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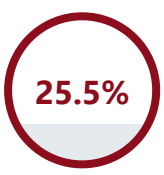

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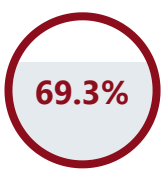

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Improving the training on creating a distance learning platform in higher education: evaluating their results

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Abstract—The Covid-19 pandemic has had a profound impact on the world, and one of the many changes it has brought about is the shift to distance learning in Kazakhstan's universities. However, both teachers and students were ill-prepared for this sudden change. In some remote villages, lack of internet access meant that students had no access to online classes at all. To address this issue, universities had to rent foreign platforms, but these platforms had inadequate information security measures in place. To address these challenges, it is necessary to create a robust and secure independent platform for distance learning. This platform will be particularly important for training teachers of "Informatics" in the context of distance learning. This article presents methods and schemes for creating a distance learning platform specifically for training computer science teachers. The introduction of the "Education-Online Platform" discipline at the university has yielded promising results. As a result, a distance learning platform has been created, and this new discipline has been introduced and tested in the educational program of a particular university in the training of future specialists.

Keywords—digital learning, platform, virtual educational institution, virtual reality, immersive learning, distance learning.

Introduction

The COVID-19 pandemic has had a significant impact on education systems globally, including in Kazakhstan. In response, the Ministry of Education and Science of Kazakhstan implemented measures to support distance learning for students at all levels of education. However, the shift to distance learning has not been without its challenges. Access to reliable internet and technology has been an issue

for some students and teachers, especially those in rural areas. Additionally, there have been concerns about the quality of distance learning, as some teachers have had to quickly adapt to new technologies and teaching methods [1]. Furthermore, concerns about the potential negative impacts of distance learning on student mental health and well-being have also emerged. The isolation and lack of social interaction that can come with distance learning can be challenging for some students, particularly those who may already be struggling with mental health issues [2]. Nonetheless, the implementation of distance learning in Kazakhstan during the pandemic has allowed for the continuation of education for many students, and it has provided an opportunity for the development of new technologies and teaching methods that could improve education in the future [3]. The shift to distance learning in Kazakhstan during the pandemic has had both positive and negative impacts. While it has allowed for the continuation of education, there have been challenges related to technology access, quality of education, and student well-being. As the pandemic continues, it will be important for the Ministry of Education and Science of Kazakhstan to continue to support distance learning and address these challenges [4].

Distance learning platforms in higher education have become increasingly popular in recent years, especially due to the COVID-19 pandemic that forced many institutions to shift to remote learning [5]. These platforms offer several benefits such as increased accessibility, flexibility, and convenience, but there are also potential drawbacks to consider. Here's an assessment of the impact of distance learning platforms on online and traditional classes [6]. Distance learning platforms have had a significant impact on higher education, offering students greater accessibility and flexibility while also presenting challenges such as technical difficulties and a lack of face-to-face interaction. Institutions will need to carefully consider the pros and cons of these platforms and work to integrate them effectively into traditional classes to offer the best possible learning experience for their students [7], [8].

Several researchers have conducted studies on distance learning platforms in higher education, exploring various aspects such as effectiveness, satisfaction, and student engagement. For example, Dr. Linda Wang, a professor of educational technology at California State University, Long Beach, has conducted research on online and blended learning, exploring the effectiveness of various distance learning platforms and tools. Her research has focused on improving student engagement and success in online courses [9]. Another example is Dr. Karen Vignare, an associate professor of education at the University of Nebraska-Lincoln. She has conducted research on the use of video conferencing tools in online classes, examining their impact on student engagement and interaction [10]. The study of distance learning platforms is necessary to improve the quality of online education and contribute to the success of students [11]. To create high-quality online courses and resources that meet the needs of all students, researchers need to explore the effectiveness, satisfaction, participation, role, and accessibility and equality of distance learning platforms. Moreover, due to the structure of educational programs, priority is given to scientific research [12].

In connection with the didactic potential of technology for creating a distance learning platform and its integrated use in the educational process, it is necessary to improve the development of educational and methodological materials, educational programs, and new types of textbooks and teaching aids based on the active use of modern computer technologies. Until recently, digital education was almost not considered the main subject of research due to the complexity and multi-meaningfulness of the topic. However, a number of foreign and domestic scientific studies provide opportunities to reveal the essence of digital education [13], [14]. Additionally, as a result of the analysis of the educational experience of higher educational institutions on the use of distance learning platforms in the training of future computer science teachers of the country, surveys have shown that the future specialists have a high level of information competence and a wide range of modern information and communication technologies, partly due to the internet services included in the platform [15]. However, it has also been found that many students and undergraduates lack methodological training in creating digital platforms on their own, despite the significant potential of self-use of various online educational platforms. Thus, it is important for each teacher to have information literacy and the ability to use and create distance education platforms for the organization of comfortable and productive work in a digital environment. We believe that the development of distance education platforms should provide for the training of specialists not only on the part of the state order but also on the part of universities that are able to work in the direction of developing distance learning platforms in accordance with the needs of universities in training teachers. Therefore, the purpose of our research work is to theoretically justify and practically implement improving the training of future computer science teachers to create a modern distance learning platform. If the training of future computer science teachers in the educational process of higher education is based on the ability to create a distance learning platform, it would meet modern requirements since the creation and use of modern digital platforms require educated and qualified specialists.

In conclusion, distance learning has become a crucial part of education during the COVID-19 pandemic, offering both opportunities and challenges. While distance learning platforms in higher education provide increased accessibility and flexibility, they also present technical difficulties and a lack of face-to-face interaction. Researchers must continue to explore the effectiveness, satisfaction, participation, role, and accessibility and equality of distance learning platforms to improve online education quality and contribute to student success. Moreover, the training of specialists in creating distance education platforms is crucial for the successful integration of digital technologies in education.

Methodology

DLPlatform (Distance Learning Platform) is a dynamic object-oriented distance learning environment designed to enhance the learning process. Developed for use in universities, DLPlatform incorporates distance learning technologies and offers courses and materials that can be used in the educational process. The platform offers four levels of access: teacher, curator, student, and administrator. This separation is designed to create a suitable learning environment. Figure 1 below shows the scheme for creating a distance learning platform.

Model for creating a distance learning platform

After authorization, students gain access to available courses and certificates, as well as a separate page where they can view their information. Teachers are given access to existing courses, the ability to add new ones, and the ability to evaluate students and track their progress. The platform is available on the internet and is built using distance learning technology with a graphical structure. One of the main advantages of DLPlatform is its open-source software code system. This makes it easy to revise and improve the platform to meet the current and growing needs of users. DLPlatform also offers a friendly user interface and is available in three languages: Kazakh, Russian, and English. It offers a wide selection of tools for creating a training course, including information transmission, evaluation of learning outcomes, communication and interaction with students and teachers, and joint development of educational materials. DLPlatform is a web interface, accessible from anywhere in the world with an internet connection. The platform is scalable, allowing the number of students taking an electronic course on the platform to be up to several million. DLPlatform is also designed with security in mind, protecting the platform from unauthorized access, data loss, and misuse.

DLPlatform offers an extensive list of roles, including site administrator, site manager, Course Category Manager, teacher, student, and guest. Working with the platform is simplified as much as possible for each of the user groups. The intuitive interface was developed specifically for

users who do not have deep knowledge of website programming and database management, making it easy to use. A wide selection of DLPlatform tools, various ways to present educational material, test knowledge, and monitor progress, allows users to create a high-quality course and organize a full-fledged educational process in an electronic environment. The presence of a large number of instructions for using the LMS system and the basics of working with each of its tools greatly simplifies working with the DLPlatform. DLPlatform is positioning itself as an effective, fast, and high-quality solution for organizing eLearning. The platform has been developed by Rakhmetov Maxot and is copyrighted by the National Institute of Property of the Republic of Kazakhstan.

DL platform

The study aimed to evaluate the readiness of future computer science teachers to work with DLPlatform. The study evaluated students of the specialty "6B01503 – Informatics" and undergraduates of the specialty 7M01511 - Informatics from the L. N. Gumilyov Eurasian National University, Kh. Dosmukhamedov Atyrau University, Kazakh National Pedagogical University, and Caspian University of Technology and Engineering named after Sh. Yesenov. Table 1 shows the universities involved in the study, and the number of students who participated. The universities were divided into experimental and control groups based on the elective disciplines offered in their educational programs.

Universities Involved in the Study

University	group	2021-2022	**2022-2023**	Total
L. N. Gumilyov Eurasian National University	AND	**22**	11	33
Kh. Dosmukhamedov Atyrau University	**AND**	18	21	**39**
Kazakh National Pedagogical University	K	20	16	36
Caspian University of Technology and Engineering	K	21	20	41
Total -149	AND	**40**	32	72
K	41	36	77	

As seen in Table 1, the experimental groups consisted of students from L. N. Gumilyov Eurasian National University and Kh. Dosmukhamedov Atyrau University, while students from Kazakh National Pedagogical University and Caspian University of Technology and Engineering were selected as the control group. The universities were chosen based on their educational program and inclusion of relevant subjects. The experimental group from L. N. Gumilyov Eurasian National University included 22 students in the 2021-2022 academic year and 11 students in the 2022-2023 academic year. The experimental group from Kh. Dosmukhamedov Atyrau University included 18 students in the 2021-2022 academic year and 21 students in the 2022-2023 academic year. The Kazakh National Pedagogical University and Caspian University of Technology and Engineering had a total of 77 students in the control group. The experimental and control groups were subjected to the same methodology for the formation of readiness of future computer science teachers to develop a distance learning platform.

The study evaluated the readiness of future computer science teachers to work with the distance learning platform on a scale of assessment consisting of three levels: high, medium, and low. This assessment helped determine the effectiveness of the distance learning platform in preparing future computer science teachers. The evaluation criteria for the three levels were:

Higher level: The future computer science teacher is characterized by a stable development of training, is defined as a subject of professional activity, pedagogically capable of working with a distance learning platform, and possesses high-level pedagogical skills with the necessary knowledge.

Medium level: The future computer science teacher is pedagogically capable of working with the distance learning platform, but considers the lack and partial formation of some components in the structure of the training.

Low level: The future computer science teacher's training components are not formed in working with the distance learning platform.

These components were used to monitor the quality of knowledge of the future computer science teacher, determine the effectiveness and assimilation of new material, and lead each teacher to self-control over their future professional activities. The results of the experiment served as a basis for further research on the possibilities of forming the readiness of future computer science teachers to develop a distance learning platform through a training experiment.

Results

To facilitate the improvement of training for future computer science teachers in creating distance learning platforms, a comprehensive assessment of the existing educational practices in schools was conducted. The aim was to gauge the teachers' familiarity with distance learning platforms, the extent of their utilization in the educational process, and the proficiency of computer science teachers in employing such platforms. Additionally, the fundamental question arose: Are prospective computer science teachers equipped to construct distance learning platforms?

Consequently, the need for a detection experiment arose to investigate these aspects. The detection experiment took place during the 2020-2021 academic year and consisted of two stages. In the first stage, the utilization of distance learning platforms in schools across the Republic of Kazakhstan and the proficiency levels of computer science teachers were examined. The second stage focused on evaluating the level of acquaintance future computer science teachers had with distance learning platforms in higher educational institutions. The initial question was addressed by analyzing the following key factors:

The experience of computer science teachers in utilizing distance learning platforms in the educational setting.

The skill set of teachers in developing distance learning platforms.

Although distance learning poses various challenges for teachers, survey results indicated that 96% of the surveyed computer science teachers expressed a positive attitude towards distance learning platforms and demonstrated readiness to integrate them into their teaching practices. However, it was observed that many school teachers lack the knowledge and skills required to create and utilize distance learning platforms in computer science instruction. Similarly, within higher education, the study affirmed the following findings:

Prospective teachers do not incorporate distance learning platforms into their classroom activities.

Teachers do not assign tasks related to the creation of distance learning platform components.

Future computer science teachers are ill-prepared to develop distance learning platforms.

The outcomes of the detection experiment served as a foundation for further investigations into the feasibility of cultivating the

necessary readiness among future computer science teachers through a training (formation) experiment.

The formation experiment was conducted during the 2021-2022 and 2022-2023 academic years, with the aim of testing a methodology for forming the readiness of future computer science teachers to create a distance learning platform. The experiment involved 149 students, divided into an experimental group of 72 students and a control group of 77 students. The experimental group was exposed to a course on "Digital Educational Resources in the Subject Area" and "Educational Online Platforms", with independent work assignments that involved the creation of distance learning platforms.

Table 2 shows the indicators before and after the formation experiment. The data shows that before the experiment, both the experimental and control groups had a low level of training and were not ready to create distance learning platforms. After the experiment, there was a significant improvement in the experimental group, with a decrease in the number of students who could not create a distance learning platform and an increase in the number of students who were highly prepared to create one.

Indicators before and after the experiment

gr	Number and percentage of students							
number	lower	**%**	middle	%	high	%		
Pre-experiment	AND	72	35	49,1	28	37,6	9	13,2
C	77	36	46,95	34	43,5	7	9,5	
After the experiment	**AND**	72	**9**	12,25	**36**	49,1	27	38,35
C	77	24	30,75	**37**	48,25	16	21	

Figure 3 shows the changes in knowledge level before and after the formation experiment. The data clearly shows an increase in the number of students with a high level of knowledge, indicating the effectiveness of the methodology used in the experiment.

Indicators before and after the formation experiment

The effectiveness of the methodology used in the formation experiment was rigorously assessed through various methods, including observation, surveys, testing, analysis, and generalization. To determine the statistical significance of the results, the chi-square criterion was employed.

The chi-square test is a statistical measure used to determine if there is a significant association between two categorical variables. In our case, the chi-square test was applied to assess the differences between the characteristics of the experimental and control groups before and after the experiment. The formula for calculating the chi-square value is as follows:

(1)

Where:

$\chi 2$ is the chi-square value,

Oi is the observed frequency,

Ei is the expected frequency.

The critical value of the chi-square criterion is determined based on the significance level (α) chosen for the test. In this study, a significance level of 0.05 ($\alpha = 0.05$) was selected, indicating a 95% confidence level. The critical value for $\alpha = 0.05$ is 5.99. Before the experiment, the observed and expected frequencies were calculated for each group, and the chi-square value was determined using the formula. The resulting chi-square value was found to be 0.346. This indicates that there were no significant differences between the characteristics of the experimental and control groups at the start of the experiment. After the experiment, the same calculations were performed, and the chi-square value was found to be 16.66. This value exceeded the critical value of 5.99, indicating a significant difference between the experimental and control groups after the intervention. The higher chi-square value suggests that the methodology used in the formation experiment had a substantial impact on the knowledge and skills of future computer science teachers in developing distance learning platforms. The calculated chi-square value demonstrates that the differences observed between the experimental and control groups are statistically reliable with a confidence level of 95%. This statistical significance strengthens the conclusion that the methodology employed in the experiment effectively enhanced the readiness of future teachers in creating and utilizing distance learning platforms.

In summary, the chi-square test provided a quantitative measure of the effectiveness of the methodology. By comparing the observed and expected frequencies, the test confirmed that the differences between the experimental and control groups were statistically significant. The calculations demonstrated the significant impact of the formation experiment on the development of future computer science teachers' skills and knowledge in distance learning platform creation.

Conclusions

As evidenced by practical experience, there is no one-size-fits-all technology for creating a distance learning platform. Each author proposes their own unique approach tailored to their specific needs. During our study, we developed a technology for creating a distance learning platform that encompasses various stages: planning the platform's structure within the educational process, designing the platform's components, testing its functionality, and finally, implementing it in the educational setting. We consider this methodology as a comprehensive "recipe," providing a step-by-step algorithm and a systematic approach to achieving the desired outcome.

The methodology for forming the readiness of future computer science teachers to create a distance learning platform not only offers an algorithm, but also provides diverse methods and services for prospective teachers. Additionally, significant emphasis is placed on fostering independent work among students, enabling them to develop the necessary skills and expertise in utilizing distance learning platforms.

Our primary objective was to cultivate the competence of our future specialists in creating their own platforms within the realm of distance learning. It brings us great satisfaction to witness the joy and sense of accomplishment reflected on the faces of our students as they achieve their desired results. By following the proposed methodology and embracing independent learning, we aim to empower our students to become proficient and innovative practitioners in the field of distance learning platform development. Through this process, we strive to foster a generation of educators who possess the necessary competencies to create effective and engaging learning environments using the tools and technologies of distance education.

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