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Neuropsychological Aspects of Co-Educators in a Digital Educational Environment: Conditions, Benefits, Safety

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Abstract: The article reflects the role of digital learning environment in today's education. It is pointed out that digital learning environments are aimed at developing new competencies of education seekers. These include understanding how technologies and interfaces work, protection of privacy and personal data, searching for information and evaluating it in terms of reliability and validity for use, information processing, teamwork and the ability to communicate in a team. In this context, the problem of the influence of the digital educational environment, which is now largely formed, on the development of personal potential of educational aspirants is becoming increasingly relevant, and it is to this issue that this article is devoted. The article proves that the most important measure to make a decisive step towards solving the fundamental task of improving the quality of education is the development of personalized education.

Keywords: transformation; learning process; online education; digitalisation; innovative technologies; neuropsychological aspects of co-educators in digital educational environment.

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1. Introduction

Today's digital transformation needs highly qualified specialists. The social sphere is no exception, where digital technologies are being actively introduced to simplify the process of citizens' application and thus improve the quality of services provided to the population. One of the priority basic requirements of the labour market is qualitative training of students to solve professional tasks with the help of digital technologies.

Schools and universities are also not the primary source of knowledge. The Internet offers a rich resource for education: a variety of learning platforms, online courses, webinars, specialised information sites, etc. The digital environment meets many needs of the participants of the educational process, it is already firmly embedded in the educational infrastructure and solves problems that are difficult to solve in traditional forms.

The digital transformation of society has radically changed the educational process, moving it into a new, virtual environment. The emergence of online platforms, mobile applications, and other digital tools has opened up limitless learning opportunities. However, along with the advantages, digital education also carries certain risks for the psychological health of education seekers. Understanding the neuropsychological features of human interaction with the digital environment is key to ensuring effective and safe learning in today's world.

The study of the digital educational environment, particularly receiving education in it, was engaged by many scientists and educators, such as Hnatyuk et al. (2024).

Zinchyna (2023) believes that "the digital learning environment opens up limitless opportunities for students to develop and realise their potential."

However, according to Graesser, Sabatini, & Li (2022), "to fully realise these opportunities a number of challenges must be overcome. By working together, the state, educational institutions, teachers, students, and parents can create a digital educational environment that fosters the development of each individual student."

The research methodology includes:

Theoretical analysis: Analysis of scientific literature: a review of existing studies, articles, and monographs on the digital educational environment, its impact on the educational process, safety issues in the digital space; systematisation and generalisation of theoretical provisions on the digital transformation of education, its advantages, and disadvantages.

Comparative analysis: Comparison of different models and approaches to the use of digital learning environments (online courses, webinars, gamification, mobile learning, etc.); comparison of the experience of different countries in implementing digital technologies in education.

Synthesis method: generalisation and systematisation of data obtained from the analysis of literature and practical experience; formulation of conclusions about the role of digital learning environments in today's education, their advantages and disadvantages, as well as safety issues.

Sources of information: Scientific articles and monographs on the digital transformation of education; reports and studies of international organisations (PISA); statistical data on the use of digital technologies in education; Internet resources and online platforms used in the educational process.

The penetration of digital technologies into all spheres of human life and activity requires a new quality of education. If earlier the main educational trend was the ability to use a computer to solve a wide range of professional tasks, today the situation has changed dramatically.

Today's world offers new life realities created by the introduction of digital technologies for students. The article brings together three main aspects: Opportunities, Challenges, and Ethical Considerations. It takes a holistic view of the impact of generative AI on education. Unlike studies that focus on only one of these aspects, the article provides an integrated analysis, which is important for understanding the complexity of this technology.

Generative AI raises new moral issues such as academic virtue, authorship, and the impact on critical thinking. This article can make an important contribution by addressing these issues and providing recommendations for the ethical use of generative AI in education. I. Holiiad, Y. Semeniako, V. Pienov, V. Shakotko, N. Ashykhmina, V. Dinko & B. Maksymchuk.- *Neuropsychological* Aspects of Co-educators in a Digital Educational Environment: Conditions, Benefits, Safety

The purpose of the article is: To consider the role of digital learning environments in today's education and their impact on neurodevelopment, to characterise the neuropsychological aspects of co-teachers in the digital educational environment, to explore the possibilities of digital learning environments for the development of students' personal potential and to determine the conditions, benefits, and safety of co-teachers in the digital environment.

2. The Role of Digital Learning Environments in Today's Education and Their Impact on Neurodevelopment

Digital learning environments play an important role in the modernisation of education, providing new opportunities for learning and development. However, their impact on neurodevelopment is multifaceted and depends on the way they are integrated into the learning process. To preserve mental health and optimise learning outcomes, it is necessary to apply a balanced approach, taking into account the neuropsychological characteristics of educational applicants.

If earlier the use of Internet resources was considered a supplement to the leading positions of textbooks and other paper-based learning materials, today the Internet has strengthened its position in the educational process. With the spread of the coronavirus in 2020, the education system finds itself in a unique situation where distance learning has temporarily become the only possible form of education.

According to Wojciech et al. (2021), "naturally led to an increased attention to a variety of online resources in formal and non-formal education. Suddenly there was a realisation that learning activities and content can be organised in different ways due to the richness of online resources and their possibilities."

Networking resources have answered the question of how communication and interaction can be achieved when school attendance is not possible. Conclusions about the results of such interaction have yet to be drawn. The education process is becoming more and more oriented, including modularity, technology, accessibility, and flexibility. The natural process of globalisation, computerisation, and the inclusion of the Internet in all spheres of life has facilitated the creation and development of digital learning environments (DLEs). The use of which has a lot of experience in other countries.

In Finland, for example, digital educational technologies have been introduced into the teaching process. The Finnish Ministry of Education believes that the use of such technologies helps motivate students to engage in independent learning activities, independent research, and collaborative work. In Finnish schools, digital technologies serve as a tool for the phenomenon of guided learning, in which the process of acquiring knowledge is based on the exploration of phenomena in the real world. According to PISA, digital education has a high rating in Finland.

We also have the opportunity to participate internationally. One of the main advantages of digital learning environments is that they provide access to learning materials at any time and from anywhere. This greatly facilitates self-learning, as learners can choose their own pace of learning, repeat challenging material, or deepen their knowledge using additional sources. At the same time, digital platforms allow the creation of interactive materials, simulations, and videos, which greatly enhance the perception of complex topics and promote better learning.

Equally important is the aspect of the interaction between students, teachers, and classmates. Digital environments promote communication skills through forums, chat rooms, online courses, and video conferencing. They allow students to discuss complex topics, work together on tasks and projects, and receive immediate feedback from teachers.

One of the most important aspects of digital learning environments is their ability to support the integration of different learning tools and platforms. This allows for the creation of multi-format learning, including video, audio, text, quizzes, and other interactive elements that offer a variety of learning approaches. In addition, Hurevych, Konoshevskyi & Opuhko (2022) note that "textbook publishers are naturally losing their monopoly on creating educational content: Today, many thousands of teachers around the world create and publish educational materials on their personal websites, often in high demand."

Persistence, Competitiveness, Responsibility, Sufficiency, Utility. There are many different ways to utilise the digital environment in education. Typically, these include online courses, webinars, and training on the Moodle platform. The practice of integrating social media into the educational process is becoming more widespread. Various pedagogical approaches, concepts, and methods of working with DLEs have also been developed. Let us dwell on the most popular of them.

At the same time, this freedom can only exist if the teacher does not standardise the students' actions. The ability of the online environment to provide feedback, which is not always easy to realise in traditional face-to-face learning, is considered important. Blended learning involves different learning models that the teacher chooses depending on the lesson's objectives. The use of computers in the classroom does not always mean that blended learning is being used.

In the classroom, acquired knowledge is deepened through seminars, project activities, role-playing, and other interactive modalities. Thus, students have the opportunity to master the material independently, at a pace, and in a way that is convenient for them.

Flexible model. The most important prerequisite of this model is a flexible work plan that can be changed when necessary. This model requires a special organisation of the workspace: the Internet workspace should be set up in the center of the room, and group work and discussion areas should be set up at the edges of the room. This model is based on the educational needs of students and assumes the formation of a culture of independent learning and self-organisation.

Station rotation. The basis of this model is the rotation of groups of students by stations in the lesson: an online learning station, a station for working with the teacher, and a station for project work. The composition of students can vary depending on the lesson objectives. All students move in a circle and visit each station; their number can vary, and the principles of division into subgroups can be different.

Lab rotation. In this model, part of the lesson takes place in a regular classroom, but for one lesson, students go to a computer lab to work in an online environment.

Adaptive Learning Technology. Adaptive learning is a teaching method that uses the computer as the leading interactive learning device. The technology is based on the idea of the Montessori system, the core of which is an individualised approach to learning for each child.

Gamification is based on the use of online and offline game technologies in education. Its main goal is to create a motivational basis for learning skills and abilities, for children's activity and development. This technology is characterised by game attributes and mechanisms implementation, such as goals, points, leaderboards, rewards, and levels. Virtual classroom involves the creation and use of a virtual learning environment on the Internet with access through a portal. It means that in such an environment, the teacher and students work together.

Mobile learning (m-learning) is today's approach to education that allows you to learn anywhere, anytime using mobile devices (smartphones, tablets, etc.). It's like having an entire library of knowledge at your fingertips. It can be special apps for learning languages, solving math problems, or just interesting educational games. Many educational institutions and online courses offer mobile versions of their platforms to make it easier to access the materials.

1:1 technology. This technology provides personalised learning, provided that each student is equipped with personal technology tools (computer, tablet, laptop). Thus, the digital learning environment aims to develop new skills. These include understanding how technology and interfaces work, protecting privacy and personal data, finding information and evaluating it for reliability and usability, processing information, teamwork, and communication.

The transition to a digital learning environment has significantly changed the learning environment for students. On the one hand, it has opened many new opportunities for them, and on

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the other hand, it has presented them with new challenges. Let's consider these aspects in more detail. The opportunity to learn at one's own pace, choose an individual learning trajectory, receive additional materials to deepen the subject, study materials, and a variety of interactive tools (simulations, tests, forums) makes learning more interesting and effective. Learning in a digital environment helps to develop important skills such as information literacy, critical thinking, and creativity.

3. Opportunities of Digital Learning Environments for the Development of Students' Personal Potential

The development of the higher education system largely responds to this trend. One of the consequences of such development in this sphere is the emergence of an information-saturated space. The latter functions according to fundamentally new laws.

Speaking about today's level of development of the system of higher professional education, it is no exaggeration to say that there is great experience in using innovative digital technologies in various educational practices. In such conditions, it is quite natural to create a digital environment. The latter facilitates the exchange of different data between information systems and simplifies their ordering, as well as the integration of innovative educational technologies into a single logic.

Students develop a number of important skills and qualities that are in demand in today's society.

They largely determine the social and personal status of today's educated person. Another important advantage of digital learning environments is their ability to stimulate students' creativity. Interactive tools, graphic editors, multimedia project software, and virtual laboratories allow students to express their ideas, develop ingenuity, and work in teams. The use of digital technology in project activities allows students to take initiative, work on non-standard tasks, apply creative problem-solving, and develop new ideas.

Discussions on shaping digital education with the help of AI learning tools and cognitive science principles are extremely relevant. AI tools, such as adaptive learning platforms, intelligent tutors, and learning data analytics systems, allow personalising learning by taking into account each student's individual needs. Cognitive science principles such as personalisation, active learning, feedback, and metacognition emphasise the importance of effective teaching methods. The combination of these two approaches creates a digital education that is more flexible, adaptive, and effective.

One of the key aspects is adaptability. Artificial intelligence tools can analyse a learner's progress and automatically adjust the learning material to provide an optimal level of difficulty. This allows students to learn at their own pace, focusing on the topics that cause the most difficulty. Intelligent tutors provide personalised feedback to help students understand their mistakes and improve their knowledge. Learning data analytics systems allow tutors to track student progress and identify patterns to help them make informed instructional decisions.

The principles of cognitive science emphasize the importance of active learning. Interactive learning materials, gamification, and project work engage students in an active learning process, promoting better learning. Feedback is crucial for learning, and AI tools enable real-time feedback. Metacognition, or the ability to lear,n is also an important aspect, and digital tools can help students develop these skills.

However, there are also challenges. There is a need to ensure that AI is used morally, that personal data is protected, and that algorithmic bias is prevented. It is also important to ensure that digital education is accessible to all students, regardless of their socioeconomic status. Teachers must be prepared to use new technologies and have the appropriate skills. Despite these challenges, the potential of AI and cognitive sciences to transform digital education is enormous.

Digital learning environments also help to develop communication skills. Online courses, forums, chat rooms, and video conferencing provide opportunities for exchange, discussion and collaboration between learners from different parts of the world. This helps learners develop

effective communication skills, the ability to express their opinions and arguments, and to work as a team. At the same time, this type of communication requires learners to be able to work with information in real time, as well as to be able to dialog, interact with others, and consider different points of view.

According to Sheremet et al. (2019), "the transition to a digital educational environment has significantly changed the learning environment for students." On the one hand, it has opened many new opportunities for them, and on the other hand, it has presented them with new challenges.

Let's consider these aspects in more detail. This is the opportunity to choose an individual learning trajectory, to receive additional materials to deepen the subject, learning materials, the ability to study remotely or combine learning with work, a variety of interactive tools (simulations, tests, forums) make learning more interesting and effective. Learning in a digital environment helps to develop important skills such as information literacy, critical thinking, and creativity.

Thus, it helps students to achieve the planned results: subject, meta-subject, and personal. In addition, it is also about creating pedagogical conditions that help students gain experience in solving various problems of their future professional activity. Such conditions include: communicative, organisational, and cognitive.

"The interactivity of educational material increases the efficiency of student learning, which leads to better academic performance. At the same time, independent acquisition of knowledge is not always possible due to a lack of access to the necessary materials or the ability to obtain the necessary knowledge. In some cases, it is also impossible to verify the validity of information if there is no organized digital system." (Pinchuk et al., 2019).

The possibilities of the latest information technologies can also be used in educational work. For example, information technology and Internet resources can be used during lectures:

- when writing a website review on the topic under study;
- when preparing a review abstract that defines the topic of the lecture and complements its content;
- when analysing existing abstracts on the topic in order to evaluate them in relation to the material under study;
- compiling a bibliography;
- when discussing the content of the lecture in the network room.

According to Ovcharuk et al. (2020), "the use of digital technologies in lectures, thus, helps students to develop a responsible attitude to learning, desire, and ability to self-education based on learning motivation and understanding the ability to make informed decisions and follow individual educational trajectory. When preparing students for laboratory and practical classes, the opportunities of digital technologies can be used in the same way as in lectures."

In addition, their skills can be utilised in the following learning activities:

- reviewing monographs, scientific articles, and abstracts related to the topic of the practical training;
- preparation of abstracts and reports;
- preparing for a discussion on the topic of the seminar class;
- creation of Internet pages containing answers to frequently asked questions, useful links, and reference materials;
- developing individual or mini-group projects.

Through the use of digital technologies in preparation for laboratory and practical classes, students develop a desire for independent learning and self-improvement. This contributes to the formation of a deep understanding of today's scientific knowledge and its application in real life.

An innovative form of organising the educational process at the university is the technology of web-quest. This is a specially organised research activity of students. For its successful implementation, students search for information on the Internet at the specified addresses. From the point of view of the development of students' personal potential, the creation of web quests is subordinated to the following objectives: I. Holiiad, Y. Semeniako, V. Pienov, V. Shakotko, N. Ashykhmina, V. Dinko & B. Maksymchuk.- *Neuropsychological* Aspects of Co-educators in a Digital Educational Environment: Conditions, Benefits, Safety

- development of students' ability to use the obtained information in practice;
- practicing time management skills;
- development of skills in information evaluation, analysis, and synthesis;
- training in critical thinking.

The task for web search should be put on a specially organised site. It is not difficult to see that working on the web quest task will contribute to the development of students' cognitive independence, as well as the formation of the above-mentioned personal results. Achievement of students' personal goals can be facilitated by the introduction of digital technologies in monitoring the results of their independent work. For this purpose, in addition to traditional ones, it is possible to use various innovative forms, methods, and technologies: presentations, assessment, portfolios, peer assessment.

"The use of such forms of control of students' knowledge contributes to the transformation of students into active subjects of the educational process, and, consequently, to the development of their cognitive independence, responsible attitude to learning and the ability to apply acquired knowledge in practice, especially beyond the boundaries of a particular subject area". (Bakhmat et al., 2022)

4. The Benefits and Security of the Digitalisation of the Education System

We live in a century, a time when all spheres of life are subject to innovation, and the education system has not lagged behind them. Yes, the development of technology, the improvement of the Internet, which covers all spheres of our lives, has made it possible to communicate even when we are far away. Thus, the Internet, which creates platforms that are important for people every day, has transformed the education system into a digital system.

This means that the digitalisation of the education system also means online learning. Given the tense situation in the world, digital education has made it possible for everyone to get a good education and a job. With the digitalisation of the education system, it has become easier for everyone to obtain international certificates or diplomas, which was previously impossible. It has also made it possible to participate in important international or interregional meetings.

In addition, Mertala (2020) believes that "educational tools and technologies allow students to develop effective self-study skills. Students can analyse what they need to learn, how to find and use online resources. Digital learning increases their efficiency and productivity."

According to Creely & Henriksen (2019), "digital learning tools and technologies sharpen critical thinking, which is the basis for developing systems thinking that motivates students. Students also develop a positive sense of exploration when they acquire new knowledge and skills through digital learning tools, which gives them the confidence they need to want to learn even more."

The digitalisation of education has numerous benefits that are changing the nature of the learning process and making it more efficient, accessible, and flexible. At the same time, the introduction of digital technologies in education requires careful attention to security, privacy, and ethical issues. To ensure the effectiveness and reliability of digital tools in the learning process, the benefits and security aspects of digitalisation of the education system should be considered concurrently.

The transition to a digital learning environment has opened up many new opportunities for students, but it has also created new challenges, including from a security perspective. Security in the digital learning environment is a shared responsibility of all participants in the educational process.

Bullying and harassment online can cause significant psychological harm. Children can become victims of phishing and identity theft. Access to harmful content can have a negative impact on mental development.

Hurevych, Konoshevskyi & Opuhko (2022) believe that "the digital education system makes the assessment of each studsent much more transparent and informative through real-time progress monitoring and automatically generated reports."

Student safety in the digital environment can be ensured by regularly training students, teachers, and parents in safe behaviour on the Internet, developing clear rules for the use of digital devices in schools, and collaborating with parents, psychologists, and law enforcement agencies to address cybersecurity issues.

5. Conclusions

Digitalisation of education entails important reforms in all areas of education.

Digitalisation is the process of converting any data (texts, images, sounds, etc.) into a digital form convenient for processing by a computer. Many experts predict that digitalisation will be a key moment in the history of education, changing it forever.

In the article, we examined the role of digital learning environments in today's education and their impact on neurodevelopment, characterised the neuropsychological aspects of students in a digital educational environment, explored the possibilities of a digital learning environment for developing students' personal potential, and identified the conditions, benefits, and safety of students.

The digital educational environment has great potential for improving the quality of education. However, to achieve maximum results, it is necessary to understand its impact on students' neurodevelopment and apply a balanced approach to the use of digital technologies.

The article proves that the most important measure that allows taking a decisive step towards solving the fundamental task of improving the quality of education is the development of personalised education. This approach is organically linked to the ideology of the fourth industrial revolution, in which new technologies, especially those based on AI, are used for the personalised production of material products or the provision of personalised services. In this respect, personalised education is in the context of current technological trends.

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