Presentation date: February, 2024, **Date of acceptance**: April, 2024, **Publication date**: May, 2024

36

DIGITAL TECHNOLOGIES IN THE CONTEXT OF INNOVATIVE DEVELOPMENT OF INCLUSIVE EDUCATION

LAS TECNOLOGÍAS DIGITALES EN EL CONTEXTO DE DESARROLLO INNOVATIVODE EDUCACIÓN INCLUSIVA

Akhmetova Daniya Zagriyevna[1]*
E-mail: ahmetova@ieml.ru
ORCID: https://orcid.org/0000-0002-1445-1609
Timiryasova Asiya Vitalyevna[1]
E-mail: timirasova@ieml.ru
ORCID: https://orcid.org/0000-0001-8126-3790
Morozova Ilona Gennadyevna[1]
E-mail: imorozova@ieml.ru
ORCID: https://orcid.org/0000-0002-6400-4460
Zharinov Aleksander Vladimirovich[1]
E-mail: ZHarinovAV@ieml.ru
ORCID: https://orcid.org/ 0009-0004-4980-9123
*Corresponding author:
[1]Kazan Innovative University named after V. G. Timiryasov. Russia

Suggested citation (APA, seventh ed.)

Zagriyevna, A. D., Vitalyevna, T. A., Gennadyevna, M. I., & Vladimirovich, Z. A. (2024). Digital technologies in the context of innovative development of Inclusive Education. *Revista Conrado, 20*(98), 330-336.

ABSTRACT

Digital technologies are now a vital part of educational process in many contexts. There is a growing interest in studying the opportunities of using digital technologies in inclusive and special needs education. The authors describe current trends in the education development, analysis of current disability facts and figures among children in Russia. The authors clarify the following concepts: “digital technology”, “inclusive education”, “virtual reality technology”.

To identify the difficulties that teachers and students experience when using digital technologies in inclusive education, the authors of the article conducted an experimental study. Teachers from 226 kindergartens, 361 secondary and primary schools and 47 vocational educational organizations of the Republic of Tatarstan (Russia) took part in it. Based on the results obtained, it was concluded that it is necessary to implement a personalized approach to psychological and pedagogical support for the digitalization of inclusive education.

Keywords:

Digital technology, inclusive education, students with disabilities, special needs education.

RESUMEN

Las tecnologías digitales son ahora una parte vital del proceso educativo en muchos contextos. Existe un interés creciente en estudiar las oportunidades del uso de tecnologías digitales en la educación inclusiva y con necesidades especiales. Los autores describen las tendencias actuales en el desarrollo de la educación y analizan los datos y cifras actuales de discapacidad entre los niños en Rusia. Los autores aclaran los siguientes conceptos: “tecnología digital”, “educación inclusiva”, “tecnología de realidad virtual”. Para identificar las dificultades que experimentan profesores y estudiantes al utilizar las tecnologías digitales en la educación inclusiva, los autores del artículo realizaron un estudio experimental. En él participaron profesores de 226 jardines de infancia, 361 escuelas secundarias y primarias y 47 organizaciones de formación profesional de la República de Tartaristán (Rusia). Con base en los resultados obtenidos, se concluyó que es necesario implementar un enfoque personalizado de apoyo psicológico y pedagógico para la digitalización de la educación inclusiva.

Palabras clave:

Tecnología digital, educación inclusiva, estudiantes con discapacidad, educación para necesidades especiales

INTRODUCTION

Attentive attitude towards people with disabilities, their needs and interests is an indicator of «humanity», the maturity of society and the government. According to the Federal Service of State Statistics in Russia, the total number of people with disabilities is 11,331,000 at January 1, 2022. Compared to 2014, there is a decrease in the number of people with disabilities in Russian Federation. There are 729 thousand children with disabilities in 2022. The largest number of disabled children is observed at the age of 8-14 years (45% of the total number of children with disabilities) and 4-7 years (30% of the total number of children with disabilities) - these are children of preschool and school age (Federal Service of State Statistics (n.d.)).

Every child, regardless of sensory, cognitive, musculoskeletal, speech, psycho-emotional and intellectual disorders, has the right to get an education, and needs diagnosis, correction and development, socialization and rehabilitation. In this context, a big role should be given to inclusive education, which involves providing equal opportunities for all students, regardless of their physical and mental state (Akhmetova et al., 2020). Inclusive education refers to an educational setup where children with diverse educational needs are accommodated in mainstream classroom and have equitable opportunities for quality education (Singh & Prajapati, 2021).

Currently, digital technologies are actively developing; they facilitate and intensify the educational material, develop disabled students' sensory abilities, correct defects in speech, psychomotor, intellectual, mental development and improve the psycho-emotional state of children. Digital technologies allow children to study together with their peers in the same educational environment.

A review of modern researches in the field of digitalization of inclusive education shows that today there are separate scientific researches in the field of application of some digital and assistive technologies in correctional process; there are still few researches in the field of application of digital technologies in inclusive education taking into account the specific impairments. It is necessary to evaluate the benefits and risks of digitalization and to take into account the individual characteristics of students.

Following are the objectives of the study:

1. 1. To study theoretical background of inclusive education in the context of innovative development.
2. 2. To analyze researches in the field of using of digital technologies in inclusive and special need education.
3. 3. To reveal the difficulties which teachers and students with disabilities experience while implementing digital technologies into inclusive educational process.

MATERIALS AND METHODS

At the preparatory stage of our research work, Russian and foreign scientific researches were analyzed on the following topics: inclusive education, digitalization in inclusive education and in special needs education, virtual reality technology in inclusive education. The documents and presentation materials which characterize technical and didactical peculiarities of digital technologies were analyzed.

In order to find out difficulties which students and teachers have while using digital technologies in inclusive education we conducted a survey. A total number of 800 teachers from 226 kindergartens, 361 primary and secondary schools, 47 vocational educational organizations which are located in Tatarstan Republic (Russia) participated in this study. Participants completed a questionnaire developed by the Research Institute of Pedagogical Innovations and Inclusive Education. Using the questionnaire, the researchers are able to collect data from a large number of people in a short period of time (Kyriazopoulou et al., 2023).

The questions reflected the main purpose and specific objectives of the study. The questionnaire consisted of 5 questions. The survey was conducted using online survey creator Microsoft Forms. A closed-type questionnaire was developed, requiring the choice of a specific answer from the proposed options (one or several).

RESULTS AND DISCUSSIONS

Inclusive education development in the context of pedagogical innovation

Inclusive education is an education provided by schools for all children regardless of their background, economic, social and cultural background. While creating an inclusive educational environment schools look for ways to facilitate children to learn together and share the benefits of learning.

The authors Riga et al. (2020) look at the terms «inclusion» and «education without exclusions» as synonyms. In the authors' opinion, inclusion means establishing such a framework that all children included in it, regardless of their ability, gender, language, national or cultural origin - are equally valued, treated with respect and provided with an equivalent number of authentic learning. At the

same time, inclusive education helps to overcome barriers to presence, participation, and achievement in mainstream classes.

According to Akhmetova (2020) concludes that inclusive education can foster the social exclusion processes in case of building the continuous system of inclusive education from preschool age till professional self-development.

In Table 1 the comparative characteristic of methodological basis of inclusive and general education is given.

Table 1. Comparative characteristic of methodological basis of inclusive and general education

Methodological aspects	General education	Inclusive education
Didactical principles	consistency, visibility, accessibility, consciousness, activity.	Classical principles of general education in addition to eight principles of inclusive education: 1) person's value does not depend on his/her abilities and achievements; 2) every person is capable of feeling and thinking; 3) every person has the right to communicate and to be heard; 4) all people need the support and friendship of their peers; 5) diversity enhances all aspects of human life.
Patterns	1) the effectiveness of the educational process depends on the context and conditions in which it takes place; 2) the same pedagogical influence implies various students reactions and results; 3) the personal development emerges through the interaction with society.	Patterns of general education can be applied. In addition to them, there are specific patterns: learning will be successful if an accessible learning environment is created, if students are provided with auxiliary aids and assistive tools. Correction of psychophysical impairments of people with disabilities is determined by the psychological, pedagogical and tutor support.
Educational methods	Interactive methods, game and research methods, role plays and simulations.	Additionally: correctional educational methods (differentiated instruction, multisensory learning, visualization, peer tutoring, art-therapy).
Pedagogical technologies	Digital technologies, problem-based learning, case-study, problem-based technologies, interactive technologies.	Technologies of general education. Additionally: technologies for implementing adapted educational programs taking into account the specifics of students' impairment.
The main paradigm of education	Subject-subject interaction between participants in the educational process.	Subject-subject interaction between teacher and student is the main condition for the socialization of students with disabilities. The family is considered as a third subject in the implementation of inclusive education.

Source: Preparation of authors

Digital technologies in inclusive and special needs education.

Digital technology implies that any information is presented on the computer or disseminated on the computer (Kapur, 2021). While using digital technology communication processes are implemented in an effective manner, knowledge can be improved. Various tasks, activities, duties and functions can be conducted on special digital platforms. Digital technology also provide record keeping and recovery, decentralized work and cloud computing (Kapur, 2022).

The technological developments encourage the production of more tools and software for people with developmental disabilities (Ramdoss et al., 2022), therefore nowadays there are different digital technologies that can be used in inclusive and special needs education. Among them mobile devices, smartboards, MOOCs, tablets, laptops, simulations, dynamic virtual laboratories (Haleem et al., 2022).

Why can these technologies be useful for children with disabilities? First, digital environment is predictable and consistent, which students with disabilities find less stressful. Users can study at their own rate and knowledge level, and it can help them to achieve educational goals faster (Papoutsi, 2023). Assistive technologies improve the performance and participation of students with disabilities (Basham et al., 2020), also they can enhance attention and participatory capacity for curriculum activities (Gunnars, 2021). There is also an opinion that the content designed by using multimedia is more attractive (Carnahan et al., 2009),

What is the role of digital technologies for children with concrete disorder? Geroula (2023) says that such technologies, as Ai & Stem Robotics and games, facilitate and improve educational processes including evaluation, intervention, and

learning, they develop emotional intelligence, improves educational progress for gifted students with ADHD. Digital technologies help students with cognitive disabilities and autism spectrum disorder (ASD) to focus on the contents, to access complex issues and improve learning process.

At the same time students with ASD experience positive feelings and fun interacting with the new technologies. Tablets/ smartphones allow users to express themselves in a natural way, creating better understanding (Moraiti et al., 2023); such technologies attract the attention of students with ASD, and teaching is becoming more effective (Golan & Baron-Cohen, 2006).

Virtual reality technology in inclusive education

Immersive virtual reality provides new opportunities for inclusive classrooms due to its technical capabilities; they motivate educators to get knowledge in Virtual Learning Environments (Bisht, 2019). Virtual reality is a computer-generated simulation of a real-life environment that can be interacted with using head-mounted dis-plays. One of the benefits of VR is the interaction with controllers that provide intuitive control to users (Nillson, 2018). Such technology has a capacity to imitate real-world events. This helps educational organizations to learn more effectively than conventional ways via hands-on, experiential learning. It also enables students to explore and learn about areas that would be difficult or impossible to visit in reality (Solmaz et al., 2021).

VR technology is widely used nowadays for children with autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), dyslexia, or other learning disabilities (Staggini & Cersosimo, 2021). This technology attracts attention and foster motivation, enjoyment, critical thinking, communication, collaboration and students' creativity (Kaimara et al., 2020).

One of the most famous technology that is used nowadays is VIART technology. VIART complex is used for neurocognitive and visual rehabilitation, educational and aesthetic development, sensory and psycho-emotional rehabilitation. The complex is used for children with:

- pathologies of the central nervous system;

- neuropsychological, neurological, psychiatric pathologies;

- psychosomatic disorders;

- mental trauma, post-stress disorders;

- socio-psychological disorders;

- difficulties in social adaptation;

- behavioral disorders;

- autism spectrum disorders;

- disorders of the musculoskeletal system.

The first project created within the framework of VIART is called "Goncharova" in honor of the great Russian artist Natalia Goncharova. Student puts on a VR headset, then finds himself in a specially created virtual space - a creative workshop. The user sees in front of him a room in which sketches and blanks are located, as well as compositions. At the table, the user begins to create his own unique masterpiece: he can rearrange a vase, swap some objects, and even pick up a brush and begin to draw his picture. This technology helps to develop creative abilities of students, enhance their psycho- and motor development.

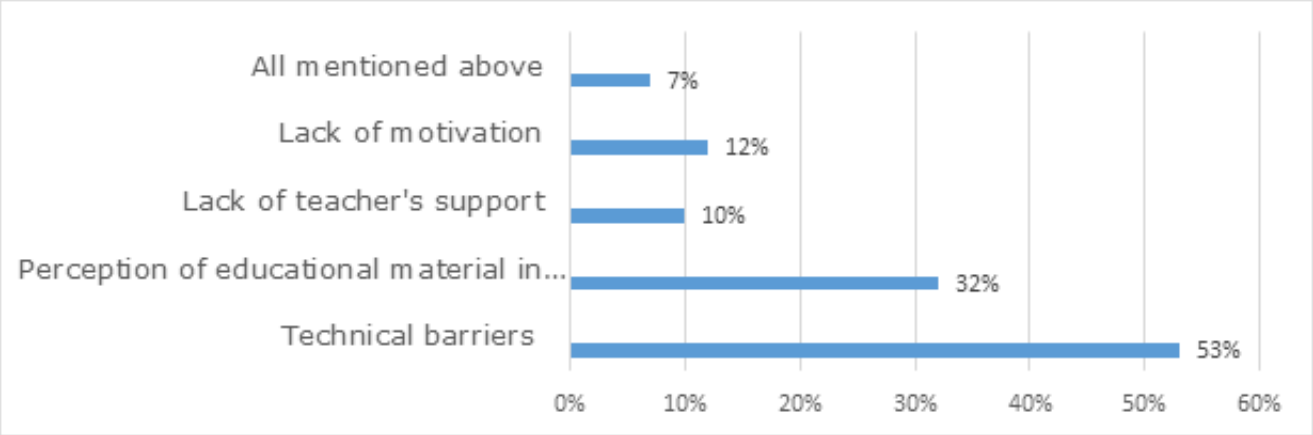
Thus, virtual reality technology has a great potential in teaching students with different educational needs, in their creative self-development process intensification, it corrects sensory and musculoskeletal disorders, speech disorders, psycho-emotional and intellectual disorders.

Difficulties and barriers students and teachers face using digital technologies in inclusive education

According to the results of the survey, in preschool educational organizations the largest group of disabled students are children with intellectual disabilities (44%). In vocational education organizations, the majority are students with musculoskeletal disorders (47%) and students with hearing impairments (36%).

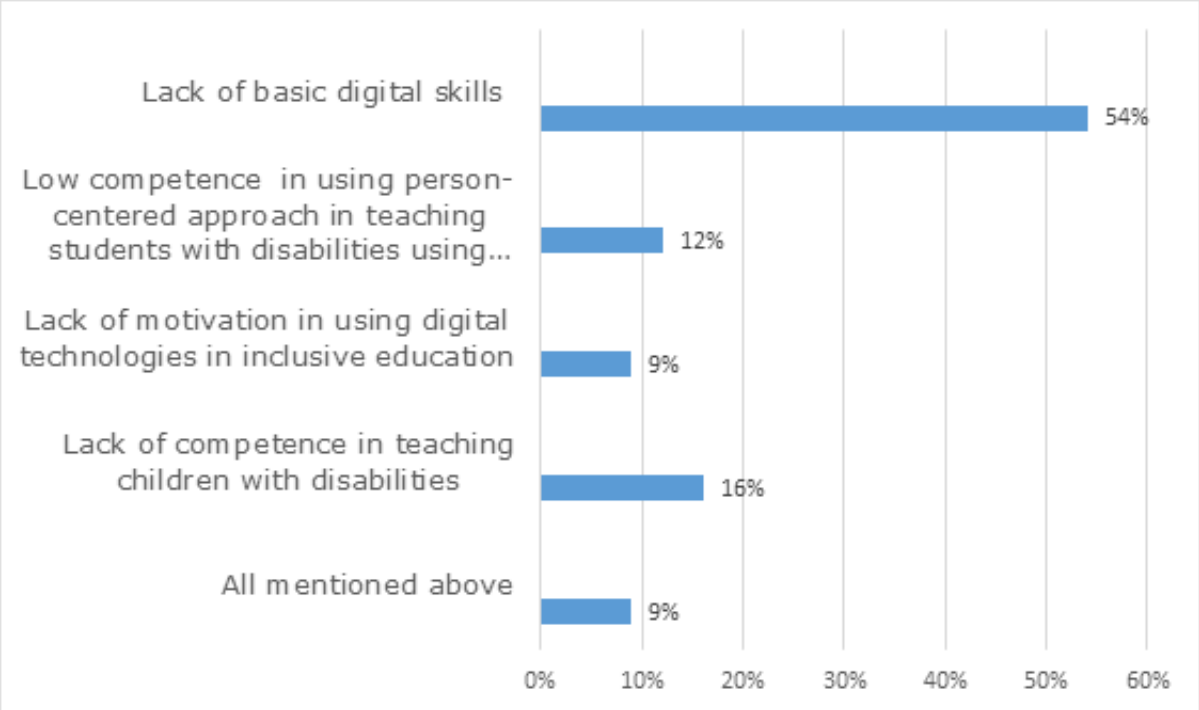
On Figure 1 and Figure 2 we can see the difficulties which students and teachers experience while using digital technologies in inclusive educational process.

Figure 1. Key challenges students face using digital technologies in inclusive education



Source: Preparation of authors

Figure 2. Key difficulties teachers have using digital technologies in inclusive education



Source: Preparation of authors

As it was observed, students lack the fundamental knowledge about digital technology. Some of them don ‘t knows how to use a special device and the appropriate instruction is not given to them. 10 % of students lack teacher’s support. They mentioned that while using digital technology it is very important when teachers guide them and support with classwork, including reading, writing, maths, sport. 32 % of students can hardly percept the educational material in digital format. They understand the courses worse in digital formats than in the printed. Some students also said that while staring at devices for a long time they feel temporary eye discomfort, they experience eye strain in different ways.

The teachers who work in inclusive classrooms mostly lack digital skills (54 % of participants). Teachers experience challenges in digital content creation for special needs children, they lack cybersecurity-related skills. They also expressed the need to enhance their digital literacy on special training courses. 12 % of teachers can't apply the person-centered approach to using digital technologies in inclusive environment. In the context of students with disabilities, it means that teachers should possess a full information about a student and his intellectual or mental disorder in order to identify the educational strategy and to choose an appropriate technology.

The teachers also answered the following question "What, in your opinion, needs to be done to improve the digitalization of inclusive education in your organization?" The following responses were received:

- to provide more digital equipment for special needs children (55%);

- to improve teachers digital literacy in inclusive education (26%);

- to enhance students' digital competence (18%);

- to carry out additional work with student parents about developing their skills in using digital tools (22%);

- all mentioned above (21%).

The findings of the survey can be summarized under 3 headings, which are:

- teachers need more motivation in using digital technologies in inclusive classrooms;

- it is important to apply person-centered approach in teaching students with disabilities using digital tools;

- digital competence of both students and teachers should be enhanced on special trainings.

ACKNOWLEDGMENTS

This article was supported by the Scholarship of Kazan Innovative University named after V.G. Timiryasov.

CONCLUSIONS

Inclusive education highlights opportunities for an equal involvement of students with disabilities (physical, mental and emotional), different ethic, social and cultural background into mainstream class education. Inclusive education helps to overcome barriers to presence, participation, and achievement in social and cultural life of educational organization.

There is an increasing number of digital technologies that can be used nowadays in inclusive and special needs education. Among them: virtual reality technology, laptops, simulations, software, digital storytelling, etc. According to the results of the survey it was revealed that students and teachers experience several difficulties while using digital technologies in inclusive education. Using digital technologies in inclusive education cannot be a chaotic process; it must be clearly coordinated and controlled. This process requires the interaction of different specialists - scientists and practitioners of various profiles: teachers, psychologists, defectologists, specialists in the field of IT and digital technologies. Students especially need psychological and pedagogical support of teachers in the inclusive educational process.

It can be concluded, that the process of digitalization of inclusive education can be effective if continuous psychological and pedagogical support is provided and if the characteristics of the students, their intellectual and physical abilities are taken into consideration. If this process is successfully implemented, the use of digital technologies allows not only to solve a number of compensatory, didactic, communicative tasks in inclusive education, but also to provide opportunities for further successful integration of disabled people into social life.

REFERENCES

Akhmetova, D., Artyukhina, T., Bikbayeva, M., Sakhnova, I., Suchkov, M. &Zaytseva, E. (2020). Digitalization and Inclusive Education: Common Ground. ***Vysshee obrazovanie v Rossii = Higher Education in Russia***, ***29***(2), 141-150.

Basham, J., Han, K., Zhang, L., & Yang, S. (2020). Considering the fourth industrial revolution in the preparation of learners with and without disabilities***. Careers for students with special educational needs, 2***(901), 31–46.

Bisht, B., Hope, A., & Paul, M. (2019). From papyrus leaves to bioprinting and virtual reality: history and innovation in anatomy. ***Anat Cell Bio, 52***(3), 213-226.

Carnahan, C., Basham, J., & Musti-Rao, S. (2009). A low-technology strategy for increasing engagement of students with autism and significant learning needs. ***Exceptionality***, ***17***(25), 76–87.

Federal Service of State Statistics (n.d.)**.** ***People with disabilities*****.** https://rosstat.gov.ru/storage/mediabank/pi_1.1.docx

Geroula, M. (2023). Inclusive education and the role of digital technologies. W***orld Journal of Biology Pharmacy and Health Sciences, 15***(01), 81–87.

Golan, O., & Baron-Cohen, S. (2006). Systemizing empathy: Teaching adults with Asperger syndrome or high-functioning autism to recognize complex emotions using interactive multimedia. ***Development and Psychopathology***, ***18***(432), 591–617.

Gunnars, F. (2021). A large-scale systematic review relating behaviorism to research of digital technology in primary education. ***Computers and Education Open***, ***2***(100058), 7-19.

Haleem, A., Javaid, M., Qadri, M. & Suman, R. (2022). Understanding the Role of Digital Technologies in Education: A review. ***Sustainable Operations and Computers, 3***(10), 275-285.

Kaimara, P., Poulimenou, S., & Deliyannis, I. (2020). Digital learning materials: Could transmedia content make the difference in the digital world? In L. Daniela (Ed.). ***Epistemological Approaches to Digital Learning in Educational Contexts***, ***4***(17), 69–87.

Kapur, R. (2021). Digital Technologies: Indispensable in Leading to Enrichment of the Living Conditions of the Individuals. ***Computers & Education, 4***(25), 28-29.

Kapur, R. (2022). Business and Management: Digital technologies: indispensable in leading to enrichment of the living conditions of the individuals. ***International Journal of Information***, ***14***(3), 25-29.

Kyriazopoulou, M., Thanassis, K., Konstantinos. M., & Arvanitis, E. (2023). Key principles of inclusive education and main challenges of implementing inclusive practice at preschool level in Greece. ***Mediterranean Journal of Education,*** 3 ***(1),*** 63-80***.***

Moraiti, I., Fotoglou, A., Stathopoulou, A., & Loukeris, D. (2023). National Center for Scientific Research "Demokritos", Greece. Strategies & digital technologies for Autism integration. ***Brazilian Journal of Science, 2***(5), 107-124.

Papoutsi, C. (2023). Digital Technologies and Empathy for Students with Special Education Needs. ***World Journal of Advanced Engineering Technology and Sciences, 9***(15), 58-69.

Ramdoss, S., Lang, R., Fragale, C., Britt, C., O'Reilly, M., & Sigafoos, J. (2022). Use of computer-based interventions to promote daily living skills in individuals with intellectual disabilities: A systematic review. ***Journal of Developmental and Physical Disabilities, 24***(73), 197–215.

Riga, A., Ioannidi, V., & Papayiannis, N., (2020). Computer supported collaborative learning in Greek inclusive secondary education. ***International Journal of Special Education and Information Technology. 6***(1), 18-28.

Solmaz, S., Dominguez, A., Santos, P., Puyvelde, V., & Gerven, T. (2021). A practical development of engineering simulation-assisted educational AR environments***. Education for Chemical Engineers***, ***35***(73), 81–93.