STUDY OF METHODS OF TEACHING DIGITAL SKILLS AND DEVELOPMENT OF COMPUTER LITERACY AMONG STUDENTS

ESTUDO DE MÉTODOS DE ENSINO DE COMPETÊNCIAS DIGITAIS E DESENVOLVIMENTO DA LITERACIA INFORMÁTICA ENTRE OS ALUNOS

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Abstract. Modern education is experiencing an era of digital transformation, in which the teaching of digital skills and the development of computer literacy among students become an integral part of preparing for the challenges of the modern information society. Emphasis on the integration of advanced technologies and methods in the learning process opens up new opportunities for improving the quality of education and forming key competencies in students. The purpose of the study is to analyze modern approaches to teaching digital skills and strategies for the development of computer literacy, which allow us to effectively respond to the needs of the labor market and technological changes. The article examines in detail the methods of integrating digital tools into the educational process, the impact of digitalization on educational standards, and the development of educational programs that meet modern requirements. The results of the study indicate the growth of the digital education market, the importance of adaptive learning, an interdisciplinary approach to preparing students for effective work in a digital environment. The results indicate the need for educational institutions to deeply rethink traditional teaching methods in order to create flexible and innovative learning environments that can adapt to the changing technological and social demands of the modern world. The article pays special attention to the prospects of implementing interactive and individualized learning methods that contribute to a deeper assimilation of digital competencies and prepare students to solve complex problems in the future professional life. The findings emphasize the need to develop comprehensive learning strategies with a further perspective on the development of critical thinking, creativity and the ability to quickly learn in a digital format.

Keywords: digital skills, computer literacy, teaching methods, educational process, innovative approaches, learning effectiveness, higher education, educational platforms.

Resumo. A educação moderna vive uma era de transformação digital, na qual o ensino de competências digitais e o desenvolvimento da literacia informática entre os alunos se tornam parte integrante da preparação para os desafios da moderna sociedade da informação. A ênfase na integração de tecnologias e métodos avançados no processo de aprendizagem abre novas oportunidades para melhorar a qualidade da educação e formar competências essenciais nos alunos. O objetivo do estudo é analisar abordagens modernas de ensino de competências digitais e estratégias para o desenvolvimento da literacia informática, que nos permitam responder eficazmente às necessidades do mercado de trabalho e às mudanças tecnológicas. O artigo examina detalhadamente

os métodos de integração de ferramentas digitais no processo educacional, o impacto da digitalização nos padrões educacionais e o desenvolvimento de programas educacionais que atendam aos requisitos modernos. Os resultados do estudo indicam o crescimento do mercado de educação digital, a importância da aprendizagem adaptativa, uma abordagem interdisciplinar para preparar os alunos para um trabalho eficaz em um ambiente digital. Os resultados indicam a necessidade de as instituições de ensino repensarem profundamente os métodos tradicionais de ensino, a fim de criar ambientes de aprendizagem flexíveis e inovadores que possam se adaptar às novas demandas tecnológicas e sociais do mundo moderno. O artigo dá especial atenção às perspectivas de implementação de métodos de aprendizagem interactivos e individualizados que contribuam para uma assimilação mais profunda das competências digitais e preparem os alunos para a resolução de problemas complexos na futura vida profissional. As conclusões enfatizam a necessidade de desenvolver estratégias de aprendizagem abrangentes com uma perspectiva adicional sobre o desenvolvimento do pensamento crítico, da criatividade e da capacidade de aprender rapidamente em formato digital.

Palavras-chave: competências digitais, literacia informática, métodos de ensino, processo educativo, abordagens inovadoras, eficácia da aprendizagem, ensino superior, plataformas educativas.

1. INTRODUCTION

In today's world, technological progress determines the pace of development of the economy and society, where the role of digital technologies is steadily growing, penetrating all aspects of human life. Innovative transformation touches education, health, industry and entertainment, digitalization transforms traditional approaches, demanding new competencies and skills and in providing these areas by training professional specialists. Global development and demand creates unprecedented opportunities for innovation, but also creates challenges that society must be able to effectively cope with. The widespread adoption of digital technologies forces a rethinking of approaches to work, education and everyday life, emphasizing the need for constant updating of knowledge and skills to ensure competitiveness in the labor market and adapt to a rapidly changing environment. Modernization of education and training is a key element capable of ensuring the relevance of knowledge and flexibility of thinking, which are necessary for successful adaptation to new conditions. Practicing gradual transformation means revising traditional curricula, implementing interactive and hands-on learning methods that focus on the development of critical thinking, creativity and the ability to quickly learn independently with the help of digital technologies. Digital education should be focused on the formation of competencies that allow you to work effectively in a digital environment, adapt to new technologies, and actively apply them to solve complex problems. This approach requires educational institutions to update their curricula, to attract teachers who are able to impart knowledge in the context of modern realities and innovations. The quality and specifics of improving students' digital skills are at the heart of training a new generation of professionals capable of adapting to changes and leading the development of technological progress. Training programs should be aimed at the transfer of specific knowledge, the development of universal digital skills, working with large volumes of information and the ability to sort it, programming, cyber security and a number of digital platforms. An important aspect is the formation of interpersonal communication and teamwork skills in an online environment, which is becoming more and more relevant in the context of globalization and remote work. Improving the quality of digital education involves the use of the latest technologies and learning methods, including virtual and augmented reality, gaming methods, as well as personalized learning trajectories that take into account the individual needs and abilities of each student.

2. LITERATURE REVIEW

The issue of digital skills and the transformation of education focuses on the analysis of various approaches to teaching and developing computer literacy among students. The importance of this topic in the modern educational space is emphasized in the work (Aremu, 2023), which indicates the need to adapt educational programs to rapidly changing technological conditions. Research (Campanozzi, 2023) examines innovative teaching methods, including the project method and gamification, which contribute to the active involvement of students in the learning process and the development of their practical skills.

The article (Bello, 2023) focuses on the use of digital platforms and interactive content, which allows for a deeper understanding of the material and the development of competencies in the field of IT. The author (Li, 2023) draws attention to the importance of an interdisciplinary approach in education, which includes the integration of digital skills in various fields of knowledge. The scientist (Tian, 2023) analyzes the trends of further educational development, taking into account the role of investments in educational platforms, which become the main factor in the formation of digital literacy.

The work (Antoun, 2023) emphasizes that funding in the field of development and implementation of innovative educational tools is critically important for improving the quality of education. According to (Putri, 2023), the development of digital libraries facilitates access to open educational resources and platforms for online learning, and for students it creates opportunities for self-education and supports a continuous learning process.

The author (Söderlund, 2023) points to the importance of partnerships between educational institutions and IT companies for the creation of effective and relevant educational products. The scientist (Tang, 2024) conducts research on the use of a combined methodological approach for a comprehensive understanding of the problems of teaching digital skills in pedagogical practice and interactive technologies. The article (Benyta, 2023) indicates that with the help of questionnaires, interviews and case analysis, they were able to identify general trends in individual differences in approaches to learning in different universities.

The author (Khan, 2023) believes that there is a need to create internal digital platforms for the effective application of various teaching methods and the determination of optimal strategies for the development of computer literacy. A study (Akpobasah, 2023) includes an assessment of the impact of socio-economic factors on students' access to digital resources, which has added challenges to the development of recommendations for increasing equity in education.

The scientist (Rawat, 2024) believes that teaching digital skills and developing computer literacy among students contributes to the importance of integrated educational approaches that combine traditional teaching methods with innovative digital tools. The author (Hämäläinen, 2021) points to the effectiveness of using online courses, interactive webinars and virtual laboratories in stimulating students' interest in learning and improving their practical skills.

According to a study (Gómez-Trigueros, 2023), an important aspect is the development of computer skills, critical thinking, communication skills and the ability to work in a team, as they are an integral part of competence in a digital environment. Analysis (Jørgensen, 2023) shows that flexibility of educational programs and an individual approach to each student contribute to more effective assimilation of knowledge and skills.

According to (Nazari-Shirkouhi, 2023), the role of investment in educational technologies and platforms in the development of digital literacy cannot be overestimated due to the growth of digital business and the role of online services. Theses (Falcinelli, 2021; Slipchuk et al., 2021) provide insight into modern hardware, software, and interactive content

development in creating stimulating and effective digital learning environments. The author (Yeşilyurt, 2023) highlights the successful experience of using online platforms for distance learning, which provide convenient access to educational resources and promote independent learning and development of digital skills.

The work (Lüdke, 2023) emphasizes the need to integrate digital tools into all aspects of the educational process, from lectures and seminars to independent work of students, which requires teachers to constantly update their knowledge and improve teaching methods. It can be concluded that the peculiarities of conducting research in the digitalization of the educational sector include the use of an interdisciplinary approach that allows covering various aspects of digital learning and literacy.

Taking into account the dynamics of digital transformation, the question arises of the importance of constant monitoring of educational innovations and their impact on the development of students' skills and competencies.which requires teachers to constantly update their knowledge and improve teaching methods. It can be concluded that the peculiarities of conducting research in the digitalization of the educational sector include the use of an interdisciplinary approach that allows covering various aspects of digital learning and literacy.

3. RESEARCH GOALS

The purpose of the article is to analyze the effectiveness of modern methods of teaching digital skills and the development of computer literacy among students, as well as to identify key factors that contribute to the improvement of the quality of education in this area. The problem of the research focuses on the identification and analysis of challenges and barriers that students and teachers encounter during learning and teaching of digital disciplines.

A promising direction of research is the development of innovative approaches and tools that can be integrated into the educational process to improve the teaching of digital skills. The tasks of the research are to determine the most effective teaching methods, analyze the needs of students in digital literacy and develop recommendations for improving educational programs.

The practical significance of the research is expressed in the possibility of applying its results to optimize educational processes in higher educational institutions, which will contribute to the training of qualified specialists capable of working effectively in the conditions of a modern digital society.

4. MATERIALS AND METHODS

A comprehensive methodology was developed for the implementation, which included a detailed review of scientific publications, analysis of statistical data, and a study of the experience of leading universities in Europe. The contextual analysis of scientific publications made it possible to identify key theoretical approaches and concepts in the field of digital education, the evaluation of statistical data made it possible to characterize the real state of affairs of the formation of digital education, to identify the main trends and challenges in its transformation.

The study of the experience of universities in Europe focused on the study of effective teaching methods, as well as on the analysis of ways to integrate digital technologies into the educational process. The most successful practices are explored and how they should be adapted and implemented in educational disciplines. This approach provided a deep understanding of the mechanisms of formation of digital literacy and revealed potential opportunities for further development in this field. An important aspect of the study was the

analysis of trends in further educational development and the role of investments in educational platforms as the main factor in the formation of digital literacy.

Special attention was paid to the study of public and private initiatives regarding financing and development of innovative educational technologies and platforms. The analysis showed that investments in digital education contribute to increasing the level of computer literacy among students and play a key role in the formation of flexible and adaptive educational systems capable of responding effectively to rapid changes in the technological and social environment.

This research factor emphasized the importance of strategic planning and interaction between educational institutions in order to ensure the sustainable development of digital education. The peculiarities of conducting the research consisted in the use of a combined approach, since the combination of various methodological approaches provided a comprehensive view of the problem, allowing to identify both general trends and unique features of individual educational programs and initiatives.

Therefore, the proposed research methodology makes it possible to present the results regarding the formation of digital skills and their application in the future in the conditions of rapid digitization of educational processes and the need of the labor market for competent personnel.

5. RESULTS

In today's world, digital skills play a key role in personal development and professional growth. Thanks to the rapid development of technology, the ability to effectively use computer programs, Internet resources and digital tools is becoming an advantage and a necessity in many areas of life.

The most important data skills in the field of IT, education, medicine, business, scientific research and even art. Digital literacy allows people to better adapt to changes, learn quickly and solve problems effectively. It opens up access to an unlimited amount of information, learning resources and communication opportunities. Without these skills, a person risks being left behind in today's digital society, where almost every field of activity requires a certain level of digital competence. Due to the rapid development of digital technologies, the relevant skills are becoming more and more important. Digital transformation covers more and more aspects of our lives, from everyday communication to solving global challenges such as climate change, epidemics and international security.

Having digital skills allows people to consume information, create new knowledge, develop innovative products and services, influence social processes and participate in important decision-making. Education and training in digital skills are becoming part of the academic curriculum, a critical component of modern culture that shapes the future of our society.

There is a steady increase in the number of students who choose the online format of education. The trend has gained particular relevance in recent years, when the world has faced challenges related to the COVID-19 pandemic, which has contributed to a rethinking of traditional approaches to education. Online education offers flexibility, accessibility, and the ability to personalize the learning process, which makes it attractive to a wide audience of students. People from anywhere in the world can receive knowledge from leading universities without the need to be physically present in the classroom.

The digitization of education opens the door to greater inclusiveness and democratization of education, allowing everyone, regardless of their financial capabilities or geographic location, to build their future. The total number of students entering online or blended learning is shown in Figure 1, including the forecast for 2024-2027.

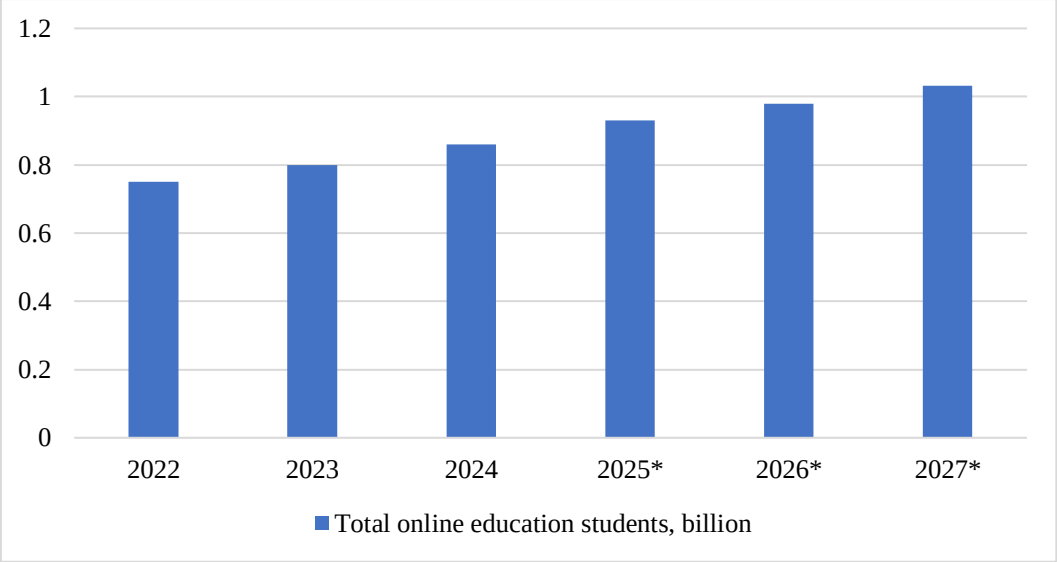

Figure 1. Total online education students. Source: based on Colorlib Report
**2025-2027 projected number*

Digital literacy among students in Europe has become one of the key priorities of education policy due to the rapid development of technology and the growing need for digital skills in the labor market. European educational institutions are actively working to ensure that students acquire fundamental knowledge in their fields, develop important digital skills that will allow them to function effectively in today's digital society. The latest practice involves learning to work with databases, programming, digital security, as well as understanding and using artificial intelligence and machine learning. The European Union has initiated a number of programs and initiatives, such as "Digital Education for All" and "The New Skills Agenda", which aim to increase the level of digital literacy among students and more broadly among the entire population of the EU. The programs are aimed at the development of digital skills and at stimulating the interest and motivation of students for independent learning in computer technologies. The process of digitalization of universities in Europe is another important step on the way to increasing the level of digital literacy among students. Many universities are implementing innovative IT solutions, creating virtual learning environments and developing online platforms for distance learning. Technology makes education more accessible by promoting the development of digital skills through students' direct use of digital tools and technologies in the learning process. Educational platforms include real-time collaboration modules, virtual labs, interactive courses, and self-study resources, greatly expanding opportunities for developing digital skills. A significant number of universities in Europe cooperate with IT companies and organizations to create specialized programs that prepare students for work in the field of high technologies, emphasizing the practical application of acquired knowledge.

Modernization of education in Europe, in view of the digital transformation, requires a comprehensive approach that includes updating curricula, developing infrastructure and training teachers. The latest approach requires the introduction of new technologies, a change in the very approach to education with a focus on critical thinking, creativity and the ability to learn throughout life. An important aspect of modernization is ensuring equal access to digital education for all students, regardless of their social and economic status. European education initiatives emphasize the importance of partnerships between governments, educational institutions and the private sector to achieve these goals. The modernization of education in Europe, aimed at the development of digital skills, creates a solid foundation for preparing the younger generation for a successful career in a dynamic and rapidly changing

world. The share of capitalization of modern universities in the direction of digitalization through online education is shown in Figure 2.

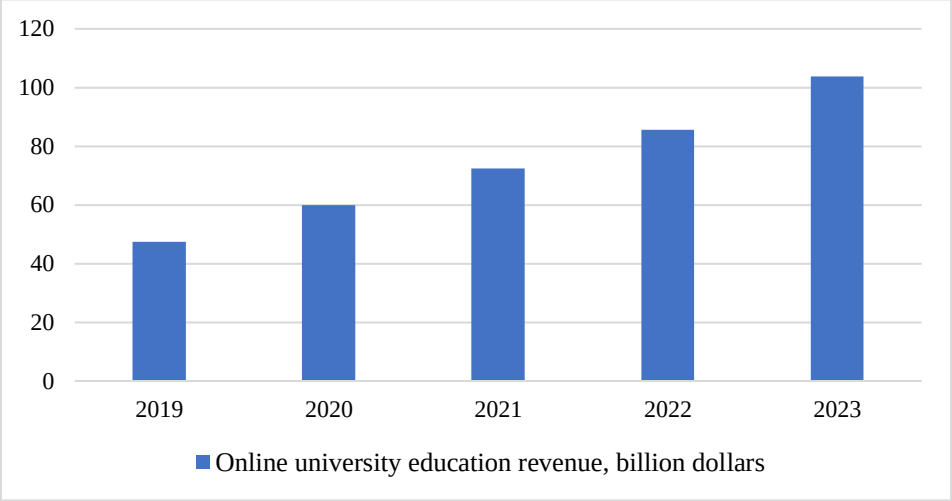

Figure 2. Global online university education revenue growth over the years
Source: based on Colorlib Report

Modern methods and practices for improving computer literacy include a wide range of approaches that adapt to the changing needs and technological development of society. One of the key elements is the integration of digital learning into educational programs at all levels, from schools to higher education institutions. This includes the use of interactive online courses, virtual laboratories, modules for self-study, as well as gamified elements that make the learning process more integrated and effective. Specialized training and workshops that focus on specific skills such as programming, working with databases, digital design and cyber security also play an important role. The approach to learning is becoming increasingly individualized, allowing students to develop the necessary skills at their own pace, taking into account their interests and professional goals.

The role of teachers in the formation of digital skills cannot be underestimated. They act not only as mediators of knowledge, but also as mentors who motivate and inspire students to constantly improve themselves in the digital sphere. The effectiveness of teachers increases significantly due to their ability to integrate the latest technologies into the educational process, as well as to adapt teaching methods to the individual characteristics of each student. An important aspect is the constant professional growth of teachers and lecturers, their participation in trainings and seminars on digital education, which allows them to remain at the forefront of educational innovations. Educators also play a key role in the formation of critical thinking, teach students to analyze and be critical of information, which is important in the age of information overload. The main methods of improving digital skills and computer literacy among students are depicted in Table 1.

Table 1. Methods of improving computer literacy among students

Method	Description of the method	Application examples
Design method	Students work on specific projects that require the application of digital skills.	Website creation, software development
Case method	Analysis of real cases of using digital technologies to solve specific problems.	Study of IT application in business, data analysis
Game methods	Using educational games and simulations for teaching students.	Coding through the game, project management simulators
The flipped classroom	Students study new material at home through videos or online courses, and work on	Video courses on programming, online trainings on IT security

	assignments in class.	
Method of project laboratories	Students work in specialized laboratories to develop and test digital projects.	Development of mobile applications, IT projects with artificial intelligence
Method of mixed learning	A combination of online learning and traditional classroom classes.	Online programming courses with regular classroom meetings
Method of learning through experience	Learning based on practical experience using digital technologies.	Internships in IT companies, practical IT projects

Source: developed by the authors.

In addition to pedagogical methods and practices, digital platforms have become a fundamental part of the educational process, which contributes to the formation of skills and computer literacy. Online platforms Coursera, Udemy, Khan Academy, provide access to thousands of courses in a wide variety of disciplines, allowing students to acquire new knowledge and improve existing skills. The use of cloud services, shared project tools and virtual workspaces promotes the development of cooperative skills and allows you to conduct projects in a team, regardless of the geographical location of its members. Digital platforms contribute to the personalization of learning, adapting the material to the needs and knowledge level of each user, which makes education more effective and popular (Spivakovskyy et al., 2020).

So, the trends and perspectives of the development of technologies in the field of education indicate the continued integration of digital tools into the educational process, as well as the search for new approaches to learning that would be maximally adapted to the needs of a modern student. Innovative technologies open up new opportunities for creating adaptive learning systems that can automatically analyze student progress and offer individualized tasks and study materials.

There is a growing importance of virtual and augmented reality, which provide alternative learning experiences, enhancing the learning of complex concepts through visualization and interactivity. In the future, we can expect a further fusion of education and technology, where the main factor will be not just access to information, but the ability to think critically, creatively approach problem solving and work effectively in a team, which will become the key to success in a rapidly changing world.

6. DISCUSSIONS

The study of methods of teaching digital skills and the development of computer literacy among students revealed a significant influence of interactive learning methods on the effectiveness of mastering the material, which is echoed in the results of other researchers. The application of gamification in the article (Gibelli, 2023) showed an increase in motivation and an improvement in the acquisition of digital competences, which correlates with own observations.

The results obtained in the research process reinforce the idea (Emidar, 2023) about the importance of an individualized approach to learning, allowing students to progress at their own pace. Compared to the findings (Majeed, 2023), which emphasize the use of massive open online courses to increase access to education, there is a need to improve digital platforms. A study (Bucar, 2023) points to the importance of integrating practical tasks and project work for a deeper understanding of the material, which supports its own recommendations.

According to (Adomi, 2023), the involvement of students in real projects with the use of digital technologies contributes to better acquisition of skills, which is confirmed by existing theses. Analysis (Moscetti, 2021) points to the importance of the social aspect in education, emphasizing the role of joint projects with the international community, which is a fundamental factor of the conducted research.

On the other hand, the work (Ningsih, 2023) emphasizes the need to include critical thinking and data analysis in programs for the development of digital skills, which prompts reflection on the approach to teaching and independence.

The hypothesis (Jørgensen, 2023) has been confirmed regarding the introduction of innovative technologies as a key means of engaging students in learning, effectively shaping the educational level. The obtained results support the idea (Bello, 2023) of the need to integrate educational modules on digital ethics and safety so that students develop technical skills and are aware of the potential risks of responsibility in the digital space.

Despite the high evaluation of the effectiveness of interactive learning and the use of the latest technologies, as indicated in the study (Badizadeh, 2023), it remains critical to ensure access to resources for all students to avoid widening the digital divide. Given the challenges associated with the COVID-19 pandemic, the work (Jawad, 2023) highlights the adaptation of teaching methods to the online format, which is in line with observations about the importance of education in today's digital development. Therefore, the effective study of methods of teaching digital skills and the development of computer literacy play a key role in preparing students for the challenges of the modern technological world.

7. CONCLUSION

Thus, in the process of researching methods of teaching digital skills and developing computer literacy among students, it was found that the integration of digital technologies into the educational process is a key factor in preparing students for a successful career and active citizenship in the modern digital society. The use of innovative approaches in the form of a project method, gamification and the involvement of digital platforms for learning plays an important role in ensuring a high level of involvement and, as a result, student motivation. The role of teachers in the formation of digital skills is irreplaceable, as they transfer knowledge, form students' ability to think critically, analyze information, and effectively apply the acquired knowledge in practice. Given the rapid changes in the technological space, educational institutions are faced with the challenge of constantly updating curricula and methods, meeting the current needs of the labor market and society.

Issues and global challenges related to the teaching of digital skills and the development of computer literacy include a shortage of qualified teachers who can effectively integrate digital technologies into the educational process. Uneven access to digital resources among students, caused by socio-economic differences, necessitates constant updating of technical equipment and software. In today's education, there is a problem of ensuring data security and privacy in the digital environment. Military conflicts and international tensions require a comprehensive approach and cooperation between governments, educational institutions and the private sector to ensure effective and equitable teaching of digital skills.

For the effective transformation of traditional education in order to improve the level of computer literacy among students, it is necessary to take a number of recommendations and measures. It is important to invest in the professional development of teachers by providing them with access to resources to learn and update their digital skills. Equal access to digital resources for all students needs to be ensured, including the implementation of support programs for those who may face difficulties in accessing technology. It is necessary to regularly update educational programs and equipment in order to meet modern technological standards and labor market requirements. It is appropriate to pay attention to the development of partnership cooperation between educational institutions and the government for the joint development of innovative educational projects and programs that would contribute to the improvement of digital skills and computer literacy among students. Considering the speed of changes in the technological world, such activities will become the foundation for preparing students for effective activities in the modern digital society.

Br. J. Ed., Tech. Soc., v.17, n.se1, p.114-124, 2024
DOI http://dx.doi.org/10.14571/brajets.v17.nse1.114-124
ISSN 2317-9907

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