THE ESSENCE OF E-LEARNING: DIDACTIC ASPECT, POTENTIAL, EFFECTS, TRANSFORMATIONAL CHANGES, ASPECTS FOR IMPROVEMENT IN WAR CONDITIONS

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Abstract: The article presents the theoretical and empirical results of research into the essence of e-learning. Based on the analysis of scientific works, a list of factors that influenced the definition of the essence of e-learning was compiled. It was found that the content of the definitions includes a transition from the technological context to didactic features (learning method ⇒ educational strategy ⇒ learning procedure ⇒ active information procedure ⇒ approach to learning ⇒ means of providing educational content ⇒ learning process ⇒ personalized approach ⇒ web-based learning ecosystem ⇒ alternative learning process ⇒ learning environment option ⇒ barrier remover ⇒ developing environment). Data on forms of e-learning, types of interaction, requirements for the online space and the personality of the e-learning teacher were summarized. The potential and effects of e-learning were detailed. The pedagogical experiment was implemented with the aim of clarifying the aspects of the organization of e-learning in the conditions of war, which were identified by students as requiring improvement. It has been determined that organizing e-learning in wartime conditions should consider the following factors among students: 1) a feeling of dependence on external factors, technical support, technical problems, an increase in intellectual and emotional load during e-learning; 2) the need for direct communication to experience a sense of belonging to the university community; 3) the need for didactic balance (optimal workload, taking into account the individual characteristics of students' learning, observing hygienic conditions for working with a computer).

Keywords: e-learning; distance learning; online learning; mobile learning; blended learning; e-learning in war conditions; e-learning potential; e-learning effects; students; lecturers.

1 Introduction

Education, as an open humanitarian system, undergoes constant changes influenced by external and internal factors. We view e-learning as a relatively new form of education. Firstly, it is a result of both external and internal influences. Secondly, it has precipitated transformative processes within education. Thirdly, it represents an ever-evolving mode of learning.

An increasing number of individuals are joining the information society as students, producers, or consumers. This trend contributes to the emergence of a fundamentally new societal information environment, referred to by modern philosophers as the infosphere. It is safe to say that the infosphere will likely define the primary features of the information society. Although still in the process of formation primarily in the most economically and technologically advanced countries, it is expected that, in response to the challenges posed by the information society, this phenomenon will eventually extend globally. Therefore, it is not an exaggeration to assume that future generations will need to adapt to a new social and technological environment, where information and scientific knowledge, rather than natural resources and energy, will emerge as the primary factors shaping both the strategic potential of society and its developmental prospects. As a result, education in the information society challenges information and communication technologies to meet the large-scale educational needs generated by its socio-economic development. Furthermore, information and scientific knowledge emerge as the primary commodities of its economic activity, constituting the core values and products of the information society. These elements directly underpin future economic prosperity, social stability, and technological advancement.

2 Method

Our research consisted of theoretical and experimental parts. The theoretical part of the research was aimed at performing the following tasks:

1. To investigate the content of the essence of e-learning, to isolate and organize information about the reflection in the content of the transition from the technological context to didactic features.
2. To summarize the results of scientific studies that prove the potential of e-learning.
3. To summarize the results of scientific studies that prove the effects of e-learning.
4. To investigate the transformational changes of e-learning in the context of different types of learning, in particular distance, online, mobile, and blended learning.

The experimental part of the study was aimed at performing the following tasks:

1. Research on e-learning as an optimal form of student education during Russia's military operations on the territory of Ukraine, which began on February 24, 2022.
2. Clarification of aspects that, according to students, need improvement for further implementation of e-learning in emergency situations.

The research used theoretical methods (analysis, arrangement, systematization, generalization) and empirical methods (observation in the conditions of e-learning, conversations, questionnaires). Students of Borys Grinchenko Kyiv University, Dragomanov Ukrainian State University, and Volodymyr Vynnychenko Central Ukrainian State Pedagogical University were involved in the pedagogical experiment. The total number of participants of the experiment was 435 full-time and part-time students.

3 Results and Discussion

Didactic aspect of the essence of e-learning

T. Miyer, N. Machynska, H. Bondarenko, N. Rudenko, L. Romanenko, I. Sukhopara, R. Shpitsa [22] and other scientists explain the essence of e-learning in the conditions of the automated infosphere. E-learning is seen as follows: 1) a special form of electronic business in education [29]); 2) a learning approach that supports online teaching and learning [42]); 3) a method of learning that uses communication on the Internet [34]); implemented via the Internet [25]; 4) a tool for removing barriers to traditional classroom learning [38]; means of providing educational content using ICT to ensure accessibility of education [17]); 5) a learning system that uses web browsers [36]; the combination of computer, browser, and the Internet to provide online education and training [19]; 6) an electronic mechanism used to deliver educational material to students [26]); 7) the learning process, which is prepared, transmitted, and managed with the help of various ICT tools locally or globally [21]; a technology which provides online teaching to a network group and exchange of resources in electronic form; 8) a model of a successful combination of technology and education [31].

In turn, we focused on the study of the didactic aspect in determining the essence of e-learning. We processed the scientific sources and organized the definitions of the authors according to the years of their publication (Table 1).

Table 1: The didactic aspect of the essence of e-learning in the definition of scientists

Year	Definition of content, authors, source
2008	an educational or training tool that involves the use of the Internet technologies (P. Sun, R. Tsai, G.

	Finger, Y. Chen and D. Yeh [41]); a learning system that uses web browsers (D. Shee, Y. Wang [36]); combination of computer, browser and the Internet to provide online education and training (J.-K. Lee, W.-K. Lee [19])
2009	an electronic mechanism used to deliver educational material to students (S. Ozkan, R. Koseler [26])
2010	a learning method that uses online communication (P. Resta, M. Patru [34])
2011	an educational strategy that is an instruction performed on a digital device such as a desktop or laptop computer or a mobile device, designed to facilitate learning. (R. Clark, R. Mayer [12])
2013	1) educational procedure, the creation of which occurs through interaction with digital content delivery, network-based services and teacher support (S. Liaw, H. Huang [20]); 2) an active information procedure, since the generation of information is carried out through personal experience and interaction based on the environment in which students are (S. Liaw and H. Huang [20])
2014	an approach to learning implemented via the Internet (T. D. Nguyen, T. M. Nguyen, Q. Pham, S. Misra [25])
2015	means of providing educational content using ICT to ensure accessibility of learning (J. Huss, O. Sela, S. Eastep [17])
2016	the learning process that is prepared, transmitted, and managed with the help of various ICT tools locally or globally (E. Masie [21])
2018	1) a personalized approach that focuses on the individual student and includes self-directed learning, multiple virtual events, mentoring, modeling, collaboration, assessment, a competency roadmap, development tools, an e-store, and a learning management system (S. Basak, M. Wotto, P. Belanger [7]); 2) a web-based educational ecosystem for the dissemination of information, communication and knowledge for the purpose of education and training (W. Cidral, T. Oliveira, T. Felice, M. Di, M. Aparicio [11])
2019	an approach to learning based on the application of information technologies (L. Alfita, A. Kadiyono, P. Nguyen, W. Firdaus, I. Wekke [4])
2020	1) alternative educational process (T. Priatna, D. Maylawati, H. Sugilar, M. Ramdhani [30]); 2) a type of learning environment that enables the creation of individually tailored pathways for adaptive learning, aimed at maximizing learning outcomes (D. Fellman, A. Lincke E. Berge, V. Jonsson [14]); 3) a learning approach that supports online teaching and learning (T. Theresiawati, H. Seta, A. Hidayanto, Z. Abidin. Z. [42]); 4) a model of a successful combination of technology and education (Quyen Le Hoang Thuy To Nguyen, Phong Thanh Nguyen, Vy Dang Bich Huynh, Luong Tan Nguyen [31]); 5) means to eliminate barriers that arise during traditional classroom learning (S. Sotiriou, A. Lazoudis, F. Bogner [38]); 6) a special form of electronic business in education (Q. Pham, T. Tran [29]); 7) e-learning is not just an aspect added to facilitate and accelerate the existing traditional education, but a developing environment, the integration of which with various elements of the educational process ensures the internal enrichment of the educational system (A. Alenezi [2])

Also, the essence of e-learning is specified in relation to the component composition, variable forms, types of interaction in e-learning. Let us detail the above.

E. Papanis [28] attributed to the components of e-learning the delivery of content in various formats to manage the learning process, a network community of learners, content developers and experts.

R. Clark, R. Mayer [12] distinguish and characterize two forms of e-learning:

1. Asynchronous (electronic self-learning, which is available upon request);
2. Synchronous (electronic learning under the guidance of a lecturer, organized at a fixed time) (R. Clark, R. Mayer [12]).

T. Miyer, N. Machynska, H. Bondarenko, N. Rudenko, L. Romanenko, I. Sukhopara, R. Shpitsa [22] distinguish such types of interaction in e-learning as:

1. Direct pedagogical interaction in e-learning involves mutual influence among participants, occurring at scheduled times outlined in the class schedule. It does not rely on the physical proximity of the lecturer and students but requires their virtual presence, with the lecturer and students assuming the roles of e-lecturer and e-students, respectively.
2. Indirect pedagogical interaction in e-learning entails influencing electronic students through educational materials pre-developed by the lecturer and integrated into the e-learning environment. This interaction does not involve the direct role of an electronic lecturer.

T. Miyer, S. Omelchuk, O. Bilyakovska, N. Rudenko, L. Romanenko, Z. Fedirko, K. Romanenko [24], based on the comparison of learning outcomes with various costs (in particular, time, mental, emotional, material, technological, technical), formulated conclusions:

- The degree of correspondence between the provided educational services and the requirements of the recipients of educational services is established both at the level of functioning of the online space (convenience, accessibility, technology, content) and at the level of the activity of the lecturer in the online space (attractive professional qualities, organization of self-regulated learning);
- The e-learning process is constantly being improved in two directions: a) development of ways to improve the quality of e-learning; b) development of more effective models of e-learning organization.

The potential and effects of e-learning

E-learning is characterized by a change in the approach to teaching and learning [27], which, in turn, is reflected in the potential and effects of its implementation.

L. Alfarani [3] sees the potential of e-learning in the provision of educational services in a remote location, thus reducing differences in different countries, regions and areas, as well as in the organization of separate education for men and women where it depends on the culture and religion of the country.

P. Biehl and S. Prescott [8] reveal the potential of e-learning in the context of eliminating educational inequality and creating a more inclusive educational environment.

According to V. Arkorful and N. Abaidoo [6], the potential of e-learning resides in the shift from traditional education to ICT-based learning, distinguished by personalization, self-organization, and flexibility. Scholars recognize e-learning's potential in harnessing internet technologies to enhance knowledge and productivity. Students gain control over content, learning processes, and the pace of learning, utilizing their experiences to attain their objectives.

According to the reasoning of R. Sugawara, S. Okuhara, and Y. Sato [40], the potential of e-learning refers to: convenience (e-learning can be conducted at a time and place convenient for each student); implementation of training based on a self-disciplined method; providing two-way communication between students and lecturers in real time.

Implementation of the potential of e-learning is determined by various factors, including:

▪ Formation of basic digital skills (ability to use a computer or tablet) and a positive attitude towards digital learning tools and formats (C. Redecker, Y. Punie [33]);

▪ Taking into account the fact that technologies can contribute to learning: 1) if a child has sufficient cognitive skills and social development; 2) if it is not substituting for important developmental experience; 3) if we are not expecting them to do what they cannot do; 4) if parenting and teaching retain priority; 5) if it complements a well-planned curriculum; 6) if it does not distract funds from more important needs (e.g., early childhood education, arts programs); 7) if we are judicious in planning and selection of computer software and activities; 8) if we do not become seduced by flashy graphics and digital legerdemain; 9) if parents and lecturers are willing to provide a human scaffold for technology-assisted learning (J. Healy [15]).

Also, the analysis of scientific sources contributed to the generalization of information about the effects of e-learning.

C. Chen and K. Swan [10] attributed the following to the effects of e-learning: greater flexibility of the class schedule; implementation of a student-oriented approach; the introduction of independent learning with a greater or lesser degree of its manifestation; ability to meet the needs of students with a wide range of learning styles.

A. Alenezi [2] draws attention to the presence of: economic effect; the effect of self-control (under the conditions of e-learning, students get better control over the learning process, since they can decide when, where, and how they learn); the effect of self-organization (students can access educational resources without traveling or spending extra time searching for these resources); procedural effect (lecturers get new channels of learning and imparting knowledge to their students).

According to E. Ural and O. Ercan [43], for e-learning to positively impact students' educational achievements, it is essential to integrate new knowledge with previously acquired knowledge when developing internet-based educational software. E-learning has a positive effect on the educational achievements of students, because web applications provide unlimited time for repeated reproduction, promote individual learning speed, unlike traditional learning; also, it provides rich audiovisual content.

I. Yusuf and S. Widyaningsih [44] see the effect of e-learning in the use of virtual laboratory environments to explain various scientific concepts, laws, phenomena, processes, etc.

C. Redecker and Y. Punie [33] indicate that the effect of e-learning refers to the constant growth of personal experience in identifying the educational needs of training participants, responding to these needs and directing the actions of participants using modern digital learning tools.

According to A. Alenezi [2], the more extensively e-learning materials and tools are utilized in educational settings, the greater the success of students and the effectiveness of pedagogical practice.

T. Miyer, N. Machynska, H. Bondarenko, N. Rudenko, L. Romanenko, I. Sukhopara, R. Shpitsa [22] systematized the advantages of e-learning in the following areas:

1. Manufacturability (the use of innovative information technologies, various ICT tools of a local or global nature, available electronic media and tools, web browsers to provide access to resources and services and to deliver educational material to pupils and students; based on the Internet, distributed on the Internet);

2. Variability of the implementation goal (removing barriers to traditional classroom learning; creation of an innovative teaching and learning environment using the Internet; changing the self-learning process; reducing the cost of education; ensuring the availability of education for all; meeting educational needs without space and time limitations; organization of flexible training; adjusting the educational process to meet the needs of students; ensuring their personalization);

3. Different orientation of the lecturer's activity (online learning, online teaching, online education; online cooperation, online communication, online interaction, exchange of resources in electronic form, attraction of additional resources and materials, creation of an innovative online environment; organization of training for each member of a network group, use of educational materials prepared in advance).

Transformational changes in e-learning

We will consider the transformational changes of e-learning in the context of distance, online, mobile, and blended learning.

S. Palvia, P. Aeron, P. Gupta, D. Mahapatra, R. Parida, R. Rosner, S. Sindhi [27] studied the genesis of distance learning on the example of the United States of America. Scientists have concluded that over the past three centuries, distance learning has evolved into what is called "online learning". There has been qualitative transition from the educational use of the postal system, the possibilities of radio and television, to modern technologies.

The birth of online education based on distance learning is also traced in the works of other scientists, namely: C. Dziuban, A. Picciano, C. Graham, P. Moskal [13]. Scientists distinguish four stages of the evolution of online learning, using the context of the United States:

I stage – distance education powered by the Internet (1990s);

II stage – expanding the use of learning management systems – LMS (2000-2007);

III stage – the growth of mass opens online courses - MOOC (2008-2012);

IV stage – growth in the number of online enrollments in higher education institutions, which are ahead of traditional enrollments in higher education institutions (after 2012).

In the contemporary context, distance education is regarded as an individualized learning process primarily conducted through mediated interaction among remote participants within a specialized environment. This environment operates based on modern psychological, pedagogical, and information communication technologies.

R. Sugawara [39], comparing e-learning with distance learning, notes that e-learning is more progressive because it enables lecturers and students who are distant from each other geographically and are in different time zones to communicate in real time in a two-way mode through computers and computer networks, and thus solves problems that cannot be overcome with the help of conventional distance education.

At the same time, distance learning and online learning are similar in that they are organized over the Internet using text, audio, video, graphics, animation, discussion boards, e-testing, web teleconferencing, synchronous chat, e-mail, etc.

Our reference to the dictionary source [5] provided us with the opportunity to clarify the essence of online education by considering the definition of the term 'online,' as outlined in the dictionary. It is described as follows: 1) continually active (device), operating in a non-autonomous mode; 2) pertaining to

screens, electronic operations, dialogues, interactions, or activities conducted online; 3) maintaining a continuous connection (work) within a computer network; 4) accessible or connected via computer. Taking into account the lexical meaning of the concept of "online", it can be concluded that the concepts of "online education" and "electronic education" can be used as synonyms. At the same time, the analysis of scientific sources proves that in the 21st century, stability in their use begins to form.

Table 2 shows the use of the terms "online" and "electronic" in fixed phrases. The content of the table proves the presence of both parallel and unified use of terms.

Table 2: Use of the terms "online" and "electronic" in fixed phrases

Constant phrases with the term "*electronic*"	Constant phrases with the term "*online*"
e-learning	online learning
e-education	online education
electronic money	network money, online buck
electronic edition, e-book, electronic publishing	online document
	online world
e-business (in a broad sense, it is all forms of electronic business activity)	
	online (virtual) community – a group of people with common interests who communicate on the Internet, VBS, video conference, or some other electronic way
	online chat
	online lecture
	online registration
electronic mail	
electronic whiteboard – everything drawn on its surface with colored markers simultaneously appears on the screen of a personal computer	
electronic signature	
electronic warfare	

The authors of the article "*Online Education: Worldwide Status, Challenges, Trends, and Implications*" S. Palvia, P. Aeron, P. Gupta, D. Mahapatra, R. Parida, R. Rosner, S. Sindhi [27] use the terms "online education", "e-education" as synonyms. In particular, in the recommendations, they note the following: "Online education quality must be improved and perceived as equal to traditional face-to-face (F2F) classroom-based education. This will ensure recognition of online education on par with the traditional education. Ultimately, getting credentials in any mode of education should become indistinguishable from one another".

At this time, it is abundantly clear that we ought to combine the virtues of both online (virtual) and offline (F2F) education. It appears that blended or flipped education can help to strike an optimal balance between e-education and traditional education. This will help perpetuate a healthy balance between hi-tech and hi-touch in e-education. This will also enable avoiding harmful effects of addiction to information technology artifacts like smartphones, the Internet, and Facebook.

Eventually, globalization of e-education is bound to happen, just as we have witnessed globalization of e-mail, e-commerce, and e-government. World bodies like the United Nations, the World Bank, and the World Trade Organization (WTO) have to get involved in this endeavor to establish meaningful standards in curriculum, certifications, students screening, faculty selection, learning management systems.

"A major theme originating from almost all countries is that "one model fits all" has clearly not worked. What we need is a right mix of localization, adjustment to cultural diversity, and technology that include Learning Management System in the context of lack of resources and infrastructure in certain parts of the world" [27].

We consider the recommendations developed by the authors of the article [27] not only as a confirmation of the synonymous use of the terms "online" and "electronic" in relation to the concept of "education", but also as significant considerations regarding the further development of education in a globalized world, identified problems, trends and consequences of the intensive implementation of electronic education.

Let us focus on the relationship between e-learning and mobile learning. First of all, we note that S. Basak, M. Wotto M. and P. Belanger [7] consider e-learning as a macro concept that includes mobile learning and online environments. According to scientists [7], m-learning is a subset of electronic learning.

S. Behera [9] points out that m-learning, on the one hand, contributes to the expansion of the use of e-learning, and, on the other hand, m-learning can be provided only taking into account the limitations and advantages associated with the use of mobile devices.

The purpose of using mobile devices (laptop, phone, tablet, personal digital assistant, Palms, Windows CE machines, etc.) is to facilitate online learning, provide access to resources, implement knowledge exchange with lecturers and fellow students (A. Abu-Al-Aish, S. Love, Z. Hunait [1]). Here one can observe moderation of the social capital of students through the high-quality exchange of knowledge and educational materials (resources) in electronic form, regardless of the location of students (A. Razzaque [32]).

Comparing e-learning with blended learning, it is worth drawing attention to the main purpose of organizing blended learning. It is a combination of different methods of effective training. As it was mentioned above, S. Palvia, P. Aeron, P. Gupta, D. Mahapatra, R. Parida, R. Rosner, S. Sindhi [27] note that when combining different learning methods, their merits should be taken into account. Scientists consider that blended learning will provide an optimal balance between both traditional and e-learning, as well as between high technology and modern technology in e-education. The organization of blended learning will allow avoiding the harmful effects of dependence on artifacts of information technology, such as smartphones, the Internet, and Facebook.

E-learning as part of blended learning serves a specific purpose. It may be:

▪ Safe interaction of participants in the learning process, as it does not provoke the transmission of viruses and infections (T. Priatna, D. Maylawati, H. Sugilar, M. Ramdhani [30]);
▪ Learning in critical conditions (conditions of constant shelling of the civilian and critical infrastructure of Ukraine, as well as the direct impact of the war on the lives and livelihoods of the families of participants in the educational process (T. Holovatenko [16]);
▪ Training in conditions of increased risk of physical and psychological injury (L. Shelestova [37]);
▪ Organization of training at a lower cost, based on expanded access and clear accountability for all participants in the training process (E. Papanis [28]);
▪ Obtaining knowledge without time or space limitations, which reduces the organization's training costs) (M. Rosenberg) [35].
▪ Provision of a wide range of solutions to improve knowledge and efficiency (Rosenberg [35]);
▪ Achievement of educational goals; formation of independence in the learning process (R. Kango, S. Ghozi [18]).

E-learning in the conditions of war: aspects for improvement

A pedagogical experiment was conducted to identify aspects that require improvement during the organization of e-learning. 435 participants of the experiment are students of Borys Grinchenko Kyiv University, Dragomanov Ukrainian State University, and Volodymyr Vynnychenko Central Ukrainian State Pedagogical University of full-time and part-time forms of education. The experimental work was carried out in the context of the introduction of e-learning as the optimal form of student education during the military operations of Russia on the territory of Ukraine, which began on February 24, 2022.

The experimental work was aimed at finding out the aspects that, according to the students, need improvement during the organization of e-learning.

The analysis of the experimental data proved that the students pointed to:

I. Experiencing the feeling of dependence on four factors:

- Dependence on external factors (studying under martial law (100% of respondents), the need to combine work and study (92% of respondents));
- Dependence on technical support (88% of respondents);
- Dependence on technical problems (lack of Internet, connection, light (100% of respondents), poor sound, image (24% of respondents));
- Dependence on increased intellectual and emotional load during e-learning (100% of respondents).

II. Feeling the need for direct communication:

- With other students (lack of opportunity to get to know fellow students (17% of respondents), discuss various issues, problems (48% of respondents));
- With lecturers (one needs to find answers to the questions that arise on his own, and not immediately get an explanation from the teacher during the class (14% of respondents));
- With other students and lecturers (lack of physical and emotional interaction with lecturers and classmates, which motivates learning (78% of respondents); lack of a full range of emotions (84% of respondents)).

III. Difficulties associated with the organization of the learning process:

- The content and scope of the task are not always clear (18% of respondents);
- It is necessary to spend additional time on getting acquainted with the explanation of work performance (16% of respondents);
- It is necessary to read or listen to a large amount of information, to perform a large amount of tasks for independent work (94% of respondents);
- The deadlines for completing tasks do not always agree with the amount of work to be performed (32% of respondents);
- The emergence of a problem with maintaining concentration of attention on the educational material; it is more difficult to maintain concentration on the material (distraction by household chores, conversations with family members, friends (38% of respondents)).

IV. Difficulties caused by individual characteristics of students:

- I perceive information worse than during face-to-face training (7% of respondents);
- It is difficult for me to organize myself for self-study (24% of respondents). It is difficult for me to study in the synchronous learning mode (2% of respondents). It is much easier for me to do work and study material in asynchronous mode (12% of respondents).
- Inadequate formation of the ability to effectively use modern IR technologies.

V. Deterioration of well-being in case of prolonged stay at the computer:

- A long time of working at the computer, which makes the eyes very tired, because you need to be online first, then perform various tasks (46% of respondents);
- Using of the computer 24/7, trying to cover the entire volume of tasks that are available in all subjects (21% of respondents);
- The need to spend a large amount of time in front of the computer screen, which caused a noticeable deterioration of vision, a feeling of extreme fatigue and a severe headache by the end of the day (8% of respondents).

4 Conclusions

The content of e-learning essence definitions was influenced by the following factors:

- Intensive development of technologies;
- Globalization of all spheres of human activity, including the educational sphere;
- Transformational and modernization processes in the education system itself;
- The socio-economic situation in one or another country and in the world as a whole (in particular, the global spread of COVID-19);
- Experience in practical implementation of e-learning;
- Satisfaction of the need for individualization of education;
- Search for new alternative forms of education.

With the acquisition of experience in the organization of e-learning, a transition from the technological context to the definition of didactic features is observed in the content of the definitions (learning method ⇒ educational strategy ⇒ learning procedure ⇒ active information procedure ⇒ approach to learning ⇒ means of providing educational content ⇒ learning process ⇒ personalized approach ⇒ web-based learning ecosystem ⇒ alternative learning process ⇒ learning environment option ⇒ barrier remover ⇒ developing environment).

Asynchronous and synchronous forms of e-learning (R. Clark, R. Mayer [12]), direct and indirect interaction in e-learning (T. Miyer, N. Machynska, H. Bondarenko, N. Rudenko, L. Romanenko, I. Sukhopara, R. Shpitsa [22]; T. Miyer, N. Siranchuk, N. Vyshnivska, N. Rudenko, O. Shkurenko, L. Romanenko, Y. Fedorova [23]), requirements for the online space (convenience, accessibility, technology, content), requirements for the personality of the e-learning lecturer (attractive professional qualities of the lecturer, the ability to organize self-regulated learning of students (T. Miyer, S. Omelchuk, O. Bilyakovska, N. Rudenko, L. Romanenko, Z. Fedirko, K. Romanenko [24]) are the essential constituents of e-learning.

The potential of providing educational services in remote locations, while organizing education in consideration of the cultural and religious aspects of the country (such as separate education for men and women) (L. Alfarani [3]), the elimination of educational inequality, and the creation of a more inclusive educational environment (P. Biehl, S. Prescott [8]) are important factors. Additionally, factors such as organization based on personalization, flexibility, and self-organization (V. Arkorful, N. Abaidoo [6]) are also crucial.

The effects of e-learning encompass meeting the needs of students with a wide range of learning styles (C. Chen, K. Swan [10]), as well as addressing economic and procedural factors, self-control, and self-organization (A. Alenezi [2]), the impact of repeated reproduction, and the utilization of rich visual content (E. Ural, O. Ercan [43]), along with the use of virtual laboratory environments (I. Yusuf, S. Widyaningsih [44]). Here directing the actions of the participants using modern digital learning tools is implied (C. Redecker, Y. Punie [33]), as well as variability of the goal of implementation and the direction of the lecturer's

activity (T. Miyer, N. Machynska, H. Bondarenko, N. Rudenko, L. Romanenko, I. Sukhopara, R. Shpitsa [22]).

Distance learning is considered as online learning in the case of organization through the Internet. Online learning and e-learning refer to the same educational process. Extended use is facilitated by e-learning (S. Behera [9]). E-learning as a component of blended learning promotes effective and efficient learning (S. Palvia, P. Aeron, P. Gupta, D. Mahapatra, R. Parida, R. Rosner, S. Sindhi [27]).

The organization of e-learning in wartime conditions should consider the following factors in students: 1) dependence on external factors, technical support, and technical issues, along with increased intellectual and emotional demands during e-learning; 2) the necessity of direct communication to foster a sense of belonging to the university community; and 3) the requirement for didactic balance, including optimal workload distribution, consideration of individual learning characteristics, and adherence to hygienic conditions for computer work.

Literature:

1. Abu-Al-Aish, A., Love, S., & Hunait, Z. (2012). Mathematics students' readiness for mobile learning. *International Journal of Mobile and Blended Learning, 4*(4), 1-20.
2. Alenezi, A. (2020). The Role of e-Learning Materials in Enhancing Teaching and Learning Behaviors. International *Journal of Information and Education Technology, 10*(1), 48-56.
3. Alfarani, L. A. (2014). Influences on the adoption of mobile learning in Saudi women teachers in higher education. Proceedings of International Conference on Interactive Mobile Communication Technologies and Learning (IMCL2014), pp. 30-34.
4. Alfita, L., Kadiyono, A. L., Nguyen, P. T., Firdaus, W., & Wekke, I. S. (2019). Educating the external conditions in the educational and cultural environment. International Journal of Higher Education, 8(8), 34–38.
5. Anhlo-ukrainskyi tlumachnyi slovnyk z obchysliuvalnoi tekhniky, internetu i prohramuvannia. Vyd. 2. Kyiv: vydavnychyi dim "SoftPres". 2006, p. 370.
6. Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, advantages and disadvantages of its adoption in higher education. *International Journal of Instructional Technology and Distance Learning, 12*(1), 29-42.
7. Basak, S., Wotto, M., & Be´langer, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. *E-Learning and Digital Media, 15*(4), 191-216.
8. Biehl, P. F., & Prescott, C. (2013). *Heritage in the context of globalization: Europe and the Americas.* (1st Ed.). Springer-Verlag.
9. Behera, S.K. (2013). E- And M-Learning: A Comparative Study, International *Journal on New Trends in Education and Their Implications, July, 4*(3), 65.
10. Chen, C.C., & Swan, K. (2020). Using innovative and scientifically-based debate to build e-learning community. *Online Learning, 24*(3), 67-80.
11. Cidral, W., Oliveira, T., Felice, Di M. & Aparicio M. (2018). E-learning success determinants: Brazilian empirical study. *Computers and Education, 122*, 273-290.
12. Clark, R. C., & Mayer, R. E. (2011). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (3rd ed). San Francisco, CA: Pfeiffer.
13. Dziuban, C., Picciano, A. G., Graham, C. R., & Moskal, P. D. (2016). Conducting research in online and blended learning environments: New pedagogical frontiers. Routledge, Taylor & Francis Group.
14. Fellman, D, Lincke, A, Berge, E., Jonsson, B (2020). Predicting Visuospatial and Verbal Working Memory by Individual Differences in E-Learning Activities. *Frontiers in Education, 5*, 22.
15. Healy, J.M. (1998). *Failure to Connect: How Computers Affect Our Children's Minds and What We Can Do about It.* Simon and Schuster.
16. Holovatenko, T. Yu. (2023). Osvitolohichnyi vymir kontseptu "travma-informovanyi pidikh" u systemi profesiinoi pidhotovky vchyteliv pochatkovoi shkoly. *Perspektyvy ta Innovatsii Nauky, 8*(26), 65-77.
17. Huss, J.A., Sela, O., & Eastep, S. (2015). A case study of online instructors and their quest for greater interactivity in their courses: Overcoming the distance in distance education. *Australian Journal of Teacher Education 40*, 72-86.
18. Kango, R., & Ghozi, S. (2019). Tantangan pembelajaran E-Learning di perguruan tinggi. *SemanTECH (Seminar Nas. Teknol. Sains dan Humaniora), 1*, 137-144.
19. Lee J.-K., & Lee W.-K. (2008). The relationship of e-Learner's self-regulatory efficacy and perception of e-Learning environmental quality. Comput. Hum. Behav. 24, 32–47.
20. Liaw S. S. & Huang H. M. (2013). Perceived satisfaction, perceived usefulness and interactive learning environments as predictors to self-regulation in e-learning environments. *Computers and Education, 60*(1), 14-24.
21. Masie, E. (2016). *E-learning definition of Masie Elliot Learning Center.* Baltijia Publishing.
22. Miyer, T., Machynska, N., Bondarenko, H., Rudenko, N., Romanenko, L., Sukhopara, I., Shpitsa, R. (2023). E-learning in the conditions of the information economy as a factor in the development of future teachers for the sustainable development of society. *AD ALTA. Journal of Interdisciplinary Research, 13*(1), Special XXXII, 13-20.
23. Miyer, T., Siranchuk, N., Vyshnivska, N., Rudenko, N., Shkurenko, O., Romanenko, L., Fedorova, Y. (2023). Indirect and direct pedagogical interaction of teacher with students in the conditions of e-learning and their performance of the roles of "e-teacher" and "e-student". *AD ALTA. Journal of Interdisciplinary Research, 13*(1), Special XXXIV, 62-68.
24. Miyer, T., Omelchuk, S., Bilyakovska, O., Rudenko, N., Romanenko, L., Fedirko, Z., Romanenko, K. (2023). Education as an open system and education as a process of organizing e-learning in the online space in the context of a variable definition of the phenomenon "quality". *AD ALTA. Journal of Interdisciplinary Research, 13*(1), Special XXXIV, 69-75.
25. Nguyen, T. D., Nguyen, T. M., Pham, Q. T., & Misra, S. (2014). Acceptance and use of e-learning based on cloud computing: The role of consumer innovativeness. *Lecture Notes in Computer Science, 8583*, 159-174.
26. Ozkan, S., & Koseler, R. (2009). Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation. *Computers & Education, 53*, 1285-1296.
27. Palvia, S., Aeron, P., Gupta, P., Mahapatra, D., Parida, R., Rosner, R. & Sindhi, S. (2018) Online Education: Worldwide Status, Challenges, Trends, and Implications. *Journal of Global Information Technology Management, 21*(4), 233-241.
28. Papanis, E (2005). Traditional Teaching versus e-learning. *Experimental Approach, Statistical Review, 1*(1), 19-35.
29. Pham, Q. T., & Tran, T. P. (2020). The acceptance of e-learning systems and the learning outcome of students at universities in Vietnam. *Knowledge Management & E-Learning, 12*(1), 63-84.
30. Priatna, T., Maylawati, D. S., Sugilar, H., & Ramdhani, M. A. (2020). Key Success Factors of e-Learning Implementation in Higher Education. *International Journal of Emerging Technologies in Learning (iJET), 15*(17), 101-114.
31. Quyen Le Hoang Thuy To Nguyen, Phong Thanh Nguyen, Vy Dang Bich Huynh, & Luong Tan Nguyen (2020). Application Chang's Extent Analysis Method for Ranking Barriers in the E-Learning Model Based on Multi-Stakeholder Decision Making. *Universal Journal of Educational Research, 8*(5), 1759–1766.
32. Razzaque, A. (2020). M-Learning Improves Knowledge Sharing Over e-Learning Platforms to Build Higher Education Students' Social Capital. *SAGE Open, 10*(2), 1-9.
33. Redecker, C., Punie, Y. (2017). *European Framework for the Digital Competence of Educators: DigCompEdu.* Publications Office of the European Union: Luxembourg.

34. Resta P., & Patru M. (2010). Teacher development in an e-learning age: A policy and planning guide. Paris: UNESCO.

35. Rosenberg, M. J. (2001). *E–Learning Strategies for Delivering Knowledge in the Digital Age*. McGraw-Hill.

36. Shee, D.Y., & Wang, Y.-S. (2008). Multi-criteria evaluation of the web-based e-learning system: A methodology based on learner satisfaction and its applications. *Computers & Education, 50*, 894-905.

37. Shelestova, L. V. (2023). Osoblyvosti navchannia uchniv pochatkovoï shkoly v umovakh viÿny. Proceedings of the XI International Scientific and Practical Conference "Implementation of modern scientific opinions in practice", March 20–21, Bilbao, Spain, pp. 204–209.

38. Sotiriou, S.A., Lazoudis, A. & Bogner, F.X. (2020). Inquiry-based learning and E-learning: how to serve high and low achievers. *Smart Learning Environment, 7*, 29.

39. Sugawara, R. (2005). *Development of e-Learning and In-house Education*. Tokyo: University Education Press.

40. Sugawara, R., Okuhara, S., & Sato, Y. (2020). Study about the Aptitude-Treatment Interaction between Learning Using the e-Learning System and Learning Type of Learner. International *Journal of Information and Education Technology, 10*(7), 488-493.

41. Sun, P.C., Tsai, R.J., Finger, G., Chen, Y.Y., Yeh, D. (2008). What drives a successful e–learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education, 50*, 1183-1202.

42. Theresiawati, T., Seta, H. B., Hidayanto, A. N., & Abidin. Z. (2020). Variables affecting e-learning ser- vices quality in Indonesian higher education: Students' perspectives. *Journal of Information Technology Education: Research, 19*, 259–286.

43. Ural, E., & Ercan, O. (2015). The effects of web-based educational software enriched by concept maps on learning of structure and properties of matter. *Journal of Baltic Science Education, 14*(1), 7-19.

44. Yusuf, I., & Widyaningsih, S. W. (2020). Implementing E-Learning-Based Virtual Laboratory Media to Students' Metacognitive Skills. *International Journal of Emerging Technologies in Learning (iJET), 15*(05), 63-74.

Primary Paper Section: A

Secondary Paper Section: AM, AN