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THE IMPACT OF DIGITAL TECHNOLOGIES ON SCHOOL-UNIVERSITY COWORKING

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Abstract. The rapid evolution of digital technologies has significantly transformed various aspects of education, creating new opportunities for coworking between schools and universities. By examining current trends, case studies, and potential challenges, this paper provides insights into how digital technologies can be leveraged to improve educational outcomes and facilitate smoother transitions for students. This article examines the applications of digital tools in facilitating, documenting, and analyzing collaborative efforts between these two educational institutions. By reviewing recent studies and initiatives, we identify key technological advancements, methodologies, and best practices that enhance coworkings. The findings underscore the essential role of digital technologies in promoting effective partnerships and fostering educational innovation. Digital technologies such as cloud-based platforms, virtual communication tools, learning management systems (LMS), and interactive media have revolutionized how educators and institutions work together. These tools provide a seamless flow of information, expand access to educational resources, and enable innovative approaches to both teaching and learning. Coworking between schools and universities has historically been focused on physical meetings, shared projects, and in-person interactions. However, with the advent of digital technologies, new forms of coworking have emerged that transcend geographical and temporal boundaries. This article examines the role that digital tools and technologies play in enhancing and reshaping the collaborative efforts between schools and universities.

Key words: digital technologies, coworking, schools, universities, educational research, technology in education, digital tools, educational institutions

Introduction

The foundational theories behind school-university collaboration encompass community of practice theory, constructivist learning theories, and systems thinking. These frameworks focus on collaborative learning and the joint creation of knowledge, emphasizing the role of digital technologies in enhancing these processes by enabling communication, data exploration, and information exchange. In today's context, the relationship between students and universities mirrors that of consumers and providers of educational services. Additionally, a characteristic of university clients is their uncertainty about what they specifically

seek from these services. It is beneficial for educational institutions to assist applicants in making informed choices while simultaneously attracting new students. Consequently, universities are eager to establish active partnerships with schools. Overall, the digital transformation of the education system is crucial for training modern, competitive professionals. Numerous researchers, such as Darling-Hammond [1] and Smith [2], have sought to define effective strategies for improving teachers' professional development through university-school collaboration.

Spivakova E. [3] identified three key forms of coworking between schools and universities:

1. *Educational and Methodological Cooperation*

This type of coworking includes:

• Updating and adapting the content of specialized education to align with specific educational focuses;

• Developing and testing textbooks, teaching aids, and instructional materials for both students and educators involved in partner secondary schools;

• Overseeing the educational process in specialized subject areas;

• Facilitating direct professional interactions between school and university teachers to exchange knowledge and experience.

2. *Scientific and Methodological Coworking*

This form is characterized by:

• Organizing elective courses and extracurricular clubs hosted by schools and universities;

• Jointly conducting academic Olympiads, seminars, and competitions;

• Designing educational programs and teaching methods that ensure continuity between secondary and higher education;

• Providing expert evaluations and methodological support from university faculty for the enhancement of specialized school curricula.

3. *Personnel Enhancement Coworking*

This includes:

• Professional enhancement and retraining of teachers, aimed at enhancing their qualifications and helping university instructors adapt to the school environment;

• Assigning university staff to schools to support the teaching process and contribute to instructional and methodological work.

International research highlights the challenges teachers face when attempting to adopt innovative teaching strategies. However, M. Alderman [4] found that collaborative research aimed at developing new pedagogical knowledge and practices significantly enhances innovation outcomes. Similarly, T. Ley, J. Leoste, and K. Tammets [5] argue that joint creative efforts within scientific partnerships between schools and universities foster a culture where teachers take ownership of learning about and applying new teaching methods.

Coworking in research enables school teachers to conduct their own investigations and reflect critically on their instructional practices. According to K. McLaughlin and K. Black-Hawkins [6], participation in educational research

deepens teachers' understanding of their work and how to improve it. A. Crump and S. Khan [7] further emphasize that teachers, when working alongside academic researchers, can play a vital role in generating new pedagogical knowledge.

The outcome of cooperation between school teachers and university teachers is not only the introduction of innovations in the educational process and the generalization of the experience of school education, but also the changes taking place with teachers: the growth of their professional competence and personal transformations. R. Dann[8] notes that participation in practical research is evaluated by teachers as the best way to improve their qualifications, develops professional knowledge, skills highlighting and solving problems leads to improved learning, as well as to a sense of professional self-realization of teachers

Coworking between schools and universities is crucial for advancing educational quality and meeting the diverse needs of learners. Schools benefit from access to higher education resources and research, while universities gain insights into the practical challenges faced by institutions. This reciprocal relationship has increasingly been supported and transformed by digital technologies, which offer new avenues for communication, data collection, and analysis. Coworking between schools and universities has traditionally been limited by geographic, logistical, and administrative barriers. However, the advent of digital technologies has revolutionized the way educational institutions interact, share resources, and engage with students. Digital tools such as learning management systems (LMS), video conferencing platforms, and online coworking tools have opened up new avenues for partnerships, enabling institutions to work together more closely and effectively than ever before.

The integration of digital technologies into education began with the adoption of basic tools like email and online libraries. Over time, these technologies have evolved into sophisticated platforms that support a wide range of educational activities. Learning management systems, for example, allow for the seamless sharing of resources, assignment submission, and feedback between schools and universities. Video conferencing tools enable real-time coworking across different locations, while online forums and social media provide platforms for ongoing communication and community building.

According to L.V.Shmelkova [9], one of the priority qualities of a person adequate to the digital space is the possession of digital technologies by a person and the ability to use them in professional activities.

The issue of the use of digital technologies has been widely covered in scientific articles and researches over the past few years. The issue of digital technologies in the educational space was dealt with by such scientists and teachers as M.Makseenko, L. Shmelkova, E.Vartanova, S.Smirnov and others. As A.Y. Uvarov notes, the use of digital technologies should be carried out in conjunction with a "synergistic" updating of the content of education [10].

This approach will dramatically improve the quality of education. Oates & Bignell[11] show how digital Technologies are transforming coworking between schools and university.

1. Online Communication Platforms. Digital communication tools such as video conferencing software (e.g., Zoom, Microsoft Teams) and collaborative platforms (e.g., Slack, Google Workspace) have become essential in facilitating coworking. These platforms allow for real-time discussions, professional enhancement sessions, and collaborative project work, making it easier for educators and researchers to work together, regardless of geographic barriers.

2. Data Collection and Analysis Tools. Digital data collection methods, including surveys, online questionnaires, and learning analytics, enable researchers to gather quantitative and qualitative data efficiently. Tools such as Qualtrics and Google Forms are widely used for administering surveysю These tools enhance the robustness of research findings by enabling large-scale data collection and intricate data analysis.

3. Learning Management Systems (LMS). LMS platforms (e.g., Moodle, Canvas) support collaborative research by providing environments where schools and universities can share resources, course content, and research findings. These systems allow for the integration of academic and instructional materials, resources, and research outputs, facilitating access to collaborative projects and their outcomes.

4. Virtual Research Communities. Digital technologies have given rise to virtual research communities where scholars, educators, and practitioners can engage with one another. Online forums, social media groups, and collaborative networks such as ResearchGate foster interdisciplinary dialogue and knowledge sharing, breaking down silos that often exist between schools and higher education institutions.

5. Open Educational Resources (OER). The advent of OER has facilitated the sharing of teaching materials and research outputs between schools and universities. Platforms like OER Commons and MERLOT allow educators to create, use, and adapt resources that enhance coworking and promote innovative teaching practices across educational contexts.

The main task of digitalization in the field of education is to improve the quality of education, that is, to prepare young people of the country who are competitive in various fields, including in the field of "artificial intelligence" and "large – scale data". Kazakhstan's journey toward digital education began with the government's strategic initiatives to modernize the education system. The State Program for the Enhancement of Education and Science in Kazakhstan 2020-2025 highlights the importance of incorporating digital technologies to improve educational outcomes. This program aims to bridge the gap between urban and rural schools, ensuring that students from all backgrounds have access to quality education. Kazakhstan has invested heavily in digital infrastructure to support the integration of technology in education. The widespread availability of high-speed internet, even in remote areas, has enabled schools to adopt digital tools effectively. Interactive whiteboards, tablets, and laptops are now commonplace in many classrooms, allowing for a more engaging and interactive learning experience.

Below is a chart displayed by the global search engine. Acording to the diagram from Google Books Ngram Viewer, 1900-1990s: - The graph remains essentially flat, indicating that the phrase “digital technologies in education” was either not used or used extremely rarely in published books during this period. Gradual Increase in 1990s-2000-starting in the late 1990s, there is a slight uptick in the graph. This suggests the beginning of recognition and discussion of digital technologies in the context of education in published literature. Steep Rise 2000s-Present: From the early 2000s onwards, there is a sharp and continuous increase in the usage of the phrase. This indicates a growing emphasis on digital technologies in education, likely due to the rapid advancement and adoption of digital tools and the internet in educational settings. Current Peak 2022: The graph peaks around 2022, reflecting the culmination of decades of increasing interest and discourse surrounding digital technologies in education. This may also be influenced by the global shift towards online and remote learning, particularly during and after the COVID-19 pandemic.

Overall, the diagram illustrates a clear trend of growing interest and integration of digital technologies in education over the past few decades, particularly accelerating from the 2000s onward (Figure 1).

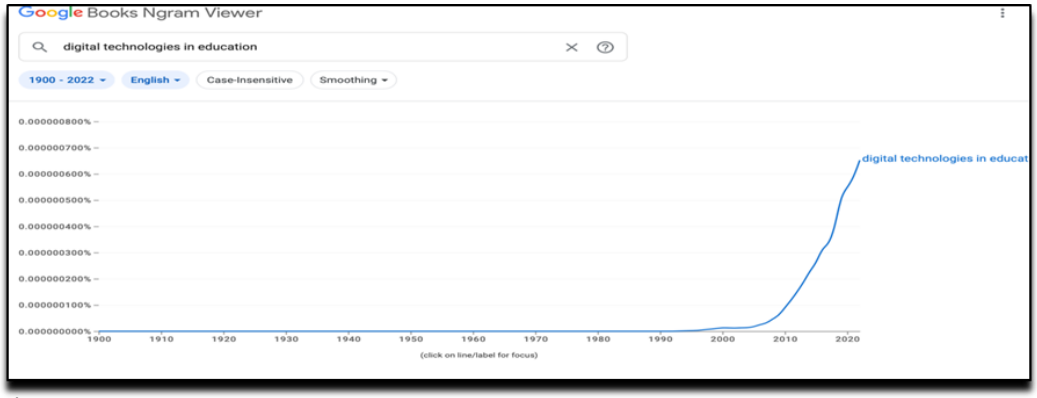

Figure 1 - History of using digital technologies in education

The integration of digital technologies in education has transformed how teaching and learning occur, making education more accessible, engaging, and personalized. As technology continues to evolve, its role in education will likely expand, offering new possibilities for enhancing learning experiences.

Today, conceptually, the education system is being implemented in three main areas: digitalization of the educational process, digital educational content, digitalization of Educational Management. However, the pandemic has made its own adjustments in this direction. The creation of digital educational content was carried out quickly. The global pandemic COVID-19 accelerated the implementation of the direction of digitalization of educational content[12].

Based on the outcomes of a 2023 study by international research organizations, the level of use of digital technologies in the field of education is as follows (Figure2).

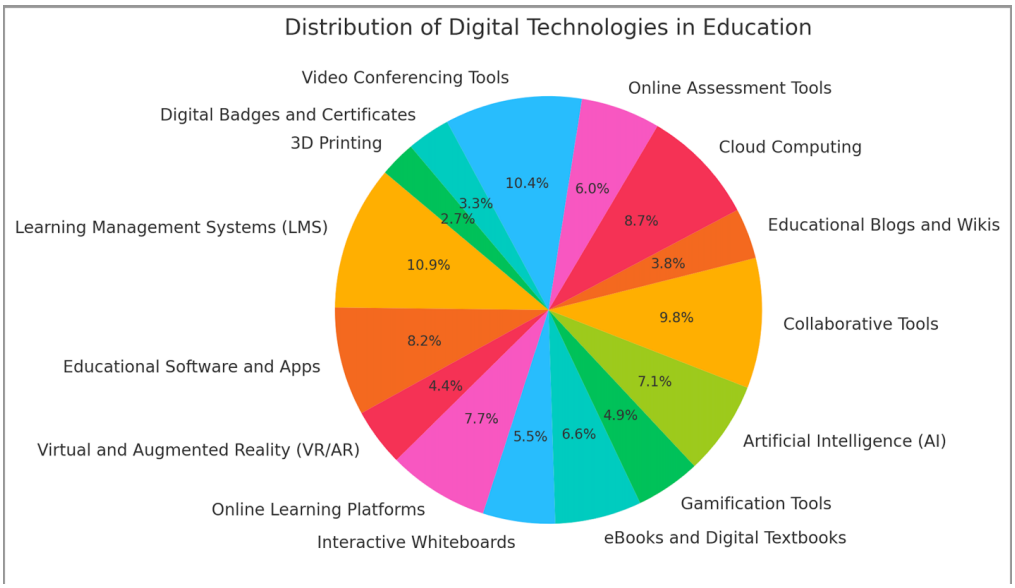

Figure 2 - Distribution of Digital Technologies in Education

Here's a pie chart that illustrates the distribution of different digital technologies in education. Each slice represents a different type of technology and its relative usage or importance in the educational field. This visualization helps to see which technologies are more prevalent or have a higher impact in educational environments.

With the introduction of digital technologies into the educational process, new terms like "digital classrooms" have emerged. A digital classroom offers various features designed to enrich the learning experience, including educational applications and websites. Key components of a digital classroom are feedback loops and technology. Feedback loops enable students to receive immediate feedback from their teachers, who can tailor their responses based on individual students, specific lessons, or groups. Additionally, tools like PowerPoint presentations, video presentations, e-learning methods, and online training are increasingly used in the teaching-learning process, making classroom instruction more interactive and engaging (Table 1).

Table 1 - Digital Technology in Education

Component: Digital Devices	Platforms and Tools	Benefits of Digital Technology	Feedback Mechanisms	Evolution of Education
1.Subcomponents 2-Laptops 3-Tablets 4-Chromebooks 5-Smartphones	1-Social Media 2-Multimedia 3-Educational Applications 4-Websites 5-E-learning Methods.	1-Faster Learning 2-Enhanced Engagement 3-Access to a Wide Range of Resources 4-Interactive Learning Platforms	1-Real-time Feedback 2-Teachers' Role in Providing Feedback 3-Use of Feedback Loops	1-From Traditional Methods to Digital Classrooms 2-Increased Interactivity 3-Opportunities for Self-directed Learning

In Kazakhstan, online learning is delivered in two main formats: synchronous and asynchronous. Synchronous learning requires real-time interaction between the teacher and students at a designated time, while asynchronous learning allows students to engage with the material at their own pace and on their own schedule. In the asynchronous format, instructors create and upload course content to an online platform, where students can independently access the materials and complete assignments. A key benefit of this approach is that learners can tailor their study time according to their individual needs and learning pace. They are also able to revisit previous content whenever necessary, which supports deeper understanding and retention of the material.

Materials and methods

As digital technology has advanced, so too have the research methods for studying collaborations between schools and universities. A mixed-methods approach, which integrates quantitative surveys with qualitative interviews, provides a more thorough and nuanced understanding of the dynamics in these partnerships. Additionally, case study methodologies often employ digital tools to document and analyze collaborative efforts, offering valuable insights into effective practices and common challenges. This research is based on data collected through anonymous surveys titled "Digital Technologies in Coworking Between Schools and Universities," which were created and distributed using Google Forms. Other data sources included official documents like cooperation agreements between schools and universities, as well as institutional reports detailing completed activities. The study's findings are drawn from both theoretical analysis of academic literature and the examination of empirical data.

Research tools and participants:

The study took place in Taraz and Almaty, focusing on M.H. Dulaty Taraz Regional University and Al-Farabi Kazakh National University, along with their associated schools. M.H. Dulaty Taraz Regional University works in conjunction with Gymnasium No. 40, which serves as a venue for both pedagogical and industrial training under a dual education system. Meanwhile, Al-Farabi Kazakh National University collaborates with School-Gymnasium No. 79, the Center for Russian Language and Culture, and the Republican Specialized Center named after Abai. The research included 88 participants, comprising teachers from both the schools and universities. The questionnaire employed in the study featured four sections with a total of 15 questions.

Results and discussion

Section 1: General Information

According to the outcomes of the study, Taraz (n=41) and Almaty (n=47) teachers took part in the study. Overall 47,7% University teachers, 52,3% School teachers.

Figure 3 illustrates the most selected one? of the questions in Section 2. *Section 2:* Use of Digital Technologies: 1. *Which digital technologies are most commonly used in your institution for coworking with other educational institutions?*- Video

Conferencing Tools (e.g., Zoom, Microsoft Teams)-90% (Figure 4), Learning Management Systems (e.g., Moodle, Blackboard)-2%, Collaborative Tools (e.g., Google Workspace, Microsoft 365)-1%, Online Assessment Tools-5%, Cloud Computing Platforms-1%, Others-1%; 2. *How frequently do you use digital technologies to collaborate with schools/universities?*- Daily-98%, Weekly-2%; 3. *In what ways do digital technologies enhance coworking between schools and universities*?- Access to shared resources and content-78%, Easier communication and coordination-10%, Student data sharing and analysis-8%, Professional enhancement and training-4%.

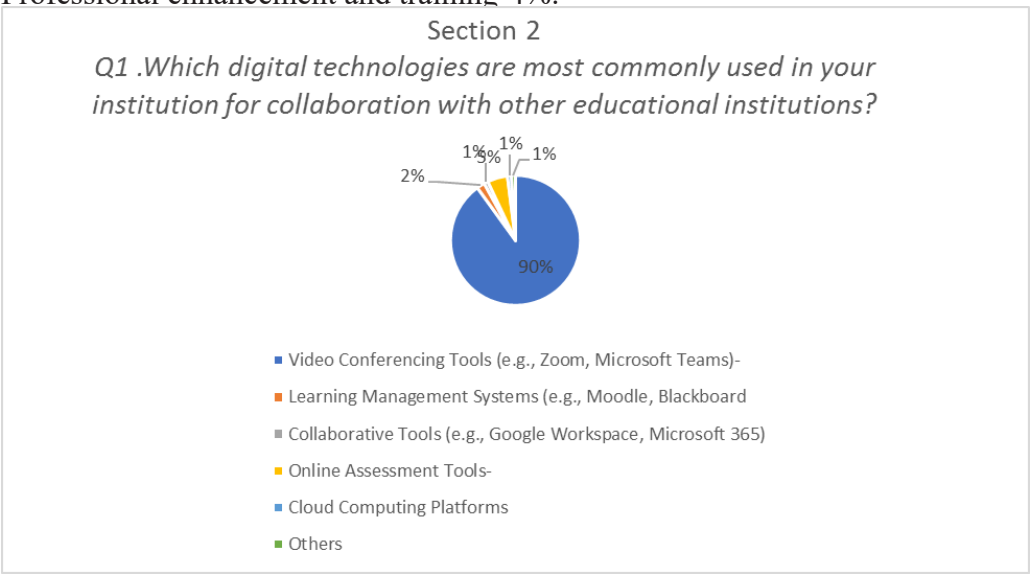

Figure 3 - The answer to the question ““Which digital platforms or technologies does your educational institution frequently employ to facilitate partnerships with other educational institutions?”

Section 3: Impact on Teaching and Learning: *How effective are digital technologies in supporting joint curriculum enhancement between schools and universities?*- Very Effective-97%, Effective-3% (Figure 4); *To what extent do digital technologies improve student transitions from school to university?*- Significantly improve-95%, Somewhat improve-3%, No noticeable impact-2%; *How do digital technologies facilitate personalized learning for students across both school and university settings?*- Highly facilitate-93%, Facilitate-6%, Neutral -1%; *What challenges have you encountered in using digital technologies for coworking between schools and universities?*- Lack of training or expertise-60%, Resistance to change-22%, Data privacy concerns-5%, Insufficient funding or resources-13%.

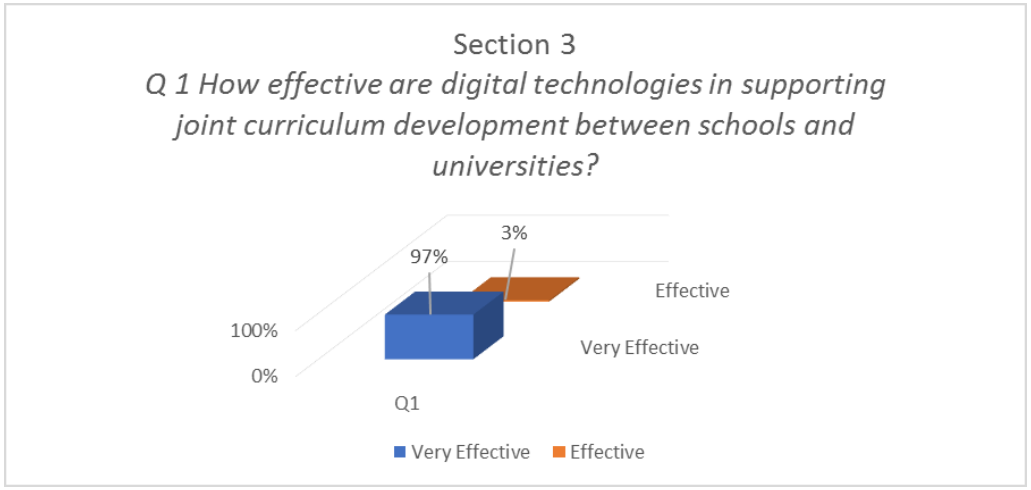

Figure 4 - The answer to the question 'How effective are digital technologies in supporting joint curriculum enhancement between schools and universities?'

Section 4: Future Perspectives: *In your opinion, what is the most significant benefit of using digital technologies in coworking between schools and universities?*- Enhanced communication and coordination-25%, Improved access to resources- 22%, Better alignment of curricula-24%, More efficient administrative processes- 16%, Greater support for student transitions-13%; *What areas of coworking could be further improved with the adoption of digital technologies*?- Joint research initiatives-34%, Curriculum alignment-35%, Teacher and faculty training, Student engagement and support Resource sharing-31% , *How likely are you to recommend the increased use of digital technologies in school-university coworkings?, What additional digital tools or technologies would you like to see implemented to improve coworking between schools and universities? Any other comments or suggestions regarding the role of digital technologies in coworking between schools and universities?*

These diagrams showed provide a clear visual representation of how digital technologies are used and their impact on coworking between educational institutions. As a outcome of the survey, we can see the importance and role of digital technology in cooperation between schools and universities.

Conclusion

Digital technologies have become essential in supporting research and collaboration between schools and universities. By improving communication channels, simplifying data collection, and facilitating the exchange of educational resources, these technologies help strengthen more meaningful and effective partnerships between institutions. To fully harness the potential of these collaborations, ongoing investment in digital infrastructure and research initiatives is crucial, with the ultimate aim of enhancing educational outcomes for all learners. However, several ongoing challenges impede the optimal use of digital technologies in promoting school-university collaboration. Issues

such as data privacy concerns, unequal access to technological resources, and the digital divide continue to present significant barriers. The digital divide, in particular—marked by differences in access to digital tools and connectivity—worsens existing inequities, especially among students from socioeconomically disadvantaged backgrounds. Additionally, varying levels of digital literacy and technological proficiency among educators can further complicate the implementation of collaborative digital initiatives. To tackle these challenges, schools and universities must collaborate to ensure equitable access to digital tools and resources for all members of the educational community. The findings of this study reaffirm the crucial role that digital technologies play in facilitating effective collaboration between schools and universities. Platforms such as video conferencing tools, learning management systems, and other digital applications have become indispensable for promoting communication, resource sharing, and professional development. As these technologies continue to advance, their potential to support and enhance inter-institutional collaboration is expected to grow. Therefore, it is essential for educational institutions to invest strategically in digital infrastructure and targeted training initiatives to ensure that these partnerships remain dynamic and productive in an increasingly digital educational landscape. Furthermore, ongoing professional development is vital to equip educators with the skills and knowledge necessary to effectively integrate digital technologies into their collaborative practices. Both schools and universities should prioritize the implementation of comprehensive training programs that keep faculty and staff updated on emerging digital tools and pedagogical innovations. Such efforts are essential to sustaining effective and equitable collaborations in the context of contemporary education.

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ЦИФРЛЫҚ ТЕХНОЛОГИЯЛАРДЫҢ МЕКТЕПТЕР МЕН УНИВЕРСИТЕТТЕР АРАСЫНДАҒЫ ЫНТЫМАҚТАСТЫҚҚА ӘСЕРІ

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Алматы Қазақстан

Аңдатпа. Цифрлық технологиялардың қарқынды дамуы білім беру салаласының әртүрлі аспектілерін айтарлықтай өзгертіп, мектептер мен ЖОО арасындағы ынтымақтастықтың жаңа мүмкіндіктерін ашты. Мақалада қазіргі тенденцияларды, кейстер мен мәселелерді талдау негізінде цифрлық технологияны оқу нәтижелерін жақсарту және оқушылардың жаңа оқу

процесіне өтуін жеңілдету үшін қалай пайдалануға болатыны туралы түсінік берілген. Сонымен қатар, мектеп және ЖОО білім беру мекемесінің бірлескен жұмысын жеңілдету үшін цифрлық технологияларды қолдану қарастырылады. Соңғы зерттеулер мен бастамаларды талдау нәтижесінде ынтымақтастықтыныңайтатыннегізгітехнологиялықжетістіктер,әдістермен оңтайлы тәжірибелер анықталды. Зерттеу нәтижелері тиімді серіктестіктер мен білім беру инновацияларын ілгерілетудегі цифрлық технологиялардың маңызды рөлін көрсетеді. Бұлтқа негізделген платформалар, виртуалды байланыс құралдары, оқытуды басқару жүйелері (LMS) және интерактивті медиа сияқты цифрлық технологиялар оқытушылар мен мекемелердің бірлесіп жұмыс істеу тәсілінде төңкеріс жасады. Бұл құралдар ақпараттың үздіксіз ағынын қамтамасыз етеді, білім беру ресурстарына қолжетімділікті кеңейтеді және оқытуға да, оқуға да инновациялық тәсілдерді енгізуге мүмкіндік береді. Мектептер мен университеттер арасындағы ынтымақтастық тарихи түрде физикалық кездесулерге, бірлескен жобаларға және бетпе-бет өзара әрекеттесуге бағытталған. Алайда, цифрлық технологиялардың пайда болуымен географиялық және уақыттық шекаралардан асып түсетін ынтымақтастықтың жаңа формалары пайда болды. Бұл мақалада цифрлық құралдар мен технологиялардың мектептер мен университеттер арасындағы бірлескен күш-жігерді жетілдірудегі және өзгертудегі рөлі мен қорытынды бөлімде мектептер мен жоғары оқу орындары арасында цифрлық технологияларды пайдалану негізінде білім беру үдерісін жетілдірудің перспективалары қарастырылады.

Тірек сөздер: цифрлық технологиялар, ынтымақтастық, мектеп, университет, білім беру саласындағы зерттеулер, білім берудегі технологиялар, сандық құралдар, оқу орындары

ВЛИЯНИЕ ЦИФРОВЫХ ТЕХНОЛОГИЙ НА СОТРУДНИЧЕСТВО МЕЖДУ ШКОЛАМИ И УНИВЕРСИТЕТАМИ

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Аннотация. Стремительное развитие цифровых технологий значительно изменило различные аспекты образования, создав новые возможности для сотрудничества между школами и университетами. На основе анализа современных тенденций, тематических исследований и потенциальных проблем в этой статье дается представление о том, как цифровые технологии могут быть использованы для улучшения результатов обучения и облегчения перехода учащихся к новому учебному процессу. Данная статья рассматривает применение цифровых инструментов для облегчения процесса документирования и анализа совместных усилий двух образовательных учреждений. В результате анализа последних исследований и инициатив, выявлены ключевые технологические достижения, методы и

оптимальные практики, которые укрепляют сотрудничество. Полученные результаты подчеркивают важную роль цифровых технологий в продвижении эффективных партнерских отношений и образовательных инноваций. Цифровые технологии, такие как облачные платформы, средства виртуальной коммуникации, системы управления обучением (LMS) и интерактивные медиа, произвели революцию в том, как преподаватели и учебные заведения взаимодействуют друг с другом. Эти инструменты обеспечивают непрерывный поток информации, расширяют доступ к образовательным ресурсам и позволяют применять инновационные подходы как к преподаванию, так и к обучению. Сотрудничество между школами и университетами исторически было сосредоточено на физических встречах, совместных проектах и личном общении. Однако с появлением цифровых технологий появились новые формы сотрудничества, которые выходят за рамки географических и временных границ. В этой статье рассматривается роль, которую цифровые инструменты и технологии играют в укреплении и изменении формы сотрудничества между школами и университетами.

Ключевые слова: Цифровые технологии, сотрудничество, школы, университеты, исследования в области образования, технологии в образовании, цифровые инструменты, образовательные учреждения

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