MODERN ELECTRONIC EDUCATIONAL TECHNOLOGIES IN THE PROCESS OF E-LEARNING

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ABSTRACT

The **purpose** of the study is to focus attention on the positive aspects of using E-learning in contrast to the traditional format in a modern university, as well as on the need for effective management of E-learning in order to improve the quality of education.

Methodology. The following research methods were used to solve the assigned tasks: theoretical – analysis of scientific sources, pedagogical and teaching-methodical materials, comparison; empirical – generalization of pedagogical experience; a pedagogical experiment to check the effectiveness of organizing students' work using LMS Moodle platform.

Results. This study focuses on the positive aspects of using E-learning. Introducing E-learning into the educational process provides new opportunities, provides everyone with the necessary knowledge and develops digital literacy skills. The study analyses the current state of e-learning in

higher education and summarizes some theoretical issues of using LMS Moodle, both positive and negative. It offers practical suggestions for the qualitative integration of E-learning into the teaching and learning process based on practical and good management of the E-learning process. The case of Simon Kuznets Kharkiv National University of Economics is used, which implemented the distance learning platform, a platform called "Personal Learning Systems" (PLS). A management system for electronic learning at the university was developed based on the modelling method, the primary purpose of which is to use modern electronic educational technologies in the educational process, to prepare a methodological base for electronic educational resources, and to improve electronic educational technologies in the format of electronic learning.

Conclusions. *The E-learning management system "personal learning systems" (PLS) in the university is considered an information-management system whose primary purpose is the application of modern electronic educational technologies in the educational process, in the preparation of a methodological base of electronic educational resources, improvement of electronic educational technologies in a distance learning format.*

KEYWORDS: *E-learning, E-learning Process Management, E-learning Management System, LMS Moodle, Electronic Educational Technologies, Modelling Method.*

INTRODUCTION

Educators had to face a whole range of new challenges. At first, they had to master the new tools of distance learning and teaching quickly. They also needed to provide single access to crucial learning tools. In addition, they are required to provide remote access for everyone in the educational community. They have tried to use technology to minimize the disruption caused by the impact of this crisis on our education system. In the pedagogical community today, the issue of the education system in the "post-virus era" is being actively discussed, and particularly with the start of hostilities in Ukraine, university education was transformed into an online format.

(Letter of 10.10.2022 № 1/11870-22, "On Introduction of Online Education"). Taking into account the broader possibilities of transferring materials in electronic form, it is difficult to disagree with the changes in the future that await the classical model,

which gives knowledge directly in the classroom. At the same time, attention is focused on shifting the vector towards positive opportunities that were previously insufficiently mastered.

Thus, we are witnessing a new reality based on a technological revolution. If earlier E-learning (short for Electronic Learning) was one of the possible forms of the educational process, now it is becoming one of the leading functional technologies. Thus, E-UKRAINE, the digital transformation portal of Ukraine, has gathered leading educational platforms with free online courses where one can improve skills or learn new professions (https://eukraine.org.ua/).

The Ministry of Education and Science of Ukraine has supplemented the list of Ukrainian and foreign platforms for online learning, such as coursera.org, khanacademy.org, prometheus.org.ua and others. (Ministerstvo osvity i nauky Ukrainy, 2022). According to SimilarWeb (a

website providing web analytics services for business), Ukrainian online educational platforms are growing and rising in the rankings of sites in the category "Education" (Industry rank / Education) (SimilarWeb, 2023).

According to the video conferencing service Zoom, the number of daily paid and free users in March 2022 exceeded 250 million, while in December 2019, the maximum number of users per day was 10 million. According to "The State of Technology" in Education report presented by Promethean analysts, in the next 1-3 years, cloud-based tools for organizing and conducting classes will take the leading position (35.8%). Next is followed by online student assessment resources (31.4%), the third place is occupied by virtual and augmented reality (25.3%), then comes programming and robotics technologies (21.8%), and the closing link is distance learning (21.6 %) (Promethean, 2021).

Analysis of Recent Research and Publications.

Many scholars have studied the theoretical and methodological foundations of distance learning in higher education. The use of information technologies in teaching and learning a foreign language is highlighted in the works of national researchers T. Kolbina (Kolbina, Oleksenko, 2020), T. Borova (Borova, Chekhratova, Marchuk, Pohorielova, Zakharova, 2021).

At the same time, the analysis of scientific and pedagogical literature and practical experience show that the problem of the formation and development of the E-learning management system in the university with Moodle needs to be sufficiently studied (Jackson, 2021). The researchers are convinced that the absence of boundaries will be a

characteristic feature of future education. Therefore, the development of E-learning education will largely depend on the quality of information technology.

The **purpose** of the study is to focus attention on the positive aspects of using E-learning in contrast to the traditional format in a modern university, as well as on the need for effective management of E-learning in order to improve the quality of education.

METHODOLOGY

The study employs scientific knowledge, comparative analysis, and system analysis methods. The following research methods were used to solve the assigned tasks: theoretical – analysis of scientific sources, pedagogical and teaching-methodical materials, comparison; empirical – generalization of pedagogical experience; a pedagogical experiment to check the effectiveness of organizing students' work using the LMS Moodle platform. A theoretical framework is based on the literature about an E-learning and distance learning. An empirical framework reflects responses from international universities and focuses on the Ukrainian example of Simon Kuznets Kharkiv National Economic University.

RESULTS

The primary purpose of E-learning management system development at the university is to establish E-learning, use E-learning in modern education according to international standards, disseminate scientific knowledge through the use of modern educational technologies in the educational process, promote the university in the market of educational services, and improve the competitiveness of its graduates.

The system should be focused on the development of the educational

organization and E-learning management, the development of a model of information competence of educators, the definition of goals and objectives for the development and implementation of E-learning, and the establishment of principles and strategic directions. It is built on a highly professional staff. It has advantages such as flexibility, online services, modern electronic educational technologies application, and additional involvement of experts from different countries and higher education institutions.

For the successful development of E-learning in higher educational institutions of Ukraine, it is necessary to fulfil a triune task: to ensure E-learning's availability, competence and motivation. Accessibility is determined by the availability of free access to the Internet for students, competence is determined by the ability to use information resources on numerous sites, and motivation is determined by the desire and aspiration of both educators and students to use these resources.

Based on a recent survey by Houghton Mifflin Harcourt, over 85% of educators view the potential of technology to help them make learning more accessible and empowering very positively. Students in the learning process expect the availability and convenience of the educational resources of the educational institution for mobile use (Houghton Mifflin Harcourt, 2022).

E-learning has firmly entered modern life as a legitimate educational strategy. Nowadays, the higher education system is in a continuous process of change, and universities must keep pace with students' needs, desires, and requirements.

Due to its complexity, multiple definitions are proposed for the concept of E-learning. In the professional environment, several terms are still used: T-learning, distance learning, network learning, virtual learning, and learning using information technology (European Education Area, 2022).

The analysis of publications describing electronic technologies makes it possible to form a list of terms that the authors interpret as "E-learning": Internet education, distance education, network education, computer-mediated communications, computer learning, e-learning, virtual classrooms, information and communication technologies, open learning, tele-learning, distributed learning, web learning, virtual learning (Pronczuk-Omiotek et al., 2018).

According to the definition of UNESCO: "E-learning - learning with the help of the Internet and multimedia." For the first time (in a professional environment), the term E-learning was used in October 1999 in Los Angeles at a CBT Systems seminar. UNESCO does not recommend using translation into national languages instead of the term and concept of E-learning since this term has a certain content, which is not always adequately transmitted by translation and is currently preferred by the professional community (UNESCO, 2022).

Among online platforms for E-learning, online platforms with open-source software for creating online courses have gained relevance in recent years. With the help of Google course builder, Coursera, Udacity, and EdX, educators can create Massive open online courses (MOOCs) and Books as Open Online Content (BOOCs) (Polianovskyi et al., 2019).

These platforms are open electronic courses that allow learners to receive education remotely using the global Internet based on leading universities in Europe, the USA, and Ukraine. MOOCs can

be integrated as part of E-learning into LMS (Kaplan et al., 2016).

Most of these courses are free, which allows anyone around the world to enroll in these courses, attend them online and receive certificates of education. The largest number of today's consumers of E-learning solutions is concentrated in the US and Canada, and among European countries – the UK, followed by Germany, Italy and France. In the US, more than 200 universities and thousands of colleges offer distance learning, and the number of online courses is increasing by about 30-40% annually. In the UK, a variety of remote programs are offered by over 50 universities (NISS,2017).

One of the most powerful online platforms for E-learning in the world, created at the state level and universities, is Coursera, which already provides more than 4,000 free online learning programs, 65 million students, more than 4,000 courses from the world's leading universities and industry educators, therefore, Coursera has one of the enormous datasets for identifying current competency trends.

According to the latest indicators (2022) of the Global Skills Index (GSI) from Coursera, Ukraine occupies a leading position (8) in terms of competencies in the field of technology. Skills proficiency in Ukraine held steady between this year's Global Skills Report (2022) and the last; Ukraine rose three spots (this year, 21st) (Coursera,2022).

Moreover, according to the 8th Annual Educator Confidence Report 2022, educators feel that technology is benefiting the educational experience. Pandemic-Era Tools educators say are vital: tools used to communicate between educators and parents (63%); tools that deliver interactive learning opportunities to students (57%); video conference tools

(52%) (Houghton Mifflin Harcourt, 2022). Overall, educators feel technology benefits the educational experience for themselves and students.

However, one of the biggest challenges of E-learning or online courses is keeping students motivated. For example, 30% of students on the Coursera platform complete the learning process successfully. Another critical issue is the practical assessment of students' knowledge and the creation and management of a productive collaborative environment. (Chehtatova et al., 2022).

A study of global trends in the development of modern distance learning technologies shows that according to the results of published data from Phil Hill's report on the analysis of the learning management market in higher education institutions in the United States and Canada, four distance learning platforms (Canvas, Blackboard, Brightspace and Moodle) dominate, which account for 80-95% of the total market share in recent years. Despite many commercial platforms, many remain available to all users (Moodle, Sakai, Canvas) (Polianovskyi et al., 2021).

Simon Kuznets Kharkiv National Economic University has developed and implemented its distance learning system, Personal Learning System (PLS). This is an electronic information educational environment that is used during classroom and extracurricular independent work, provided with developed methodological materials and recommendations, individual and thematic consultations, the use of various forms of control, accessibility and the ability to work with a computer, both students and educators, and use Moodle, Figure 1.

Figure 1
The Home Page of Simon Kuznets KhNUE Personal Learning System (PLS)
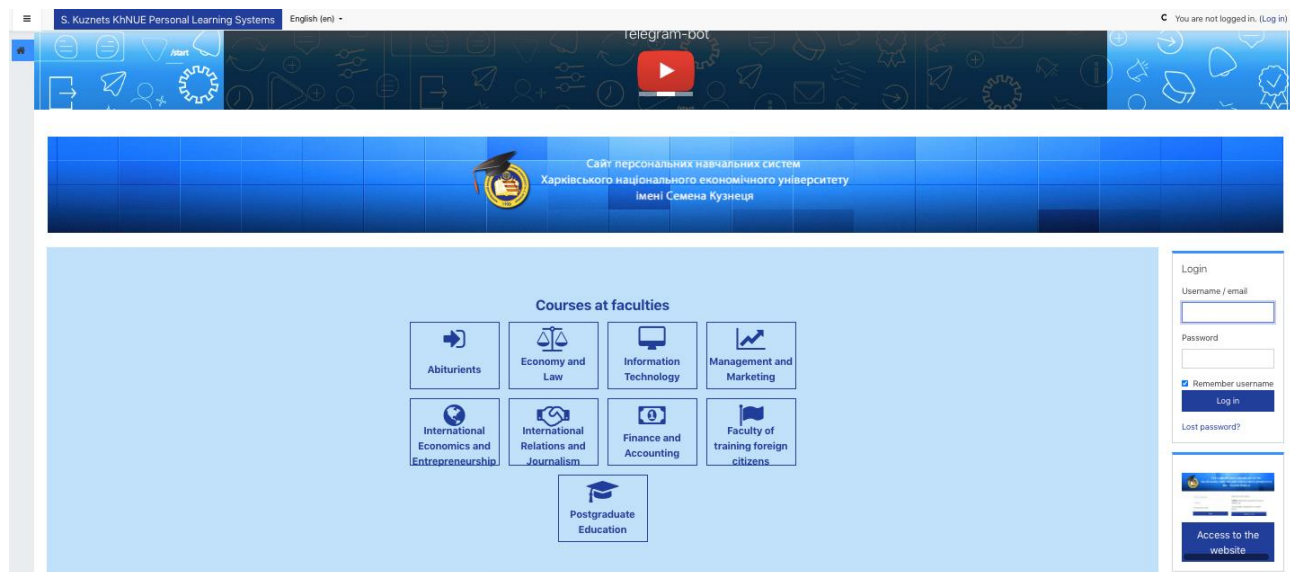
As part of E-learning, Simon Kuznets Kharkiv National University of Economics has implemented the Learning Management System (LMS) Moodle, which is part of the university's electronic information and educational environment.

Moodle (Modular Object-Oriented Dynamic Learning Environment) is a modular object-oriented dynamic learning environment, which is also called a learning management system (LMS), a course management system (CMS), a virtual learning environment (VLE) or simply a learning platform (Personal Learning System) (PLS), which provides educators, students and administrators with a very advanced set of tools for computerized learning, including distance learning (Osadcha et al., 2021).

With the help of electronic information educational environment, students can get access to lecture material (audio and video lectures), practical tasks with semi-automatic assessment, online testing, useful Internet links on the discipline under study, and so forth. This educational content management system has many positive features, the main of which are

the ability to issue access rights (administrator, course creator, educator with and without editing rights, student, guest), keep track of students, show analytical reporting, the results of assignments and testing, analyze the results of testing in large groups of students, provide statistical processing of responses (Borova et al., 2021).

Thus, having these results and statistical processing data, the educator draws attention to those sections of the course that require more detailed and high-quality processing or repetition, use external information systems and, apply the mechanisms of both synchronous and asynchronous communication, organize personalization (Kolbina et al., 2020). This online platform has excellent opportunities for organizing theoretical and practical classes and provides individual and group learning activities for students (Rebukha et al., 2020).

Moreover, in organizing the work of the online platform, considerable attention is paid to the student's independent work, which occupies a special place in the modern educational process. Essential functions of independent work as a form

of organizing learning are to form students with the necessary skills for independent work, using various creative types of work and various forms of cognitive activity that contribute to the development of both analytical abilities and skills for the rational organization of educational work (Hontarenko, 2021).

LMS Moodle is characterized by a convenient, intuitive interface that allows educators to fill the electronic course with the necessary content, resorting only to the help system, and manage this course. Various elements of the course: task, lecture, test tasks, glossary, forum, chat, blogs. The educator can structure the course calendar and thematically, and Zoom conferences are added to the electronic course at the beginning of the 2022/2023 academic year.

In order to support the educational and scientific activities of higher education institutions during the war, the Ministry of Education and Science of Ukraine has agreed with Zoom to provide free and expanded access to the Zoom Meetings for Education software during the 2022/2023 academic year. (Letter No. 1/6677-22 dated June 21, 22 "About the date of free access to Zoom").

Into LMS Moodle, educators can upload content with the material presented in various formats. It supports text extensions to PDF and Excel spreadsheets, images, presentations, and audio and video lectures.

Moodle collects statistics on learning and working with the system, and the very ability to use statistics to correct learning is an essential plus in the learning process. In addition, LMS Moodle provides an extensive toolkit for creating tests and conducting training and control testing, which is especially important for E-learning, in which testing is an essential form of knowledge control (Osadcha et al., 2021).

Thus, LMS Moodle solves many of the necessary tasks that a good distance learning system should solve. It automates routine and simplifies complex processes. It helps the student receive educational material conveniently for him and the educator's feedback in a short time. The educator can simultaneously teach many students, while the control of knowledge occurs with the help of tests, the results of which are checked by the machine. The educator (lecturer, teacher, administrator) can monitor student statistics in real-time, and automate access to different courses depending on the student's study group, Figure 2.

Figure 2

An Example of the Student Statistics in Real-Time
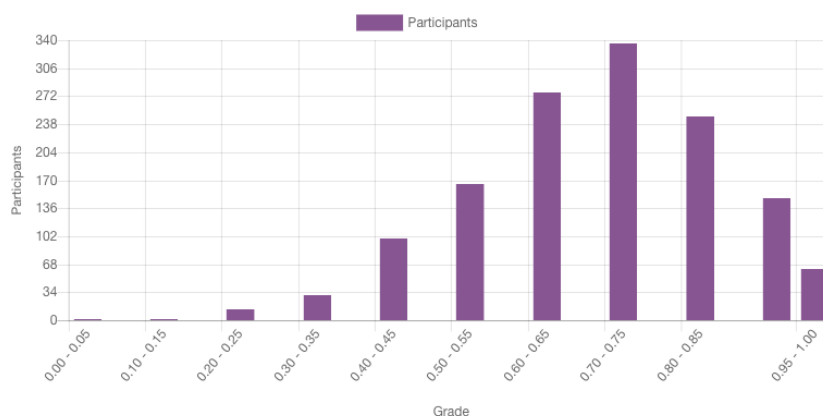
Despite many positive aspects, some negative aspects of LMS Moodle do not allow high-quality teaching of university students and, consequently, the full implementation of educational programs. One of the negative points regarding the introduction of E-learning at Simon Kuznets Kharkiv National University of Economics is considered an imperfect system for providing technical resources and an imperfect or partial lack of professional technical support. Educators are also required to have specific technical competencies in the field of web development. It cannot be said that these resources are actively involved in the educational process.

Another significant negative side is the inertia of the educational system at the university, which needs to be prepared to effectively respond to the challenges of our time, as well as the inability of educators to organize the work of electronic educational content from a methodological point of view (Borova et al., 2021). A small part of the university's teaching staff are people who do not doubt that the educational process is possible without modern technologies. However, due to the rapidly changing situation in the modern world, the education system requires specialists who are competent in using digital technologies and able to use new educational technologies to create various electronic resources.

Educators' lack of time and resources aggravates the creation of full-fledged electronic content at the university due to their high workload. Moreover, the creation of high-quality content is required, and its timely updating to maintain it in proper condition due to constant changes (Figlio et al., 2013) However, it is tough to make changes in

time, which, in turn, requires the creation of a network of universities, which today is quite challenging to predict when it will be implemented.

In addition, student grades can only be operated within the course. It is impossible to draw up a summary sheet, for example, for all disciplines of the semester, and the very concept of a semester needs to be present in the basic version of the system.

The Moodle system operates with the objects "course", "user", and the user's role in the course ("student", "teacher", "lecturer"), which is not enough to automate the educational process of the university. To preserve the integrity of the Moodle structure and the possibility of using new versions, it was necessary to create a "dean's office" system in the form of a separate block, concentrating all the functions of managing the educational process.

Moreover, the department of technical and electronic learning tools, designed to help educators provide technical support and effectively organize and administer online learning on the LMS Moodle platform, needs more specialists and time. As a result, most of the courses developed by educators are repositories of material in pdf format. Replacing a live lecture with an electronic textbook violates the requirements of state educational standards. In addition, studying textbooks instead of "live" lectures and electronic textbooks causes great difficulty in mastering the material for students since an independent study of the discipline requires effort (Callister, et al., 2016).

Low student motivation also significantly reduces the quality of learning in an online environment, where fewer external factors contribute to good academic performance. Students are often left to

their own devices during learning activities, and no one systematically motivates them to achieve learning goals. As a result, meeting deadlines during online learning can become difficult for students who need strong self-motivation and time management skills (Bettinger et al., 2017).

Taking into account the fact that the intermediate and final assessment of students can take place in the format of tests, another tricky moment of E-learning is the incompetence of many educators in compiling correct tests that can effectively assess the result of mastering the disciplines by students (Kruty, 2019).

Therefore, the active use of low-quality online technologies is of great concern due to the deterioration in the level of training of students at a given time because even distance-learning students have a significantly higher level of training than distance-learning students. Consequently, there is a concern about the lack of demand for graduates of higher education institutions in the labour market due to poor quality training. This situation will only satisfy the state and the students.

Thus, the provision of quality education and, consequently, the implementation of the priority goal of the higher education system is accompanied by some difficulties. Highly effective management of the E-learning process and good management can contribute to the quality implementation of E-learning.

Based on the modelling method, the E-learning management system at Simon Kuznets Kharkiv National University of Economics was developed and proposed. In the scientific literature, modelling is considered "the process during which the study of the aspects of the object of interest to the researcher (including its hidden properties) and the construction of a model that reflects the features, properties, connections of the object of study in the form of a simple and visual form convenient for analysis takes place" (José Luís Ramos et al., 2022).

The essence of pedagogical modelling is to identify and analyze pedagogical problems and their causes, build value bases and design strategies, determine goals and objectives, and search for methods and means of implementing a pedagogical project (Heafner, 2021). The basis of the developed E-learning management system at Simon Kuznets Kharkiv National University of Economics is a systematic approach.

The E-learning management process is seen as a system that includes a set of elements. The projected E-learning management system at Simon Kuznets Kharkiv National University of Economics has the following management functions: planning, organization, motivation, coordination, and control, and consists of three interrelated elements: organizational and managerial; technological; documentation, Figure 3.

The planning function implies the creation of a conceptual framework for E-learning management, the developing of strategic and tactical plans for preventive measures, and the developing of resources for implementing e-learning management technology.

The organization's function involves the creation of a department for the management of E-learning and the delegation of authority for the management of E-learning, as well as for such resources as personnel, material, and equipment.

Figure 3

The Page of the Set of the E-learning MS Elements
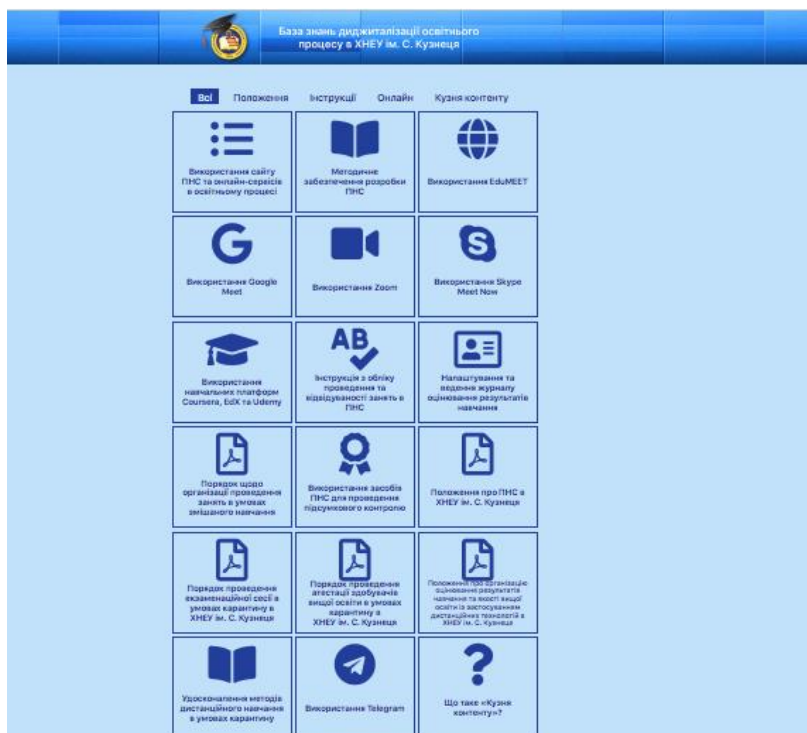
The function of motivation is seen as improving the information skills of educators, heads of departments, and deans and creating a favourable learning and motivational environment; initiation of intra-university competitions for the design of E-learning courses; developing an influential organizational culture among the staff of the educational institution, the creation of technologies for economic and moral stimulation of work on the management of E-learning (Polianovskyi et al., 2021). Of course, it will always be necessary to overcome obstacles: this is the lack of time, the state of health, and the educator's inertia, but if a motivational environment is cultivated and maintained at the university, then these factors become easily overcome.

The coordination function considers the analysis of analyses on E-learning management; the discourse of problems regarding the E-learning management system at events such as seminars, pieces of training, refresher courses, and meetings; and assistance to users and responsible structural units when registering for E-learning resources; working on the approval of local regulations confirming the expertise of online resources, development and implementation of open online courses (MOOCs) to be posted both on the university platform or various online platforms (Kaplan et al., 2016); discussion with the teaching and learning department to assess the quality of E-learning resources; writing methodological guidelines for organizing practical E-learning courses; developing methods and technologies for training sessions using E-learning.

The control function considers the recording and analysis of the organization of all E-learning management programmes and activities at a track university; clarifying the circumstances of non-implementation of the E-learning management plan; controlling the content plan; marketing of online

educational programmes; diagnosing the frequency and duration of access to the course and its modules by learners and educators; administration of databases, software, backups; establishing expertise, developed online courses; writing reports on the implementation of E-learning in the university; making corrections to the E-learning management system.

DISCUSSION

Discussing this issue covered in this study, the E-learning management system may be developed using the processes of pedagogical modelling in a systematic approach.

The foundation of the E-learning management system consists of diagnosing the state of E-learning development in the university, assessing the elements, forms, and components of the E-learning management system that are available, and assessing the level of E-learning program development skills.

The E-learning management system is focused on designing and managing E-learning, building a model of teachers' professional information competence, establishing principles and strategic directions for E-learning, analysing results, and modifying the E-learning management system. It moreover sets goals and objectives for the development and implementation of E-learning.

Thus, the E-learning "personal learning system" (PLS) is considered as an information management system, the primary purpose of which is the application of modern electronic educational technologies in the educational process (Polianovskyi et al., 2021), the preparation of a methodological base of electronic educational resources (Hontarenko, 2021), the improvement of electronic educational technologies in distance education format (Osadcha et al.,

2021). However, all the above aspects are subject to discussion.

Discussing the obtained results are very similar to the results of colleagues (José Luís Ramos et al., 2022) and other researchers (Borova et al., 2021; Chekhratova et al., 2022; Bettinger et al., 2017).

CONCLUSIONS

The primary purpose of E-learning management system development at Simon Kuznets Kharkiv National University of Economics sees the development of E-learning, active use of E-learning in modern education according to international standards, dissemination of scientific knowledge through the use of modern educational technologies in the educational process, popularization of the university in the market of educational services, the competitiveness of its graduates.

The basis of the E-learning management system in Simon Kuznets Kharkiv National University of Economics should be a diagnosis of the level of E-learning development in the university, an assessment of available methods, forms and elements of E-learning management system in the organization, an assessment of the level of skills in developing programs for the development of E-learning.

The E-learning management system in the university should be focused on the development of the educational organisation and E-learning management, the development of a model of information competence of educators, the definition of goals and objectives for the development and implementation of E-learning, establishment of principles and strategic directions of E-learning; analysis of results and adjustment of the E-learning

management system and is built on a highly professional staff.

Thus, the E-learning management system "personal learning systems" (PLS) at Simon Kuznets Kharkiv National University of Economics is considered an information management system whose primary purpose is the application of modern electronic educational technologies in the educational process of preparing a methodological base of electronic educational resources, the improvement of electronic educational technologies in distance education format.

Prospects for further research. The study of the formation and development of the E-learning management system in the university in the context of the use of modern technologies allows us to identify a list of its advantages in current conditions:

– the flexibility of the educational process through the use of online services;

– application of modern electronic educational technologies in the educational process;

– additional involvement of experts from different countries and higher education institutions in the educational process to improve E-learning topics and technologies.

Further research into the effectiveness of modern distance education technologies is an important area for future research, which will contribute to the digitalization of society to ensure the innovative development of education.

CONFLICT OF INTERESTS

FUNDING

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АНОТАЦІЯ / ABSTRACT [in Ukrainian]:

СУЧАСНІ ЕЛЕКТРОННІ ОСВІТНІ ТЕХНОЛОГІЇ В ПРОЦЕСІ Е-НАВЧАННЯ

__Метою__ дослідження є виявлення позитивних сторін використання електронного навчання на відміну від традиційного формату у вищих закладах освіти, а також необхідності ефективного управління електронним навчанням для покращення якості освіти.

Для вирішення поставлених завдань використовувалися такі __методи__ дослідження: теоретичний – аналіз наукових джерел, педагогічних та навчально-методичних матеріалів, порівняння; емпіричний – узагальнення педагогічного досвіду; педагогічний експеримент з

перевірки ефективності організації роботи студентів з використанням платформи LMS Moodle.

Результати. *Це дослідження фокусується на позитивних аспектах використання електронного навчання. Впровадження електронного навчання в освітній процес відкриває нові можливості, забезпечує кожного необхідними знаннями та розвиває навички цифрової грамотності. У дослідженні проаналізовано сучасний стан е-навчання у вищій освіті та узагальнено деякі теоретичні питання використання LMS Moodle, як позитивні, так і негативні. Пропонуються практичні пропозиції щодо якісної інтеграції е-навчання в навчальний процес, що ґрунтуються на практичному та ефективному управлінні процесом е-навчання. Використовується приклад Харківського національного економічного університету імені Семена Кузнеця, який впровадив платформу дистанційного навчання під назвою "Персональні навчальні системи" (ПНС). На основі методу моделювання розроблено систему управління електронним навчанням в університеті, основною метою якої є використання сучасних електронних освітніх технологій в навчальному процесі, підготовка методичної бази для електронних освітніх ресурсів, а також удосконалення електронних освітніх технологій у форматі електронного навчання.*

Висновки. *система управління електронним навчанням "персональні навчальні системи" в університеті розглядається як інформаційно-управлінська система, основним призначенням якої є застосування сучасних електронних освітніх технологій у навчальному процесі, у підготовці методичної бази електронних освітніх ресурсів, удосконалення електронних освітніх технологій у форматі дистанційного навчання.*

КЛЮЧОВІ СЛОВА: *електронне навчання, керування процесом електронного навчання, система керування електронним навчанням, Moodle, електронні освітні технології, метод моделювання.*