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ANALYTICAL REVIEW OF THE DIGITAL TECHNOLOGIES USAGE IN EDUCATION

Abstract: *The integration of online and digital technologies into learning processes has significantly transformed the pedagogical landscape, making education more accessible and flexible. These technologies help overcome traditional limitations related to time and space, enabling students and educators to engage in learning activities from virtually anywhere. As technology continues to advance and the demand for digital education grows, innovative educational platforms are emerging worldwide to enhance the learning experience.*

One such platform is BilimLand, which actively incorporates modern teaching methods and digital tools to improve the quality of education. BilimLand offers a wide range of interactive resources, multimedia lessons, and adaptive learning technologies, making it a valuable tool for both students and teachers. By integrating gamification elements and personalized learning pathways, the platform aims to create an engaging and effective educational environment.

This article presents an analytical review of digital resources designed to enhance the accessibility and flexibility of education. Additionally, it provides a comparative analysis of BilimLand in relation to leading global online learning platforms, examining its strengths, weaknesses, and unique features. The study aims to assess how BilimLand contributes to the evolving digital education ecosystem and its potential to compete with international e-learning solutions.

Key words: *online school, digital educational technology, educational platform, evaluation criteria, e-learning, education accessibility, BilimLand.*

Introduction

A key element of the United Nations' 2030 Agenda for Sustainable Development is quality education, with a focus on ensuring inclusive and equitable education for everyone. Digital technologies have already become vital in achieving other sustainable development objectives [1]. They offer tools to identify emission sources, enhance energy efficiency, promote low-carbon alternatives to fossil fuels, and even remove excess greenhouse gases from the atmosphere. These technologies aim to reduce or eliminate pollution and waste while boosting productivity and efficiency. And now, the impact of digital technologies on the education system has been significant, and their role has been further solidified by the recent COVID-19 pandemic [2, 3].

Online learning has accelerated the adoption of digital technologies, raising questions about the process, nature, scale and effectiveness of digitalization in schools [4]. In particular, many schools have experienced a lack of expertise and low digital capacity, which has intensified disengagement, inequality, and loss of learning [5-7]. These results highlighted the need for schools to develop expertise and digital capacity, and to increase the level of digitalization [8]. Digitalization offers the prospect for significant improvements in schools [9] and encompasses many aspects of school development [10]. However, the process is complex and requires deep transformation beyond the technical aspects of technology and infrastructure [11]. For a successful digital transformation, schools must strengthen their digital capabilities by building the necessary culture, policies, infrastructure, and digital competence of students and staff to support the effective integration of technology into the classroom.

Nowadays, digital technologies play an increasing role in education, helping teachers to organize their work more effectively and improve the quality of education. In this regard, the development of an application for organizing the teacher's work based on the study of the world's digital educational resources is becoming an increasingly relevant topic. Such an application can

become an indispensable tool for educators, helping them to find the necessary features quickly and easily. This study will consider the main directions of the world's digital educational resources research and key tasks in the development of such an application.

The purpose of this study is to investigate and analyze the existing digital technologies in education with a description of their functionality and advantages.

Overview of Online Education Systems

In 2023, the volume of the global online education market reached $237,3 billion. For comparison, in 2022, the figure was $195,8 billion. Thus, the growth of approximately 21% was recorded. The corresponding data are reflected in the Market Research Future report, published in mid-July 2024 [12].

Figure 1 – E-learning market industry

Online teaching has globally become a part of the learning process and has been more well-established in developed countries [13]. Online education platforms provide additional flexibility in terms of class schedules, formats and content, meeting a variety of needs.

If we look at the education market globally, analysts believe that by 2030 it will reach a volume of about $10 trillion with an average annual growth rate of about 5,8%. At the same time, in 2000 this market was estimated at only $2,8 trillion, and its cumulative average annual growth rate up to 2020 was about 4,3%. The structure of the global education market in 9 years is presented in Figure 2.

At the same time, the share of online education will still be small and will amount to about 5%. It is also worth noting that there are not enough solutions for school education on the market at the moment.

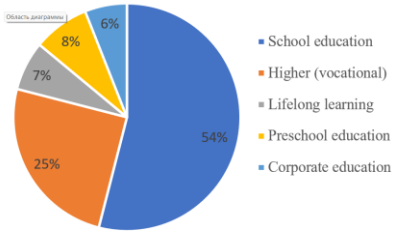

Figure 2 – The structure of the global education market

That is why more and more new educational companies are appearing, aimed specifically at working with schoolchildren, and the general distribution of EdTech startups in the world is currently presented in Figure 3.

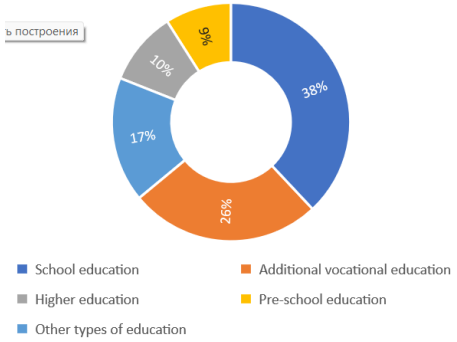

Figure 3 – General distribution of EdTech startups

The main advantages of online education: flexible schedule, which implies the possibility of choosing the time that is convenient for the learner; field flexibility, i.e. the possibility of obtaining specialized knowledge in any field in any educational institution in the world; individual approach; availability of unique training programs; focus on project activities, etc.

Algorithms for managing the formation of IT competencies in senior preschool children in the context of an information and educational environment [14], algorithms for constructing an educational policy for an educational institution [15], as well as methods for indicative planning of resource use [16] can be introduced into existing digital solutions.

There are many software solutions for the implementation and organization of e-learning classes. The use of modern digital technologies and tools allow teachers to effectively organize their work and improve the quality of education. The most widespread global online learning systems include the following platforms:

- Moodle is a learning management platform that is used in over 230 countries around the world [17];
- Blackboard is a learning management platform that is used in more than 100 countries around the world [18];
- Canvas is a learning management platform that is used in more than 1,000 educational institutions around the world [19];
- Edmodo is a platform for communication and collaboration in education that is used in more than 190 countries around the world [20];
- Google Classroom is a learning management platform that is used in more than 150 countries around the world [21].

The research analysis [22] indicated that Moodle exhibited the highest level of manifestation across all criteria, suggesting its significant advantages and preference for use in general secondary education institutions. In [18] research, it is focus on the accessibility of the Blackboard mobile app, which is one of the most common Learning Management Systems (LMS) used by many universities, especially during the current COVID-19 pandemic. Using Canvas as a LMS in educational settings offers both advantages and challenges. One of the key benefits is its support for asynchronous learning, allowing students to access and interact with course materials at their own pace, which helps accommodate various learning styles and schedules. Additionally, Canvas integrates a variety of learning tools and collaborative features, such as discussion forums and group projects, fostering an interactive learning environment that enhances student engagement and simulates real-world teamwork scenarios [19]. Students' perceptions will be compared to the teaching perspective of Google Classroom as an appropriate platform for achieving the desired learning outcomes in the ESP classroom in a more task-based, learner-centred, and multimodal learning environment. In addition to its numerous opportunities, [21] research also considers the challenges encountered by using Google Classroom such as cognitive overload, technical glitches, increased levels of plagiarism, social distancing, and excessive workload, which can be daunting both for students as well as teachers.

The most popular Russian software solutions for remote education include the following platforms:

- «Электронная школа» («Digital School») is designed for conducting lessons online, as well as for organizing remote education [23];
- «Skyeng» is an online English school, with a dedicated platform and video conferences [24];
- «GeekBrains» is an online programming school with video lessons and online courses [25];
- «Skillbox» is an online design and programming school with video lessons and online courses [26].

Courses are often accompanied by video lectures, tests and assignments that allow students to test their knowledge.

Overview of educational it solutions in Kazakhstan

Digitalization of school education is an integral part of the digital transformation of educational services in the information society. Under the Digital Kazakhstan program and in the framework of GIGA's cooperation with UNICEF and the International Telecommunication Union (ITU), efforts are being made to reduce the digital divide between urban and rural schools.

The Ministry of Education of Kazakhstan, working with educators, created a range of learning materials, such as television programs and instructional videos, that were made available through digital platforms that provided online access throughout the pandemic. As a direct result of this rapid shift to online learning, schools gained access to online knowledge and connections to other people and schools far beyond their immediate environment.

There are many online education platforms that provide courses in various fields. There are a number of leading global online learning platforms, the content and IT infrastructure of which are constantly being modernized: Coursera (more than 4,000 courses), edX (more than 3,000 courses), Udemy (more than 155,000 courses), FutureLearn (more than 400 courses), Khan Academy (more than 10,000 courses). Within the framework of this study, several Kazakhstani developments that are currently used in the educational market of Kazakhstan have been selected for content and IT infrastructure modernization:

- BilimLand is a multilingual online educational platform for teaching school subjects [27];
- OnlineMektep is a comprehensive solution for the teacher (organizer of e-learning in the traditional teacher-student model) and for the student in interaction with the teacher, or in the form of independent learning;
- BilimlandKids is a multimedia IT product for mastering the Kazakh language from an early age;
- iTest is an online simulator for preparation for UNT (Unified National Testing), final certification and EEEA (External Evaluation of Educational Achievements);
- Twig-Bilim is an innovative platform with a unique online learning resource that provides an opportunity to use interdisciplinary links in teaching science subjects with humanities subjects;
- Bilimcenter is a platform for organizing additional education and preparation for international comparative studies PISA, TIMSS, PIRLS with monitoring and certification;
- BilimUstaz is an online platform to support teacher's professional growth and activity, introduction of new pedagogical ideas and educational technologies that allow to form modern competencies of a teacher in the conditions of digital transformation of education;
- iMektep - interactive lessons for primary grades in Kazakh.

BilimLand is an educational platform that was developed to improve the quality of education in Central Asia [28]. The platform provides a wide range of educational materials and tools aimed at schoolchildren, students and educators.

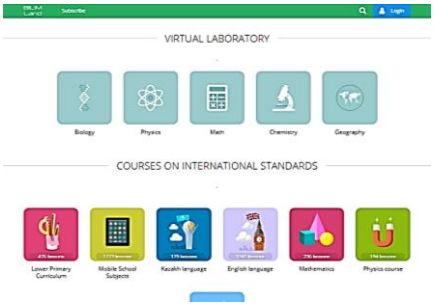

Figure 4 – BilimLand educational platform page

Key features of BilimLand include:

- Adaptive learning. The platform offers personalized courses and exercises that adapt to the learners' knowledge level and needs [29];
- Interactive materials. The website contains a variety of learning materials such as video lessons, interactive exercises and tests, which makes the learning process more engaging. Particularly worth mentioning is the virtual laboratory;
- Analytics and Reports. The platform provides tools for tracking students' progress, allowing teachers and parents to monitor progress and adjust the learning process in time;
- Courses in core subjects. BilimLand covers a wide range of school subjects, including math, physics, chemistry, languages, and more;
- Multi-language support. The platform is available in multiple languages, allowing it to be used in multilingual and multicultural educational environments.

Several mobile applications are available on the Bilimland.kz platform, each designed for specific purposes and audiences. A detailed description of each application is presented in Table 1.

Each of these applications is specifically designed to meet the needs of its audience, providing convenient access to educational resources and tools from mobile devices.

Table 1 – Functionality of Bilimland mobile applications for different user groups

Purpose	Content and functionality	Availability
Content Library		
Application for access to educational materials and resources	• Interactive lessons: View and use interactive lessons and multimedia materials. • E-textbooks: Access e-textbooks on a variety of subjects. • Video lessons: Viewing video lessons and presentations. • Tests and Assignments: Take tests and complete assignments for self-testing and preparation.	Designed for students and faculty, supports access from mobile devices
Teacher		
An application for educators to help create and manage the educational process	• Course Creation: Ability to create and customize training courses and lessons. • Classroom Management: Manage groups of students and track their progress. • Teaching Materials: Access to teaching aids and lesson plans. • Feedback: Ability to give and receive feedback to and from students.	Designed for teachers and educational administrators
Parent		
An application for parents to keep track of their children's progress and educational process	• Grade Tracking: View children's grades and test results. • Homework Monitoring: Access the assignments and materials that children are completing as part of their homework. • Notifications: Receive notifications of new materials, schedule changes, and other important events. • Accessibility: Designed for parents who want to be actively involved in their children's education.	Designed for parents who want to be actively involved in their children's educational process
Student		
An application for students that offers access to learning resources and tools for learning	• Accessing materials: Viewing and using interactive lessons, textbooks, and videos. • Assignments: Taking tests and completing learning assignments. • Participate in Courses: Access additional educational courses and classes. • Tracking progress: View test scores and grades	Designed for students of all ages who want to learn and progress

Methods

The main hypothesis of the study is that the implementation of comparative analysis will allow to identify the advantages and disadvantages of online educational platforms in Kazakhstan for their further modernization. Modernization will increase the efficiency of these systems by meeting new unique educational needs and digital transformation of education.

To implement the scientific research, approaches based on interdisciplinarity will be applied, as the application of innovative educational technologies for content modernization and modern digital technologies for modernization of IT infrastructure of educational online platforms in Kazakhstan are provided. Thus, an integrated application of educational and digital technologies is realized to improve the efficiency of existing domestic IT products of education digital transformation.

At the initial stage of the research within the framework of this article, in order to comprehensively study the problem and model the technological processes of the subject area, the research and analysis of the IT infrastructure of educational online platforms in Kazakhstan will be conducted in accordance with the new educational needs.

At this stage, a descriptive approach will be initially applied: an intensive information and patent search will be conducted, a comparative analysis of the advantages and disadvantages of existing modern IT solutions used in secondary education and requiring modernization will be performed.

To better investigate the functionality and understand the capabilities of BilimLand platform, a comparative analysis with three well-known foreign educational platforms: Khan Academy, IXL Learning and Education.com was carried out. The indicators presented in Figure 5 were selected to analyze BilimLand web-platforms.

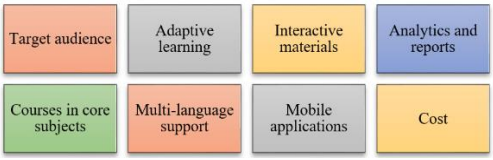

Figure 5 – Comparative analysis indicators of BilimLand online educational web platform

BilimLand's mobile app comparative analysis metrics are shown in Figure 6.

Figure 6 – BilimLand Mobile Platform comparative analysis indicators

Results&Findings

The following is a comparative analysis of the online educational platform BilimLand:

- Target audience: All platforms target a wide range of users, including schoolchildren, students and educators. However, BilimLand stands out by offering support in multiple languages, making it more accessible to multilingual regions.
- Adaptive learning: All platforms reviewed support adaptive learning, which allows users to receive personalized guidance and assignments. This is a key aspect for effective learning.
- Interactive materials: All platforms offer interactive materials, which makes learning more engaging. BilimLand stands out for the variety of interactive tools available.
- Analytics and Reporting: All platforms provide analytics and reporting features to track learners' progress. This is important to customize the learning experience for each learner.
- Core subject courses: All platforms offer a wide range of core subject courses. This ensures a holistic approach to learning.
- Multi-language support: BilimLand has the advantage of multi-language support, making it more versatile in multilingual regions.
- Mobile Apps: All platforms have mobile apps for iOS and Android, allowing access to the materials from different devices.
- Cost: While Khan Academy provides all content for free, the other platforms require a paid subscription. BilimLand offers both free and paid content, making it more flexible in terms of accessibility.

Next, a comprehensive analysis of the BilimLand platform was conducted, comparing it with its foreign counterparts Khan Academy, IXL Learning, and Education.com, and considering the mobile applications of these platforms and their functionality.

Table 2 presents the results of the comparative analysis of BilimLand Web-platforms with global brands of online educational platforms Khan Academy, IXL Learning and Education.com.

Mobile apps are an important part of educational platforms, providing access to learning materials on the go. Here is a look at the functionality of mobile applications for BilimLand, Khan Academy, IXL Learning and Education.com.

Table 3 presents the results of the comparative analysis of BilimLand mobile applications with global brands of Khan Academy, IXL Learning and Education.com online education platforms.

The BilimLand platform is a powerful tool for digital education with numerous advantages, including adaptive learning, interactive materials and multilingual support. Comparison with foreign platforms Khan Academy, IXL Learning and Education.com shows that BilimLand combines elements of successful educational solutions and provides unique opportunities for multilingual educational environments.

Table 2 – Comparative analysis of Bilimland web-platforms

Characteristics	BilimLand	Khan Academy	IXL Learning	Education.com
Target audience	Pupils, students, teachers	Pupils, students, parents, teachers	Pupils, students, teachers	Pupils, parents, teachers
Adaptive learning	Yes	Yes	Yes	No
Interactive materials	Yes	Yes	Yes	Yes
Analytics and reports	Yes	Yes	Yes	Yes
Courses in core subjects	Yes	Yes	Yes	Yes
Multi-language support	Yes	English only	English only	English only
Mobile applications	Yes (iOS and Android)	Yes (iOS and Android)	Yes (iOS and Android)	Yes (iOS and Android)
Cost	Partially free and paid content	Free	Paid	Paid

The mobile apps of all platforms provide access to learning materials and support important features such as analytics and offline access, but BilimLand stands out for its multi-language support and collaboration tools.

Table 3 – Comparative analysis of the functionality of Bilimland mobile applications

Feature	BilimLand	Khan Academy	IXL Learning	Education.com
Access to training materials	Yes	Yes	Yes	Yes
Interactive exercises	Yes	Yes	Yes	Yes
Progress & Analytics	Yes	Yes	Yes	Yes
Offline access	Yes	Yes	Yes	Yes
Push notifications	Yes	Yes	Yes	Yes
Collaboration tools	Chats, forums	Forums	No	No
Multilingual interface	Yes	No	No	No

These features make BilimLand a competitive player in the international education arena.

Conclusion

In the framework of this study, the educational online platform BilimLand was analyzed, which allows increasing the efficiency of the educational process through the use of innovative IT and pedagogical solutions. This Kazakhstani development has a large functionality and rich content sufficient to meet the requirements of modern consumer of educational services.

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АНАЛИТИЧЕСКИЙ ОБЗОР ИСПОЛЬЗОВАНИЯ ЦИФРОВЫХ ТЕХНОЛОГИЙ В ОБРАЗОВАНИИ

Аннотация: *Интеграция онлайн и цифровых технологий в учебные процессы значительно преобразовала педагогический ландшафт, сделав образование более доступным и гибким. Эти технологии помогают преодолеть традиционные ограничения, связанные с временем и пространством, позволяя студентам и преподавателям участвовать в учебных мероприятиях практически из любого места. По мере того, как технологии продолжают развиваться и растет спрос на цифровое образование, по всему миру появляются инновационные образовательные платформы, улучшающие процесс обучения.*

Одной из таких платформ является BilimLand, которая активно использует современные методы обучения и цифровые инструменты для повышения качества образования. BilimLand предлагает широкий спектр интерактивных ресурсов, мультимедийных уроков и адаптивных технологий обучения, что делает его ценным инструментом как для студентов, так и для учителей. Интегрируя элементы геймификации и персонализированные учебные пути, платформа стремится создать увлекательную и эффективную образовательную среду. В этой статье представлен аналитический обзор цифровых ресурсов, предназначенных для повышения доступности и гибкости образования. Кроме того, он предоставляет сравнительный анализ BilimLand в отношении ведущих мировых онлайн-платформ для обучения, рассматривая его сильные и слабые стороны, а также уникальные особенности. Исследование направлено на оценку того, как BilimLand способствует развитию цифровой образовательной экосистемы и его потенциала для конкуренции с международными решениями в области электронного обучения.

Ключевые слова: *онлайн-школа, цифровые образовательные технологии, образовательная платформа, критерии оценки, электронное обучение, доступность образования, BilimLand.*

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БІЛІМ БЕРУДЕ ЦИФРЛЫҚ ТЕХНОЛОГИЯЛАРДЫ ҚОЛДАНУДЫҢ АНАЛИТИКАЛЫҚ ШОЛУЫ

Онлайн және цифрлық технологияларды оқу үдерісіне енгізу педагогикалық ландшафтты айтарлықтай өзгертті, білім беруді қолжетімді әрі икемді етті. Бұл технологиялар уақыт пен кеңістікке байланысты дәстүрлі шектеулерді еңсеруге көмектесіп, студенттер мен оқытушыларға кез келген жерден оқу процесіне қатысуға мүмкіндік береді. Технологияның дамуы мен цифрлық білімге деген сұраныстың артуына байланысты бүкіл әлемде оқыту үдерісін жетілдіруге бағытталған инновациялық білім беру платформалары пайда болуда.

Осындай платформалардың бірі – BilimLand, ол білім беру сапасын арттыру үшін заманауи оқыту әдістері мен цифрлық құралдарды белсенді түрде енгізеді. BilimLand интерактивті ресурстардың кең ауқымын, мультимедиялық сабақтарды және бейімделетін оқыту технологияларын ұсынады, бұл оны студенттер мен мұғалімдер үшін құнды құралға айналдырады. Геймификация элементтері мен дербестендірілген оқыту траекторияларын біріктіре отырып, платформа қызықты әрі тиімді білім беру ортасын құруды мақсат етеді.

Бұл мақала білімнің қолжетімділігі мен икемділігін арттыруға бағытталған цифрлық ресурстардың аналитикалық шолуын ұсынады. Сонымен қатар, онда BilimLand платформасы мен жетекші жаһандық онлайн оқыту платформаларының салыстырмалы талдауы жүргізіліп, оның артықшылықтары, кемшіліктері және бірегей ерекшеліктері қарастырылады. Зерттеу BilimLand платформасының цифрлық білім беру экожүйесінің дамуына қосатын үлесін және оның халықаралық e-learning шешімдерімен бәсекелесу әлеуетін бағалауға бағытталған.

Түйін сөздер: *онлайн мектеп, цифрлық білім беру технологиялары, білім беру платформасы, бағалау критерийлері, e-learning, білімнің қолжетімділігі, BilimLand.*

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