

## ИНФОРМАТИКАНЫ ОҚЫТУ ӘДІСТЕМЕСІ. БІЛІМ БЕРУДІ АҚПАРАТТАНДЫРУ

### МЕТОДИКА ПРЕПОДАВАНИЯ ИНФОРМАТИКИ. ИНФОРМАТИЗАЦИЯ ОБРАЗОВАНИЯ

#### METHODS OF TEACHING COMPUTER SCIENCE. INFORMATIZATION OF EDUCATION

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#### ACTIVE AND DIGITAL LEARNING METHODS IN EDUCATION

##### Abstract

The “Training of university teachers to integrate active teaching methods in digital technologies” program aims to transform Kazakhstan's higher education teaching methods by incorporating Case-Based Learning (CBL), Problem-Based Learning (PBL), Team-Based Learning (TBL), and digital technology. Designed to align with global standards, the program seeks to enhance teaching effectiveness and integrate modern technologies through diverse sessions, strategic sequencing, and case studies for real-world relevance. It covers active learning and digital technology modules, reinforced by case studies showcasing practical outcomes. The initiative aligns with national educational reform goals, with a detailed implementation and evaluation strategy. Future research will assess its long-term impact and scalability, marking a significant step towards modernizing Kazakhstan's higher education.

*Keywords:* digital technology integration, training, Case-Based Learning, Problem-Based Learning, Team-Based Learning.

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#### БІЛІМ БЕРУДЕГІ ОҚЫТУДЫҢ БЕЛСЕНДІ ЖӘНЕ ЦИФРЛЫҚ ӘДІСТЕРІ

##### Аңдатпа

“Университет оқытушыларын цифрлық технологияларда оқытудың белсенді әдістерін интеграциялауға үйрету” бағдарламасы кейстер (CBL), проблемалық оқыту (PBL), командалық оқыту (TBL) және цифрлық технологиялар негізінде оқытуды қосу арқылы Қазақстанның жоғары оқу орындарында оқыту әдістерін трансформациялауға бағытталған. Әлемдік стандарттарға сәйкес әзірленген бағдарлама оқытудың тиімділігін арттыруға және әртүрлі сессиялар, стратегиялық дәйектілік және нақты әлемге қатысты жағдайлық зерттеулер арқылы заманауи технологияларды біріктіруге бағытталған. Ол практикалық нәтижелерді көрсететін жағдайлық зерттеулермен қамтамасыз етілген белсенді оқыту және цифрлық модульдерді қамтиды. Бастама іске асыру мен бағалаудың егжей-тегжейлі стратегиясымен ұлттық білім беру реформасының мақсаттарына сәйкес келеді. Болашақ зерттеулер оның ұзақ мерзімді әсері мен ауқымдылығын бағалауға мүмкіндік береді, бұл Қазақстанның жоғары білімін жаңғырту жолындағы маңызды қадам болады.

*Түйін сөздер:* цифрлық технологияларды интеграциялау, оқыту, жағдайларға негізделген оқыту, проблемалық оқыту, топтық оқыту.

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## АКТИВНЫЕ И ЦИФРОВЫЕ МЕТОДЫ ОБУЧЕНИЯ В ОБРАЗОВАНИИ

### Аннотация

Программа “Обучение преподавателей университета интеграции активных методов обучения в цифровых технологиях” направлена на трансформацию методов преподавания в высших учебных заведениях Казахстана путем включения обучения на основе кейсов (CBL), проблемного обучения (PBL), командного обучения (TBL) и цифровых технологий. Разработанная в соответствии с мировыми стандартами, программа направлена на повышение эффективности преподавания и интеграцию современных технологий с помощью разнообразных сессий, стратегической последовательности и тематических исследований, имеющих отношение к реальному миру. Она охватывает модули активного обучения и цифровых технологий, подкрепленные тематическими исследованиями, демонстрирующими практические результаты. Инициатива соответствует целям национальной реформы образования, с подробной стратегией реализации и оценки. Будущие исследования позволят оценить его долгосрочное воздействие и масштабируемость, что станет значительным шагом на пути модернизации высшего образования Казахстана.

*Ключевые слова:* интеграция цифровых технологий, обучение, обучение на основе кейсов, проблемное обучение, командное обучение.

### Introduction

The landscape of higher education is undergoing a profound transformation worldwide, driven by the rapid advancement of technology and the evolving needs of a diverse student population. This change is particularly pertinent in Kazakhstan, a nation striving to position its educational system at the forefront of global standards. Traditional educational paradigms, primarily characterized by passive, lecture-based learning, are increasingly seen as insufficient in fostering the critical thinking and problem-solving skills essential in today's dynamic world.

Against this backdrop, the introduction of the training program "Training of Higher Education Teachers in Active Learning Methods and Digital Technology Integration" in Kazakhstan represents a timely and strategic initiative. This program is conceived with the dual objectives of modernizing teaching methodologies and integrating digital technologies in higher education. It seeks to address a crucial gap in the professional development of educators, enabling them to transition from traditional to more interactive, student-centered teaching approaches [1].

The significance of this program lies in its alignment with the broader educational reforms underway in Kazakhstan. The national educational policy emphasizes innovation in teaching methods, improved quality of education, and enhanced alignment with international educational standards. The integration of active learning methodologies such as Case-Based Learning (CBL), Problem-Based Learning (PBL), and Team-Based Learning (TBL) represents a paradigm shift from the conventional teacher-centered approach to a more engaging, learner-centric model. This shift is expected to foster greater student engagement, enhance learning outcomes, and better prepare students for the challenges of the 21st century [2].

Moreover, the program recognizes the critical role of digital technology in contemporary education. The integration of digital tools and resources in teaching practices is not just a trend but a necessity in the current digital age [3]. It offers educators innovative ways to enhance learning experiences, engage with students, and manage educational content more effectively. However, successfully integrating technology into teaching requires more than just access to digital tools; it demands a fundamental change in teaching philosophy and methodology, coupled with adequate training and support for educators [4].

In this context, the proposed training program is designed to equip educators in Kazakhstan with the necessary skills and knowledge to implement these modern pedagogical techniques effectively. It

aims to bridge the gap between the existing educational practices and the emerging global trends in higher education, thus contributing to the national goal of creating a more dynamic, inclusive, and forward-looking educational environment.

The introduction of such a program is timely and aligns well with global educational trends, where there is an increasing emphasis on developing critical thinking, collaboration, and problem-solving skills among students. By fostering an environment that encourages active learning and embraces digital innovation, the program stands to not only enhance the quality of education in Kazakhstan but also to set a precedent for educational transformation in the region.

### *Literature review*

The increasing trend in publications (see figure 1) from 2013 to 2023, focusing on "case OR team OR problem AND based AND learning" in Scopus, indicates a growing interest in active learning methodologies like Case-Based Learning (CBL), Team-Based Learning (TBL), and Problem-Based Learning (PBL). This suggests a wider acceptance and application of these methods in education, reflecting the evolving needs of modern learning environments. The notable rise in publications demonstrates an expanding research field, indicating these methodologies' global relevance and potential for future educational innovations.

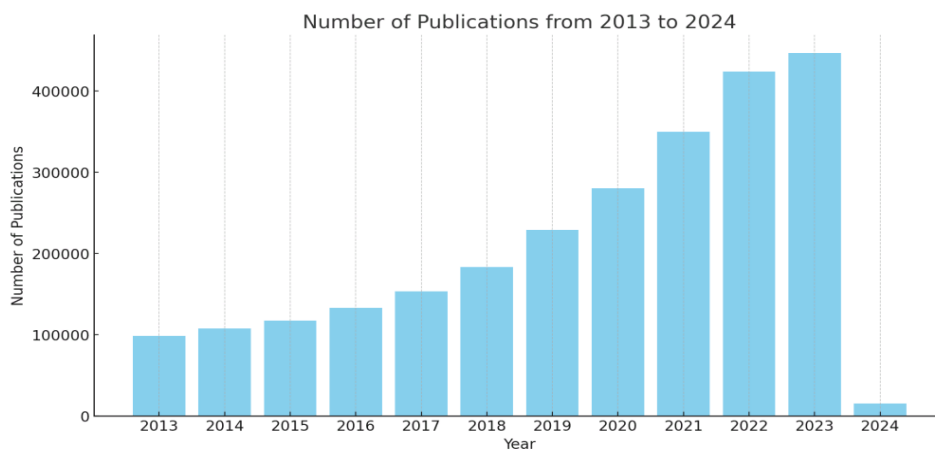


Figure 1. Trends in Publications on Active Learning Methods between 2013–2024

Studies confirm that CBL, PBL, and TBL enhance student engagement and outcomes over traditional lectures [5]. This body of work highlights the increased retention rates, deeper understanding, and improved critical thinking skills among students engaged in active learning environments. PBL, characterized by its student-centered approach, has been shown to effectively develop critical thinking and problem-solving skills. Studies have indicated that PBL enhances students' ability to apply knowledge to real-world situations, thus improving their practical skills and preparedness for professional challenges [6]. TBL's effectiveness lies in its collaborative learning approach. Studies suggest that TBL can significantly improve teamwork and communication skills, and foster a deeper understanding of course content [7]. It encourages active participation and accountability among students, leading to improved academic performance [8]. CBL has been recognized for its ability to bridge theoretical learning with practical application. Studies show that CBL improves decision-making and analytical skills by presenting students with real-life scenarios that require the application of theoretical knowledge [9]. The integration of digital technologies in education has transformed teaching and learning processes. Technology offers innovative ways to facilitate interactive and personalized learning experiences, as evidenced by the increased adoption of digital tools and online learning platforms, especially during the COVID-19 pandemic [10].

The global shift towards skill-based education, emphasizing critical thinking and problem-solving, aligns with Kazakhstan's educational reforms. These reforms aim to modernize the educational

system and align it with international standards [11]. While the benefits of active learning and digital integration are clear, challenges in implementation, such as resistance to change, lack of resources, and training needs, are also notable. However, these challenges present opportunities for innovation and growth in Kazakhstan's educational sector. There is a growing body of research on the effectiveness of professional development programs in equipping teachers with active learning strategies. Studies indicate that well-structured training can significantly enhance teachers' ability to facilitate active learning, leading to improved student outcomes [12].

Research globally and within Kazakhstan underscores the efficacy of active learning strategies like CBL, PBL, and TBL in improving student engagement and learning outcomes. These methodologies foster a more profound understanding and critical thinking, as evidenced by studies like those in Shymkent's schools, which have demonstrated the practical application of these methods in enhancing student learning experiences [13]. PBL, especially in the context of Kazakhstan's medical education reforms, as shown in the Karaganda State Medical University's shift towards PBL and TBL, has been instrumental in developing critical thinking and problem-solving skills. The adaptation of these methodologies indicates a significant shift from traditional rote learning to more dynamic and applied learning approaches. TBL's role in enhancing collaborative skills is particularly relevant in Kazakhstan's educational reform. Research points to improved teamwork and communication skills, critical in a modern educational context. Such collaborative methods are being increasingly valued in Kazakhstan's educational institutions as they align with global educational trends [14]. CBL has proven beneficial in bridging theory with practice. In Kazakhstan, where traditional methods have predominantly focused on theoretical knowledge, CBL presents an opportunity to foster applied learning, as demonstrated by initiatives in certain Kazakhstani universities to incorporate more case-based and practical learning scenarios in their curricula [15].

The integration of digital technology in Kazakhstan's education system, as seen through the initiatives like e-learning environments and digital competence development in schools and universities, is a significant step towards modernizing education. This transition, as mentioned in studies conducted within Kazakhstan, reflects a growing understanding of the need to align educational practices with technological advancements [16]. Kazakhstan's educational reforms, in line with global trends, emphasize skill-based education. The country's efforts in integrating active learning strategies and improving educational outcomes are highlighted in reports and studies focusing on educational transformations in Kazakhstan, showcasing its commitment to aligning with international education standards [17]. Despite the positive impact of active learning methodologies, challenges in their implementation, such as resistance to change and the need for resource allocation, are evident in Kazakhstan. Addressing these challenges is crucial for the successful integration of these methods into the educational system, as seen in various educational institutions across Kazakhstan [18].

Training programs for teachers in active learning methods are crucial. Studies within Kazakhstan have shown that professional development programs significantly enhance teachers' abilities to implement active learning strategies, thus contributing to better student outcomes [19]. Studies conducted in Kazakhstan, such as those focusing on the education of senior graders based on mathematical intuition and logic, reveal that traditional teaching methods, often focused on rote learning, are giving way to more innovative, problem-solving, and critical thinking-based approaches. Such shifts are crucial for improving the overall quality of education in Kazakhstan [20].

### **Research methodology**

*Program Conceptualization and Framework Development.* This paper began with a comprehensive assessment of the current educational landscape in Kazakhstan's higher education sector. Recognizing the need for pedagogical innovation and technology integration, the program was conceptualized to address these gaps. The framework was developed with an emphasis on active learning methodologies, specifically Case-Based Learning (CBL), Problem-Based Learning (PBL),

and Team-Based Learning (TBL), coupled with digital technology integration. This framework aimed to align with global educational standards and respond to the evolving needs of modern learners.

The development of the program's structure and objectives was informed by a thorough review of existing literature and educational models from various global contexts. Academic journals, policy documents, and best practice guides in higher education were meticulously analyzed. These materials were instrumental in shaping the core principles of the program, ensuring that it was grounded in proven pedagogical theories and practices.

The curriculum aims to provide comprehensive insights into active learning and digital education technologies. Each module was developed to focus on specific aspects of these methodologies, ensuring a comprehensive educational experience. The curriculum covered fundamental principles, practical application, and advanced techniques in active learning, supplemented by relevant examples and case studies. The structure of each module was crafted to facilitate an incremental and immersive learning experience for educators.

*Program Structure and Content.* The program was structured to provide a sequential and immersive learning experience. It was divided into distinct phases, each building upon the knowledge and skills acquired in the previous one. This structure was designed to facilitate a deep understanding of active learning methodologies and their integration with digital technologies.

The program comprised several modules, each focusing on different elements of active learning and digital technology. For instance, one module delved into the theory and application of CBL, another explored the nuances of PBL, while a third focused on the dynamics of TBL. Each module was carefully crafted to address specific learning objectives and outcomes, and was enriched with relevant case studies and examples.

Case studies, showcasing successful implementations of active learning and digital technologies, played a pivotal role. These case studies were carefully selected to demonstrate practical applications and outcomes, thereby enhancing the learning experience and offering tangible insights into the effectiveness of these methodologies.

This "Materials and Methods" section outlines the systematic approach taken to conceptualize, design, and structure the training program. It highlights the thorough research and careful planning that went into developing a curriculum that is both theoretically sound and practically relevant. The inclusion of case studies further underscores the program's emphasis on real-world applicability, making it a robust model for educational innovation in Kazakhstan's higher education sector.

### **Results of the study**

We summarize key findings from our needs assessment and their implications for the program's development in the following table to illustrate their connection. Table 1 provides a clear overview of how specific needs identified in Kazakhstan's higher education sector have shaped the structure and focus of the proposed training program. Each program element responds directly to a specific educational need identified in our assessment. The outlined training program, through its six meticulously designed modules, provides a comprehensive and structured approach to enriching the pedagogical skills of higher education teachers. Starting with an introduction to active learning, the program systematically builds on the complexity of educational methodologies, covering CBL, PBL, TBL, and integrating these approaches with digital technologies.

Each module is tailored to not only impart theoretical knowledge but also to ensure practical application through interactive workshops, collaborative projects, and hands-on experiences. The progression from foundational principles of active learning to the sophisticated application of digital technologies and assessment strategies signifies a holistic approach to teacher development.

By the program's conclusion, participants are equipped to transform their educational practices, fostering environments that are more engaging, interactive, and aligned with the demands of contemporary higher education. This initiative stands as a pivotal step towards enhancing the quality of education, promising to prepare students more effectively for the challenges and opportunities of the future (table 1, 2).

Table 1. Correlation Between Needs Assessment Findings and Training Program Development

<i>Key Findings from Needs Assessment</i>	<i>Implications for Training Program</i>
<i>Predominance of traditional, lecture-based teaching methods</i>	<i>Incorporate interactive and student-centered methodologies in the program</i>
<i>Demand for active learning methodologies (CBL, PBL, TBL)</i>	<i>Develop modules focused on CBL, PBL, and TBL techniques</i>
<i>Gap in digital technology integration in teaching</i>	<i>Integrate digital tools and platforms into the curriculum</i>
<i>Need to align with global educational standards</i>	<i>Ensure the program aligns with international best practices in education</i>
<i>Evolving expectations of modern learners</i>	<i>Design the program to be interactive, practical, and technology-rich</i>
<i>Requirement for comprehensive pedagogical reform</i>	<i>Develop a holistic conceptual framework that addresses identified needs</i>

Table 2. Educational Enhancement through Active Learning: A Structured Program Overview

<i>Module</i>	<i>Content Overview</i>	<i>Learning Objectives</i>	<i>Duration and Activities</i>
<i>Module 1: Introduction to Active Learning</i>	<i>Extensive exploration of active learning, covering its evolution, key principles, and various models and techniques. Focuses on the rationale behind active learning and its role in fostering engaging classroom environments.</i>	<i>Understand active learning principles, explore its benefits, and identify challenges in implementation.</i>	<i>Two weeks, with lectures, discussions, group activities, and reflective exercises. Includes quizzes and essays.</i>
<i>Module 2: Case-Based Learning (CBL)</i>	<i>Focuses on Case-Based Learning, exploring its theory, benefits for critical thinking, and the process of designing and implementing case studies.</i>	<i>Design effective case studies, develop discipline-specific case studies, and conduct interactive CBL sessions.</i>	<i>Weeks 3 and 4, with workshops for creating and presenting case studies, and collaborative learning sessions.</i>
<i>Module 3: Problem-Based Learning (PBL)</i>	<i>Dedicated to Problem-Based Learning, discussing its foundational principles, role in fostering critical thinking and self-directed learning, and alignment with learning outcomes.</i>	<i>Formulate real-life problems, facilitate student-led PBL sessions, and integrate PBL in curricula.</i>	<i>Weeks 6 and 7, focusing on theoretical instruction and practical application through workshops and collaborative design of PBL scenarios.</i>
<i>Module 4: Team-Based Learning (TBL)</i>	<i>Centers on Team-Based Learning, covering its essential components, mechanisms like readiness assurance tests and application exercises, and the role of the instructor.</i>	<i>Form and manage learning teams, design TBL sessions, and implement TBL in classrooms.</i>	<i>Weeks 9 and 10, involving interactive lectures, role-playing, and practical application in designing TBL sessions.</i>

<i>Module 5: Digital Technology Integration</i>	<i>Explores the integration of digital technologies in education, highlighting various tools and their enhancement of active learning experiences.</i>	<i>Understand digital tools in education, gain practical skills in technology integration, and critically assess digital tools.</i>	<i>Weeks 12 and 13, featuring interactive workshops on digital tools and collaborative projects for technology integration.</i>
<i>Module 6: Assessment and Evaluation in Active Learning Environments</i>	<i>Focuses on assessment and evaluation strategies in active learning, covering effective assessment tools, digital tools for assessment, and challenges in evaluating collaborative activities.</i>	<i>Design effective assessments, utilize digital tools for assessment, and develop feedback and evaluation techniques.</i>	<i>The final weeks 14 and 15, with seminars, practical application of assessment tools, and collaborative projects on assessment strategies.</i>

*Case studies:*

*Case study "Case-Based Learning Approach in Addressing Real-World Cyber Attacks"*

This case study focuses on a cybersecurity course at a leading technology university. The course was redesigned to incorporate a case-based learning (CBL) approach, directly engaging students with real-world cyber attack scenarios (table 3).

*Table 3. Active Learning in Higher Education: A Comparative Case Study Analysis*

<i>Case Study</i>	<i>Course Focus</i>	<i>Approach</i>	<i>Implementation Highlights</i>	<i>Key Learning Objectives</i>	<i>Outcomes</i>	<i>Conclusion</i>
<i>Case-Based Learning Approach in Addressing Real-World Cyber Attacks</i>	<i>Cyber-security</i>	<i>Case-Based Learning</i>	<i>Interactive sessions analyzing cyber attack cases, group projects developing response strategies.</i>	<i>Practical application, critical thinking, collaborative learning.</i>	<i>Enhanced understanding of cybersecurity, improved analytical and decision-making skills, positive feedback.</i>	<i>Effective in developing practical skills and understanding of cybersecurity complexities.</i>
<i>Implementing PBL in Database Management Systems Course</i>	<i>Database Management Systems (DBMS)</i>	<i>Problem-Based Learning</i>	<i>Weekly real-world database problem scenarios, group work on solutions, instructor as facilitator.</i>	<i>Practical application, critical thinking and creativity, collaborative skills.</i>	<i>Increased engagement and interest, notable skill improvement in DBMS, positive feedback.</i>	<i>Significant positive outcomes in understanding and applying DBMS concepts, skill development.</i>

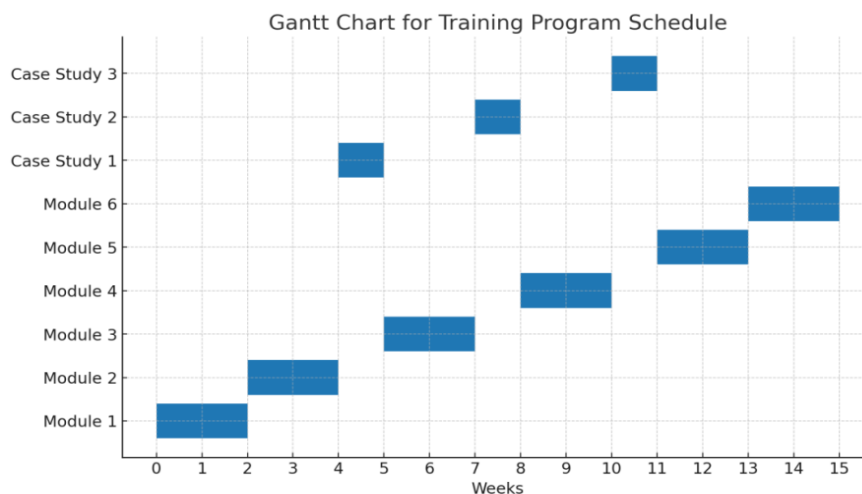
*Case study "TBL for Collaborative Software Development Projects"*

Background: This case study focuses on a software development course at a technical university where Team-Based Learning (TBL) was integrated to enhance the collaborative and practical aspects of learning. The course, previously lecture-centric, was transformed to emphasize teamwork in building actual software projects (table 4).

*Table 4. Enhancing Software Development Education through Team-Based Learning: A Case Study Overview*

<i>Aspect</i>	<i>Details</i>
<i>Background</i>	<i>Focuses on enhancing collaborative and practical learning in software development through TBL at a technical university. The course transitioned from lecture-centric to teamwork on actual software projects.</i>
<i>Course Structure</i>	<i>Semester-long project requiring design, development, and deployment of a software application, covering software design patterns, coding standards, version control, and project management.</i>
<i>Implementation of TBL</i>	<i>Teams formed with diverse skills, project divided into phases (planning, development, testing, deployment), and regular progress review sessions.</i>
<i>Learning Objectives</i>	<i>Encourage collaborative software development, provide real-world project experience, and facilitate interdisciplinary learning across coding, UI/UX design, and project management.</i>
<i>Outcomes</i>	<i>Students improved in teamwork, communication, and problem-solving; projects showed better quality and understanding of the software development lifecycle; positive feedback for the TBL approach's engagement and real-world relevance.</i>
<i>Conclusion</i>	<i>TBL integration was highly effective, enhancing technical and soft skills, and preparing students for industry with an immersive, collaborative learning environment.</i>

The provided Gantt chart (figure 2) visually represents the timeline of our training program, clearly outlining the sequential unfolding of each module and case study over the course of 15 weeks. This chart offers an at-a-glance view of the program's structure, from its initiation at Week 0 to its conclusion, ensuring a clear understanding of the course's duration and content distribution.



*Figure 2. Training Program Timeline Gantt Chart*



## **Discussion**

The "Training of university teachers to integrate active teaching methods in digital technologies" program marks a significant stride in Kazakhstan's educational reform. This program, through its diverse and comprehensive curriculum, directly addresses the challenges faced in the higher education sector, particularly in the context of adopting modern teaching methodologies and integrating digital technologies.

The program effectively overturns Kazakhstan's traditional lecture-based teaching model. By incorporating active learning strategies like CBL, PBL, and TBL, the program not only fosters a more engaging learning environment but also enhances critical thinking and problem-solving skills among students. This shift is crucial in preparing students for the complexities of the modern world and aligns with the evolving educational needs globally.

The program's emphasis on digital technology integration is a timely response to the digital transformation in education. This aspect of the program not only provides educators with the necessary tools and skills to effectively incorporate technology into their teaching practices but also prepares students to navigate the digital-first landscape of the contemporary world.

One of the notable strengths of the program is its scalability and adaptability across different educational contexts. The modular structure and the inclusion of diverse case studies make it relevant and applicable to various disciplines and teaching scenarios. This flexibility is key to the program's potential to cause a ripple effect of educational innovation beyond individual institutions. The program's objectives and structure are in harmony with Kazakhstan's broader educational policies and goals. This alignment ensures that the program not only addresses immediate teaching and learning needs but also contributes to the long-term vision of educational excellence in the country.

## **Conclusion**

The training program stands as a beacon of educational innovation and reform in Kazakhstan. Its well-rounded approach in modernizing teaching methodologies and integrating digital technologies has the potential to transform the landscape of higher education in the country. The program's alignment with global educational trends and national educational policies positions it as a pivotal initiative in elevating the quality and effectiveness of higher education in Kazakhstan.

**Implications for Future Research and Practice:** The program lays a foundation for further research, particularly in assessing the long-term impact of these teaching methodologies and technology integration in various educational settings. Future research can focus on experimental studies in universities to gauge the program's effectiveness over time and explore the integration of emerging technologies.

**Potential for Broader Impact:** As an innovative model, the program has the potential to inspire similar initiatives in other regions, adapting its framework to local educational contexts. It exemplifies how strategic and well-planned educational reforms can significantly enhance teaching and learning experiences, preparing educators and students for the challenges of the 21st century. In conclusion, the "Training of Higher Education Teachers in Active Learning Methods and Digital Technology Integration" program is a significant step towards modernizing and improving Kazakhstan's higher education system. It promises not only to enhance the educational experiences of students and teachers within the country but also to set a benchmark for educational innovation on a global scale.

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References

- [1] Zhao W. et al. The effectiveness of the combined problem-based learning (PBL) and case-based learning (CBL) teaching method in the clinical practical teaching of thyroid disease //BMC medical education. – 2020. – T. 20. – C. 1-10.
- [2] Wiek A. et al. Integrating problem-and project-based learning into sustainability programs: A case study on the School of Sustainability at Arizona State University //International Journal of Sustainability in Higher Education. – 2014. – T. 15. – №. 4. – C. 431-449.
- [3] Sych T., Khrykov Y., Ptakhina O. Digital transformation as the main condition for the development of modern higher education //Educational Technology Quarterly. – 2021. – T. 2021. – №. 2. – C. 293-309.
- [4] Bulman G., Fairlie R. W. Technology and education: Computers, software, and the internet //Handbook of the Economics of Education. – Elsevier, 2016. – T. 5. – C. 239-280.
- [5] Freeman S. et al. Active learning increases student performance in science, engineering, and mathematics //Proceedings of the national academy of sciences. – 2014. – T. 111. – №. 23. – C. 8410-8415.
- [6] Anazifa R. D., Djukri D. Project-based learning and problem-based learning: Are they effective to improve student's thinking skills? //Jurnal Pendidikan IPA Indonesia. – 2017. – T. 6. – №. 2. – C. 346-355.
- [7] Peters T. et al. Benefits to students of team-based learning in large enrollment calculus //Primus. – 2020. – T. 30. – №. 2. – C. 211-229.
- [8] Ghahramani A. et al. Team-based and collaborative learning studies in flipped classrooms: A scoping review in higher education //Interdisciplinary Journal of Virtual Learning in Medical Sciences. – 2022. – T. 13. – №. 3. – C. 149-164.
- [9] Lavi R., Marti D. A Proposed Case-Based Learning Framework for Fostering Undergraduate Engineering Students' Creative and Critical Thinking //Journal of Science Education and Technology. – 2023. – C. 1-14.
- [10] Hodges C. B. et al. The difference between emergency remote teaching and online learning. – 2020. – T. 7. – C. 1-3.
- [11] Yakavets N. Educational reform in Kazakhstan: The first decade of independence //Educational reform and internationalisation: The case of school reform in Kazakhstan. 2014. – T. 23. – №. 4. C. 1-27.
- [12] Pereira-Santos D., Prudêncio R. B. C., de Carvalho A. C. Empirical investigation of active learning strategies //Neurocomputing. – 2019. – T. 326. – C. 15-27.
- [13] Parmankulova P. Z. et al. Problem-based learning: integrating web-quest and case-study strategies in students with hearing impairments //International Journal of Innovation and Learning. – 2023. – T. 34. – №. 4. – C. 441-455.
- [14] Riklefs V. et al. Transforming medical education in Kazakhstan: Successful case of internationalization from Karaganda State Medical University //Medical Teacher. – 2018. – T. 40. – №. 5. – C. 481-487.
- [15] Sartania N. et al. Increasing collaborative discussion in case-based learning improves student engagement and knowledge acquisition //Medical Science Educator. 2022. – T. 32. – №. 5. – C. 1055-1064.
- [16] Kassymova G. et al. E-Learning environments and problem-based learning //International Journal of Advanced Science and Technology. – 2020. – T. 29. – №. 7. – C. 346-356.
- [17] Ng M. L. et al. Designing, implementing and evaluating an online problem-based learning (PBL) environment—A pilot study //Clinical linguistics & phonetics. – 2014. – T. 28. – №. 1-2. – C. 117-130.
- [18] Zulkifli N. F. et al. Team-based Learning: Benefits On Learning And Students' Perception //Education in Medicine Journal. – 2019. . – T. 4. – №. 11. – C. 61-69.
- [19] Hendriana H., Johanto T., Sumarmo U. The Role of Problem-Based Learning to Improve Students' Mathematical Problem-Solving Ability and Self Confidence //Journal on Mathematics Education. – 2018. – T. 9. – №. 2. – C. 291-300.
- [20] Popova Y. et al. Improving the effectiveness of senior graders' education based on the development of mathematical intuition and logic: Kazakhstan's experience //Frontiers in Education. – Frontiers, 2022. – T. 7. – C. 1-13.