that the full integration of individuals with disabilities into society should be based on humanitarian principles. Equalizing access to information and education serves not only the independent development of disabled individuals but also their participation as active members of society. For visually impaired individuals, digital technologies and typhlopedagogical solutions help reduce existing social barriers in society, thereby paving the way for the realization of humanitarian ideas.

Analysis and Results

The activity of visually impaired individuals in the field of computers is evidenced by the many internet resources they have created and manage. Among them are specialized forums where various issues related to visually impaired individuals are discussed. This article examines the methods of using digital technologies adapted specifically for these individuals. These

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technologies provide them with the opportunity to participate effectively in the information environment of society.

One way to create conditions for visually impaired individuals to work with computers is to develop specialized devices for them. These computers are equipped with an internal speech output system, the ability to deliver information in audio format, and specialized software. However, the main disadvantage of this approach is that since these devices and programs are non-standard, their prices are high and they cause difficulties in use.

Currently, portable computer devices designed for people with disabilities incorporate integrated technologies, but such equipment is still not widely available. Therefore, the most effective approach is to use additional hardware and software that allows working with regular personal computers and commonly used programs (MS Word, Internet Explorer, etc.). This method enables visually impaired and blind individuals to have an experience close to that of typical users.

One of the essential devices designed for visually impaired individuals is the Braille display, which outputs computer information in the form of raised dots. This device typically consists of 20 to 80 modules, allowing the user to "see" the computer screen through a small window and read the information sequentially by moving it.

Currently, speech synthesizers that convert text-based information into audio format are also widely used. These devices transform textual information into audio signals and deliver it to the user. Thanks to this technology, visually impaired individuals can work with computers without the need for specialized equipment, facilitating their integration into society.

The most effective solution for visually impaired individuals is to use both a speech synthesizer and a Braille display together. However, the high cost of Braille displays hinders their widespread use. As a result, most users rely only on the speech output system, but even in such situations, the computer becomes an effective means of information exchange for them.

Visually impaired individuals typically work with computers using a keyboard. Practice shows that if the visual impairment is not accompanied by motor system issues, mastering the keyboard does not pose significant difficulty. In particular, knowing how to type with all ten fingers significantly improves work efficiency.

The process of working with computers for visually impaired individuals is unique. Regular users monitor the state of the operating system through the on-screen display. However, visually impaired individuals do not interact with on-screen elements (such as menus, buttons, etc.), but instead use special audio or Braille output technologies. Therefore, developing user-friendly software for them is of paramount importance.

The proper use of digital technologies provides visually impaired and blind individuals with the same opportunities as others. However, working with graphic and text-free information may be somewhat more complicated. Their main difficulty lies in the need to process information sequentially in order to understand the overall state of the computer system. The special knowledge and skills presented in this research help overcome these challenges and improve work efficiency.

According to our research, based on a survey conducted by the Society of the Visually Impaired in Tashkent, approximately 10% of working-age individuals with disabilities are computer users.

They emphasized that by using computers in education, work, and social activities, they have achieved the following results:

- Expanded worldview (81.8%)
- Easy access to educational and professional information (74.2%)
- Quick access to information (72.7%)
- Increased confidence in their abilities (68.2%)

Also, more than half of visually impaired and low-vision individuals aged 16–18 reported that they are currently computer users and plan to continue using it in the future.

73.9% of the respondents emphasized the usefulness of using assistive technologies and digital learning resources, expressing a good understanding of their importance. The majority of participants (95.8%) supported the creation of special computer centers or programs. They wish to have access to consultations and technical assistance, as well as to use expensive equipment in these centers.

However, among those unable to use digital technologies, the main reasons cited were the lack of technical equipment (35.8%) and a lack of necessary knowledge and skills (26.4%). Therefore, most visually impaired and low-vision individuals feel the need for additional computer training.

The research findings indicate that there is high demand for assistive computer technologies among visually impaired individuals. They highly evaluate the effectiveness of assistive technologies and digital learning resources. At the same time, the need for educational, methodological, and technical support to support this process has also been identified.

Conclusion

The effective use of digital technologies provides the following opportunities for visually impaired individuals:

- Access to the Internet and other electronic information resources;
- Scanning simple texts and converting them into voice format;
- Receiving electronic information in a convenient form (printed in Braille or enlarged fonts);
- Creating independent documents (assignments, reports, etc.);
- Using modern software for working with information (databases, search engines, etc.).

Thus, the proper use of digital technologies significantly compensates for the lack of vision in information exchange and enhances opportunities for active participation in social life. It facilitates access to information, helps individuals become more independent in reading, working, and socializing, and ensures the full integration of visually impaired individuals into society.

To achieve this, it is crucial to provide them with modern digital technologies, offer appropriate training, and establish special centers.

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