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DIGITAL EDUCATIONAL ENVIRONMENT
AS A CONDITION FOR EFFECTIVE STAFF TRAINING
FOR INNOVATION ECONOMY

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Abstract

The research focuses on the formation of a digital educational environment (DEE) as a crucial factor for training personnel capable of thriving in an innovative economy.

Purpose. The study addresses the challenges posed by the rapidly evolving digital business landscape, emphasizing the need for educational institutions to adapt by creating a competitive DEE. The primary goal is to identify the key directions for developing a DEE that effectively prepares students for the demands of the digital economy.

Materials and methods. The research utilized various methods, including systematic and functional approaches, expert assessments, and statistical analysis, to evaluate the potential of the educational environment in training digital business professionals. A case study was conducted at Sevastopol State University. The study compared traditional teaching methods with a blended learning model.

Results. The authors conclude that a well-designed DEE, leveraging platforms like Moodle (Modular Object-Oriented Dynamic Learning Environment), is essential for preparing future professionals in the digital economy. The results of the research are recommended for use in frameworks for additional professional training, employment, and staff retraining, with the aim of enhancing the overall professional competence of specialists.

Keywords: digital personnel; information and educational environment; informal education; business education; digital ecosystems; individual trajectory

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Научная статья | Методология и технология профессионального образования

ЦИФРОВАЯ ОБРАЗОВАТЕЛЬНАЯ СРЕДА КАК УСЛОВИЕ ЭФФЕКТИВНОЙ ПОДГОТОВКИ КАДРОВ ДЛЯ ИННОВАЦИОННОЙ ЭКОНОМИКИ

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Аннотация

Исследование сосредоточено на формировании цифровой образовательной среды (ЦОС) как ключевого фактора подготовки кадров, способных успешно функционировать в инновационной экономике.

Цель исследования. Исследование рассматривает проблемы, связанные с быстро развивающимся цифровым бизнес-ландшафтом, подчеркивая необходимость адаптации образовательных учреждений к созданию конкурентоспособной ЦОС. Основная цель – определить ключевые направления разработки ЦОС, которая эффективно подготовит студентов к требованиям цифровой экономики.

Материалы и методы. В рамках настоящего исследования использовались различные методы, включая системный и функциональный подходы, экспертные оценки и статистический анализ для оценки потенциала образовательной среды в подготовке специалистов для цифрового бизнеса. Применён метод кейс-стади в образовательном процессе Севастопольского государственного университета. Представлен сравнительный анализ традиционных методов преподавания и модели смешанного обучения.

Результаты. Сделаны выводы о том, что хорошо спроектированная ЦОС, использующая такие платформы, как Moodle (Modular Object-Oriented Dynamic Learning Environment), является необходимой для подготовки будущих специалистов в цифровой экономике. Полученные результаты исследования рекомендуется использовать в схемах дополнительного профессионального обучения, трудоустройства и переподготовки кадров с целью повышения общепрофессиональной компетентности специалистов.

Ключевые слова: цифровой персонал; информационно-образовательная среда; неформальное образование; бизнес-образование; цифровые экосистемы; индивидуальная траектория

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Introduction

The rapidly developing digital business requires an instant response of the educational environment to the changing demands of citizens, society, government, and business. Rapid changes are challenges for the education system. Therefore, there is a necessity to form the digital environment of an educational organization as a direction that ensures its competitiveness in modern realities. The construction of a digital educational environment [DEE] addresses the issues of developing a system of basic personal competencies that will provide a person with the

opportunity to quickly adapt to social and economic changes, as well as his successful socialization, professionalization, and well-being in a transforming economy [14].

When forming a DEE as a condition for the effective training of personnel for an innovative economy, some issues arise that are related to the inadequacy of qualification requirements applicable to labor resources [15]. The issue is also the assessment of the existing potential of the educational environment in training the workforce for the digital business. The next set of issues is related to the presence of technological and knowledge risks in the education system in training personnel for the digital business [16]. It is, therefore, relevant to study the potential of the education system in training personnel for the digital business and determine the role of the management staff of high school in its renewal, which is the scientific relevance of the research.

The research goal is to identify the primary directions of the formation of a competitive DEE of an institution as a condition for effective training of personnel for an innovative economy [13].

At the request of various target groups, it considers the joint creation of value to achieve the goals of self-development and self-education of digital economy personnel. In solving the set tasks, we examine modern education trends in the digital economy context [2]. Additionally, we identify the issues that need to be solved to eliminate the obstacles to the effective use of the digital education system of the institution and formulate priority tasks that need to be solved.

Digital Educational Environment Concept

At the present stage, the DEE is a part of the global information space of various industries and directions: economic, managerial, political, industrial, sectoral, medical, etc. Simultaneously, the basic element of the DEE is the training segment, which in turn acts as a combination of existing or intentionally created pedagogical conditions for the elevation of an individual [11]. Summarizing the available data on the DEE structure, one can assume that, regardless of the scale, it should include three components: conditions (platform and form of presentation of training informa-

tion), content (actual data and information), and result (level of formation of relevant competencies) [18]. The Unified Information Space [UIS] of an institution assumes the functioning of the following subsystems: administrative, registration and authorization, knowledge, communication, accounting, library and bibliographic, organizational, educational, and process. There may be a digital dean's office in the pedagogical segments. Additionally, the subsystems of the UIS are supposed to accumulate test, economic, statistical, and documentation information [1].

Therefore, the concept of DEE is considered by us a public set of information models designed to provide various educational tasks, as well as conditions for training personnel for an innovative economy. The public model means the ability and right of consumers to use different systems as part of the DEE [6], replace them, add new ones in the field of the network infrastructure, forming a single technological educational platform with innovative technologies, creating conditions for effective interaction between stakeholders. The specialization of the DEE will be considered further.

Modern Digital Environment of Educational Institutions

When evaluating a modern DSP, its goal-setting raises questions. J. Reale, E. O'Brien, et al. indicate the components of goal setting in the digital environment for managing educational programs at the university. To support the management of the main professional educational program (MEP) during the life cycle, the scholars propose a developed system of digital services, including the "Personal account of the head of the MEP," "Student's personal account," and "Teacher's personal account." Therefore, the proposed goal setting of the DEE is competitive and feasible [16].

S. Taranukha, M. Savelyeva, and I. Fomina consider the transformation of the digital information and educational system of the transport high school into a digital ecosystem based on the implement of artificial intelligence technologies. The scholars study the digital ecosystem of the transport university. It is determined by a systematic approach, as a set of ecosystems of users [19]. The digital ecosystem of students is studied as a set of elements homogeneous in terms of education, the functioning

of which is aimed at the formation of students' competencies within a separate educational program and the provision of basic and additional services at the request of the main users [13]. The list of additional services that are elements of the structure of the digital ecosystem is considered based on a certain sample of students of various courses in the field of bachelor's and master's studies in economics and digital technology in order to cover various professional orientations and monitor possible changes in needs depending on the maturity of the student. A conceptual model of the digital ecosystem is built based on the set of basic and additional services. From our perspective, these components are viable, especially within the framework of a specialized educational institution.

Ecosystem for Training Future Leaders of the Digital World

The digital educational environment as a condition for effective training of personnel for an innovative economy is not limited to the framework of an educational institution. The study by N. Altukhova and E. Vasilyeva examines the features of teaching the course "Internet entrepreneurship," supported by the Foundation for the Development of Internet Initiatives, at universities in Russia, Belarus, and Kazakhstan. The Department of Business Informatics of the Financial University (Moscow, Russia) has been teaching students and postgraduates the basics of entrepreneurship on the Internet since 2015. The scholars highlight the issues of teaching technological entrepreneurship. Therefore, several publications identify key participants in training professionals whose competencies may be in demand within the ecosystem of the digital world. The recommendations for improving the effectiveness of the learning process developed by the scholars are of particular interest [10]. An important advantage of the approach to teaching the course "Internet entrepreneurship" is the integration of Lean Startup methodology and design thinking. The scholars have developed case studies and practical recommendations for creating digital services based on human-centered design. The extracurricular business game "Your profession in the field of Internet technologies (IT)" is also fairly relevant. The tasks of the business game describe the necessary personal qualities and competencies of eight popular IT professions: consultant, presale manager,

top product manager, software developer, support engineer, tester, brand project manager, and system administrator. When forming an ecosystem for training future leaders of the digital world, it is of interest to build a portrait of a typical representative of the profession, the type of behavior in a conflict situation, and communication characteristics. When conducting these types of games, one can use psychological tests to test the knowledge of the subject area and identify communication skills and logic.

Therefore, when forming an ecosystem for training future leaders of the digital world, one should consider the set of competencies inherent in the personnel of the digital economy, as well as the algorithm of career growth.

Building an effective digital learning environment is a systemic prerequisite for the success of higher education institutions. In fact, a digital learning environment is an open set of information systems designed to provide various tasks of the educational process. Among pedagogical technologies, it is the information and communication technologies that have a significant potential to provide educational activity of individuals and their self-assessment, which is close to adequate one. These are both the specificity and the phenomenon of the digital educational environment [12].

Expansion of the capabilities of traditional forms of learning to master educational programs and effective communication between participants in the educational process were the prerequisites for the development of the Electronic Information and Education Environment of Sevastopol State University (EIEU). The EIEU provides the solution to the following tasks:

1. Organization of training using different tools: chats and forums;
2. Development of training modules directly in the system;
3. Development of tests and control materials;
4. Recording the progress of the educational process and the results of interim certification and results of mastering the basic educational programs;
5. Analysis of user activity and motivation for learning.

The process of implementation of the Digital Learning Environment at Sevastopol State University has gone through several stages:

1. Creation of the digital information and educational environment of the University, which includes digital educational and digital

information resources, various information systems, telecommunication technologies, and appropriate technological means that ensure the full mastering of educational programs by the students. To organize e-learning, Sevastopol State University uses the Moodle distance learning system - there, teachers or a team of teachers of the University develop e-learning courses and implement a flexible automated grading system for all completed assignments (local regulatory documents for e-learning, including Regulation on e-learning and distance learning technologies dated January 29, 2018, Regulation on creation, expertise, and placement of e-learning resources dated August 27, 2018, and Regulation on crediting the results of mastering open online courses dated December 27, 2017, were developed;

2. Establishment of the organizational structure of e-learning and definition of the functions of the structural units of the University;
3. Continuous training and professional development of the University faculty and staff on educational programs using e-learning and distance learning technologies;
4. Development of methodological recommendations and instructions for teachers on providing distance learning, video instructions on working with Moodle platform, on creating and editing e-learning courses, and organization of methodological support for e-learning;
5. Examination of digital courses before opening access to students to determine the degree of compliance of their structure and content with the working program of the discipline, modern practices of using information and communication technologies, and the requirements of the Regulations [9];
6. Development of a system of incentives for teachers; to calculate the indicators of effective contract, the points for development and implementation of an e-learning course or massive open online course, which passed internal and external expertise as an author in digital information and education environment, are included.

Materials and methods

We utilize a set of general scientific methods: systematic and functional approaches; special research methods: sociological (expert assessments, observation, analysis of educational practices, questionnaires, and interviews of participants in educational relations, employers) and statistical. The employed methods allow us to scientifically characterize the potential of the educational environment in training personnel for the digital business.

Today, future bachelors in economics have quite high requirements for the application of digital technologies in professional activities. The educational process at Sevastopol State University is focused on ensuring that each particular student acquires the knowledge, skills, and abilities defined by the requirements of Federal State Educational Standards (FSESU) in the relevant fields of study. For Sevastopol State University, there is a rather acute problem of training higher-level economists, taking into account the peculiarities of the university development today and the tasks set within the Priority 2030 project.

The digital educational environment of the Institute of Social Sciences and International Relations of the Sevastopol State University introduces new pedagogical practices [4]. Particular attention was paid to the organization of personalized learning in a digital educational environment, for which e-learning provides ample opportunities [7]. At the moment, there is a structure for teaching the discipline Foreign Language for students in the direction 38.03.01 – Economics, which has been formed over the past years. In this connection, we consider it expedient to develop professional competencies in future economists in a digital educational environment since:

- First, it helps future bachelors to study better and obtain a higher level of knowledge in the disciplines;
- Second, it helps to increase their motivation;
- Third, it develops students' skills in using digital resources for independent study of academic disciplines.

Training bachelors - future economists in digital technologies in a digital educational environment has a number of advantages:

- Flexibility of the learning process - the ability to organize the learning process in any place where there is access to the Internet;

- Visualization - the possibility to present information in a visual form;
- Efficiency - less time is spent on the learning process, especially on the control of learning material and interaction with students.

An important element in the formation of professional competencies of future economists is the introduction of digital technologies in group learning: gamification in education, virtual tutors, the introduction of elements of artificial intelligence in the practice of continuing education, familiarization with new concepts of e-learning development, expansion of communication channels with applicants (telephone, Skype, zoom-conferences, e-mail, social networks, etc.).

The introduction of electronic information resources and e-learning courses into the learning process creates fundamentally new pedagogical tools, providing fresh opportunities as well. At the current stage of transition to the new generation standards based on modular technology, the issue of high-quality organization of students' independent work becomes especially relevant [17].

In the educational process of Sevastopol State University, digital educational courses are used to organize students' independent work and are an effective tool for shaping the range of necessary skills and abilities for mastering the discipline of "Foreign Language".

We developed a digital training course, English for Economists, for Bachelor's degree students of the 38.03.01 program Economics. This e-learning course runs on the Moodle platform and provides forms of synchronous and asynchronous interaction, while students are also provided with the support of a teacher in a face-to-face format. The content and structure of the e-learning course are determined by the objectives for the formation of foreign language professional and communicative competence and assume that students master the necessary and sufficient level of communicative competence to solve social and communicative tasks in various areas of professional activity.

The course English for Economists is aimed at training bachelors in different situations of interpersonal and professional communication (their foreign language skills should not be lower than B1+) to solve the following professionally oriented tasks:

- Expand the active vocabulary by means of professional terminology related to business and management, finance and economics;
- Improve the skills and abilities in reading authentic texts and professional articles;
- Enhance listening comprehension skills of native speakers in their major;
- Develop linguistic interaction skills: presentation, report, and annotation of authentic literature in the specialty;
- Develop basic skills in writing and editing CVs, official letters, and other types of business correspondence;
- Improve negotiation skills in English and argumentative presentation of one's point of view in solving professional tasks. Attention to entrance testing is due to the situation that has developed in practice, associated with the spread of the initial levels of language training of students. This problem and methods for solving it, proposed at the Sevastopol State University, are described in detail in [3; 8].

It is important to emphasize that, for the effective implementation of personalized learning, initial testing data plays a crucial role. This data, combined with other forms of systematic monitoring of educational outcomes, helps manage the educational process. It facilitates the creation of individualized learning paths, assesses educational results, and supports other aspects of personalized education.

The digital learning environment developed at Sevastopol State University achieves its goals for all participants in the educational process. For students, it enhances opportunities to create personalized educational pathways and access the latest educational resources. For teachers, it alleviates the burden of managing extensive documentation, reduces the routine workload associated with task assessment, simplifies the monitoring of educational progress, and fosters new educational opportunities.

Research results

The study was conducted in the Institute of Finance, Economics and Management of Sevastopol State University, where the digital educational environment is based on LMS Moodlesevsu.ru. The authors de-

veloped and implemented the electronic training course “English for Economists” for the organization of independent work 122 students of Sevastopol State University. The research was conducted throughout 2023-2024. The course is based on the contents of the curriculum “Foreign Language for Economists”. The control group included 60 students and were taught by traditional methodology with textbooks and workbooks only. Whereas the experimental group included 62 students who were offered a mixed learning model which involved a combination of traditional forms of teaching and independent work with an electronic training course based on LMS Moodle platform.

The ascertaining and formative stages of the experiment involved measuring the initial level of foreign language communicative competence of future economists. Here is a diagram showing the distribution of percentage correlation of the level of formation of foreign language communicative competence of future economists at the initial and the final stage of the experiment. The diagram shows positive dynamics in the levels of foreign language communicative competence of future economists in experimental group where mixed-learning format was applied (Fig. 1, Table 1).

Four assessment criteria have been established:

a) Motivational: This criterion assesses students’ motivation for using ICT tools such as LMS Moodlesevsu.ru, Web 4.0 services, and VR. Methods include administering a questionnaire titled “Do I feel stressed when using technology in my academic process?” and analyzing the results.

b) Cognitive: This criterion evaluates students’ understanding of essential profession-oriented topics, including “Jobs,” “People and Organizations,” “Money,” “Finance and the Economy,” “Business Skills,” “Corporate Culture,” “Negotiations,” and “Making Arrangements.” Assessment methods involve interactive oral questionnaires, group observations, and analysis of educational activities.

c) Technological: This criterion measures students’ operational skills in effectively using LMS Moodlesevsu.ru and other digital resources. It includes the integration of external Internet services into the LMS, the creation of interactive tasks using H5P elements, and the automation of

result checks. Methods consist of conducting questionnaires and analyzing results within the digital educational environment.

d) Reflexive: This criterion evaluates students' self-reflection regarding their development of professional competence. Results are monitored and categorized as follows: 1. Productive (82-100 points), 2. Medium (60-81 points), 3. Low (0-59 points).

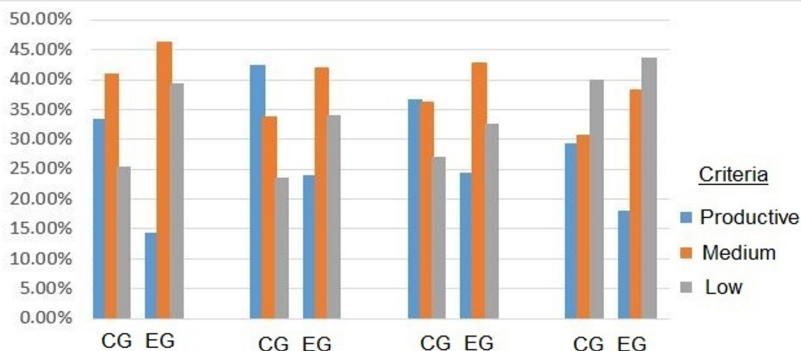


Fig. 1. Diagram introduces the results of the research (2023-2024)

Table 1.

Overview of the observation results of the experimental and control group participants

Productive	Medium	Low	Criteria
33.49%	41.07%	25.44%	Motivational
14.36%	46.35%	39.29%	
42.42%	33.95%	23.62%	Cognitive
23.97%	42.07%	33.97%	
36.72%	36.23%	27.06%	Operational
24.44%	42.91%	32.66%	
29.34%	30.69%	39.96%	Reflexive
18.05%	38.26%	43.68%	

As can be seen from the diagrams, 33.4% of respondents showed stable motivation to master the foreign language acquisition as well as an

aspiration to use a foreign language in the future profession. According to cognitive criteria (42.42%) – a high level of development of professional competence was achieved. 36.72% is considered as a high level of proficiency in modern ICT technologies. Reflexive criteria is 29.34% that confirms a high level self-assessment in DEI.

Discussion of the results

Digitalization of education and science today refers to the priority areas of development of the information society. Due to this fact, the problem of transforming the education system to train competitive specialists in taking into account the challenges and trends in the development of digital technologies.

According to our research, the successful formation of general professional competence is due to the active implementation of e-learning and widespread use of ICT as well as through the use of innovative digital learning tools [5].

As can be seen, the initial outcomes of the implementation of digital education show a noticeable improvement in the effectiveness of students' independent study due to the enhanced support from teaching mentors. The distance learning system Moodle now incorporates forum and chat functions, streamlining the delivery and assessment process for student work. The assessment of students' work has been partially automated. It is expected that the utilization of the Moodle remote learning system will enhance students' comprehension of theoretical lecture material when replicated in a virtual setting, allowing them to catch up on missed training sessions. Outstanding students receive “badges” as recognition.

The practice of using the Moodle system for monitoring academic performance has been proven to be a highly effective method. However, there have been some challenges in its implementation, specifically related to technical issues with the Moodle database. This problem arose due to a sudden influx of developers, leading to an overflow in the database. Consequently, Moodle often experiences downtime on weekends. The size of the Moodle database is 409.9 MB, but a compressed back-

up of the data is only 172 MB. Additionally, the current situation does not allow for the realization of the opportunity to address these issues.

The pedagogical feasibility of incorporating distance learning systems, such as Moodle, into the educational process of SevSU for both full-time and distance learning can be deduced. Independent student work, which forms approximately 75% of the total study hours, is fundamental to higher education. Currently, Northern State University is developing a set of performance indicators to evaluate the overall effectiveness of their distance learning system.

Conclusion

The research underscores the critical importance of a robust Digital Educational Environment (DEE) in preparing students for the demands of a rapidly evolving digital economy. The study highlights that the integration of digital tools like LMS Moodlesevsu.ru and other ICT resources significantly enhances students' motivation, cognitive understanding, and technological proficiency. The findings also reveal that a mixed learning model, which combines traditional methods with digital learning, leads to substantial improvements in students' professional competence, particularly in foreign language acquisition for future economists.

The implementation of digital education at Sevastopol State University demonstrates a positive trend in the effectiveness of independent student work, as well as the overall learning process. However, the study also identifies challenges, particularly technical issues related to the Moodle system, which need to be addressed to fully realize the potential of digital learning environments. Despite these challenges, the DEE at Sevastopol State University has proven to be a valuable tool in modernizing educational practices and equipping students with the skills necessary for success in a digitalized world.

The research suggests that further development of personalized learning paths and continuous improvement of digital infrastructure are essential to overcoming the current limitations and maximizing the benefits of digital education. This approach not only supports students' academic achievements but also prepares them for the complexities of professional

life in the digital age, ensuring they are well-equipped to meet the challenges for the future of work.

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