

E-LEARNING IN THE CONDITIONS OF THE INFORMATION ECONOMY AS A FACTOR IN THE DEVELOPMENT OF FUTURE TEACHERS FOR THE SUSTAINABLE DEVELOPMENT OF SOCIETY

^aTETIANA MIYER, ^bNATALIIA MACHYNSKA, ^cHENNADII BONDARENKO, ^dNINA RUDENKO, ^eLYUDMILA ROMANENKO, ^fIRYNA SUKHOPARA, ^gROKSOLANA SHPITSA

^{a,c,g}*Borys Grinchenko Kyiv University, 18/2, Bulvarno-Kudriavska Str., 04053, Kyiv, Ukraine*

^b*Ivan Franko National University of Lviv, 1, Universytetska Str., 79000, Lviv, Ukraine*

email: ^at.miyer@kubg.edu.ua, ^bnatalya_im@ukr.net, ^dh.bondarenko@kubg.edu.ua, ^en.rudenko@kubg.edu.ua, ^fl.romanenko@kubg.edu.ua, ^fi.sukhopara@kubg.edu.ua, ^gr.shpitsa@kubg.edu.ua

Abstract: The article presents the theoretical and experimental results of E-learning research in three contexts: in the conditions of the information economy, taking into account the leading ideas of sustainable development of society, and as a factor in the development of prospective teachers. As a result of the analysis of scientific sources, stages of the formation and development of the leading ideas of sustainable development were distinguished, and the role of education at each of the stages was determined. The directions of development of the future teacher in the context of promoting the sustainable development of society in the conditions of the information economy are determined. The definition of the concept of "E-learning" was analyzed and 8 key categories were singled out, which scientists used to explain the essence of this phenomenon. Theoretical and experimental results of E-learning research contributed to the identification of advantages and disadvantages of E-learning of future teachers and systematization of the identified data in the following areas: 1) advantages of E-learning (economic advantages for a society of sustainable development; pedagogical advantages for lecturers; advantages for development future lecturers; organizational benefits for teachers and future teachers); 2) disadvantages of E-learning (deficiencies in preparation for E-learning; disadvantages of the online learning process). The study covered lecturers and students of Boris Grinchenko Kyiv University and Ivan Franko National University of Lviv.

Keywords: E-learning; information economy; sustainable development of society; advantages and disadvantages of e-learning; students; lecturers.

1 Introduction

The desire of societies all over the world to keep up with technological progress and globalization and the implemented actions generate new challenges. As defined by UNESCO, these challenges are represented by increased complexity and uncertainty, greater individualization and social diversity, expansion of economic and cultural uniformity, deterioration of ecosystem services on which they depend, increased vulnerability and susceptibility to natural and man-made disasters, access to a huge amount of information, which, in turn, is rapidly growing in volume. At the same time, new challenges give rise to a new round of development of society, education, people, new technological solutions, new forms of transfer of experience to the next generation, new opportunities for learning, etc.

2 Materials and Method

To reveal the essence of e-learning in the conditions of the information economy as a factor in the development of future teachers for the sustainable development of society, the following tasks were defined:

- To analyze the processes of formation and development of the leading ideas of sustainable development of society with an emphasis on the role of education;
- To characterize the information economy in the context of the introduction of a new approach to the structuring of production industries;
- To determine the prospective teacher's training in the context of promoting the sustainable development of society in the conditions of the information economy;
- To determine didactic and technological accents in revealing the essence of e-learning;
- To determine the advantages and disadvantages of e-learning.

Various methods were used in the research, namely: theoretical (analysis of scientific data, arrangement and systematization of selected information, summarization of results in tables and lists of data) and empirical (surveys, questionnaires). Teachers and students of Borys Grinchenko Kyiv University (25 and 150 people, respectively) and Ivan Franko National University of Lviv (25 and 150 people, respectively) were involved in the experimental part of the study.

The results of the study covered such subjects of the educational process as students of the "Elementary Education" specialty and lecturers of the above-mentioned universities.

3 Results and Discussion

The dominance of man-made culture, man-made thinking, disharmony in the systems "man – nature", "man – man", and neglect of true values caused the formation of the theory of sustainable development. This process took place in four stages.

The first stage (1960–1991) is characterized by the emergence of sustainable development ideas. These are the ideas of D. Herman [21] (about conflict-free, harmonious and balanced civilizational progress), J. Forrester [7] (about "global modeling" and the use of mathematical modeling to determine the long-term consequences of the development of the world situation), A. Peccei [21] (about cultural self-determination as a new principle of the world economic order and the orientation of the strategy of human development), of the Club of Rome (on the need to account the maximum permissible capabilities of the natural environment to cope with the ever-increasing anthropogenic influence) and of the World Commission on Environment and Development (on the need to transfer humanity to a position of stable balance between consumption, population, and the Earth's ability to support life).

During the second stage (1992–1999), the development of sustainable development ideas was carried out with an emphasis on achieving balance and defining the role of education in the information society. The beginning of the stage was initiated by the UN conference. The main purpose of the international event was consideration of issues about the state of the environment and the further development of humanity. At the conference, a course was determined to bring humanity to a level of development characterized by a sustainable balance between consumption, population, and the Earth's ability to support life. Since 1992, UNESCO has supported education for sustainable development. In 1995, the information society was characterized as a global society in which the exchange of information will have no temporal, spatial, or political boundaries. This society, on the one hand, will contribute to the interpenetration of structures, and on the other hand, it will open up new opportunities for self-identification and the development of one's own unique culture. At the end of the second stage, the human development index (HDI) was introduced and education was defined as an indicator of sustainable development of society [7].

In the third stage (2000–2014), the implementation of the ideas of sustainable development was carried out with an emphasis on the new direction of development of education and training, as well as on the process of sustainable human development. At the beginning of the 21st century, the World Summit on Sustainable Human Development (2002) declared 2005–2014 as the Decade of Education for Sustainable Development (DESD). DESD aimed to integrate the principles and practices of sustainable development into all aspects of education and training, promoting changes in knowledge, values, and attitudes to enable a more sustainable and just society for all. In 2003, the "Declaration of Principles" was adopted during the World Summit on Information Society in Geneva. The document refers to the information society as a society in which everyone would be able to create, access, use, and exchange information and

knowledge in order to give individuals, citizens, and nations the opportunity to fully realize their potential. In 2009, the UNESCO World Conference discussed a new direction in the development of education and training to ensure the sustainable development of society. The basis of this direction was the values, principles, and methods that are necessary for effective response to current and future challenges. In 2010, the European Union adopted the Europe 2020 Strategy. This document defines priorities (mental development of a person; more effective use of resources to ensure sustainable development; inclusive development, which will contribute to high employment of the population) and initiatives (development of the field of research and innovation; promotion of educational and professional mobility, integration of education with professional activity; modernization of higher education and promotion of higher education institutions to sustainable human development). The essence of sustainable human development is explained as a process of positive, ever-growing cultural, socio-economic, political, scientific and educational, technological and innovative changes, which is based on the coordination of the needs of current and future generations in resources of development, the implementation of social standards, the latest technologies and the preservation of the environment for future generations. In November 2013, the 37th session of the UNESCO General Conference approved the Global Program of Action (GAP) on Education for Sustainable Development and was recognized by UN General Assembly Resolution A/RES/69.

The IV stage (2015 – present) is characterized by the implementation of ideas of sustainable development, taking into account the value priorities of human potential for the further development of society at its various levels (from regional to global). Also, an emphasis was made on the role of education in conditions of intensive formation and development of the information economy as a result of the development of the information society, accelerated movement of information, dynamics in the development of scientific knowledge, the growth of the role of information and knowledge, recognition of them as important strategic resources of society. People must learn to understand the complex world in which they live. They must be able to collaborate, speak out, and act for positive change (UNESCO, 2015) [29].

The agenda of sustainable development until 2030 records the need to change people lifestyle, transform the way they act and think [36]. The education system in different countries must ensure these changes, determine the appropriate goals and content of education, and introduce pedagogical methods that contribute to the sustainable development of society. Quality education in the context of sustainable development is considered both as an end in itself and as a means of achieving all other goals of sustainable development, as an integral part of sustainable development, and as a key factor.

The information economy as a sphere of human activity and a means of expanding learning methods for the development of human potential

The sphere of human activity has changed into information economy. Information resources are classified as the main subjects of human labor in the information economy and important strategic resources of states, as they affect the development processes of society and the economy. Information resources in the information economy form the basis for introducing a new approach to the structuring of production industries.

Division of production branches looks as follows:

- The industry of raw materials production is an array of raw data that will be stored in archives and libraries, or delivered through global information networks;
- The processing branch of production is the activity of specialized structures for the transformation of unsystematic data into meaningful messages, the preparation of information products and services aimed at meeting public needs, promoting scientific and technical

progress, forming and developing the intellectual and industrial potential of countries.

The processing branch of the production of information resources penetrated into all types of human economic activity, without exception, thanks to the intensive development of information resources and enterprises that produce computer and communication equipment with software, develop a system for forming, storing, searching, transmitting and processing data and information. The intensive production and use of information resources, the establishment of the leading sector of the economy is indicated in scientific sources by the terms “new economy”, “information economy” [26].

T. Kidd [11] noted that technological evolution has caused:

- 1) step-by-step development of e-learning;
- 2) influence on electronic learning of connectivism as a theory of learning in the age of digital technologies. In the theory of connectivism, the role of the social and cultural context for learning is emphasized, because learning in the age of digital technologies does not just happen within an individual, but within networks and between networks.

With an emphasis on connectivism, Kidd [11] singled out four stages of the development of e-learning:

The first stage is the early stage of e-learning - using auxiliary programs, teaching the content of educational subjects using a computer. On the computer, teachers demonstrated their own developments to students. Students perceived the material passively.

Stage II – 1980s. For the first time, multimedia communication applications were developed that involved interaction between students and computers. The process of developing educational software and its use has begun. During the study, the students were still passive.

Stage III – 1990s. Intensive development of the Internet, offering online courses based on the Internet, introduction of active learning based on group discussions, using online forums. The role of teachers and lecturers has shifted from providing passive teaching to administration, discussion, and learning. Student interaction in that period was characterized as existing, but limited by the number of participants.

IV stage – the beginning of the 21st century. The development of social networks has led to the formation of more flexible interaction between the participants of the educational process and to wide connections between students and communities. The learning process takes place within and between networks.

In the information economy, the organization of the learning process has also undergone changes. Along with traditional training, E-learning was organized. Scientists have studied the evolution and development of E-learning from the point of view of technology, education, and economy and have formulated the following conclusions [38]: 1) The development of E-learning has occurred for more than forty years in parallel with technical breakthroughs; 2) The emergence of e-learning is explained by the integration of technology, education, and economy.

Technology as a driver of the continuous evolution of e-learning must be combined with innovations in teaching and learning methods to improve the usability of e-learning and ensure it is learner-centered. As for the economy of e-learning, it consists of three sectors: the service sector, the educational content sector, and the infrastructure sector [10]. Many countries, especially in the European Union, establish policies to promote e-learning in order to increase economic competitiveness and support sustainable development based on its ability to increase jobs and social cohesion [16; 25].

Didactic and technological accents in disclosure the essence of e-learning

As a result of digitization, increasingly more educational content is moving to online learning platforms that provide e-learning. In turn, the spread of e-learning has led to scientific substantiation of the essence of e-learning as a phenomenon. In order to organize the definitions, we singled out in each definition a key category for understanding the essence of the concept of “e-learning”, as well as categories characterizing this concept.

1. Electronic learning as a special form in education

An example of the definition and its analysis is in Table 1. E-learning is a special form of e-business in education that focuses on such learning and teaching processes as: learning, knowledge sharing, and collaboration (Q. Pham, T. Tran (2020) [24]).

Table 1: Tabular analysis of the content of the definition of e-learning as a special form in education

Key definition category	Categories characterizing this concept
A special form of e-business in education	process learning, process teaching, exchange of knowledge, cooperation

2. Electronic learning as an approach to learning

An example of the definition and its analysis is in Table 2. E-learning is an approach to learning that supports online teaching and learning based on the use of innovative information technologies for the dissemination of information and knowledge, and also allows for flexible learning, organizing the learning process according to the needs of students and reducing the cost of education (T. Theresiawati, H. Seta, A. Hidayanto, Z. Abidin (2020) [34]).

Table 2: Tabular analysis of the content of the definition of e-learning as an approach to learning

Key definition category	Categories characterizing this concept
Approach to learning	online-learning, innovative information technologies, dissemination of information, dissemination of knowledge, flexible learning, taking into account the needs of students, reducing the cost of education

3. E-learning as a teaching method

Examples of definitions and their analysis are presented in Tables 3-5. E-learning is a teaching method that uses Internet communication for interaction between lecturers and students using developed learning materials and specific content (P. Resta, M. Patru (2010) [29]).

Table 3: Tabular analysis of the content of the definition of e-learning as a teaching method

Key definition category	Categories characterizing this concept
Teaching method	communication on the Internet, interaction between lecturers and students, use of developed educational materials, use of certain content

E-learning is understood as a teaching method through the Internet for some educational programs managed by a learning management system to enable interaction and collaboration, as well as meeting of the learning needs of students anywhere and at any time (T. Nguyen, T. Nguyen, Q. Pham, S. Misra (2014) [20]).

Table 4: Tabular analysis of the content of e-learning definition as a teaching method

Key definition category	Categories characterizing this concept
Teaching method	learning via the Internet,

	educational programs, learning management system, ensuring interaction, cooperation, meeting educational needs anywhere, at a convenient time
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E-learning is understood as a continuously innovative method of teaching and learning, which is based on the application of information and communication technologies to provide access to resources, services, and management without spatial and temporal limitations, to promote interaction and cooperation in learning, to put students at the center of teaching and advocate for student personalization (L. Alfita, A. Kadiyono, P. Nguyen, W. Firdaus, I. Wekke (2019) [3]).

Table 5: Tabular analysis of the content of the definition of e-learning as a teaching method

Key definition category	Categories characterizing this concept
Teaching method	application of information technologies and communication, provision of access to resources and services, management without space and time limitations, promotion of interaction and cooperation in education, placing students at the center of teaching, personalization of students

4. E-learning as a means

Examples of definitions and their analysis are given in Tables 6, 7. E-learning is a means to remove barriers to traditional classroom learning, involving the creation of innovative teaching and learning environments (S. Sotiriou, A. Lazoudis, F. Bogner (2020) [33]). We would like to add that in the period from 2019 to the present, such barriers include the global spread of COVID-19 and the introduction of martial law in Ukraine. These barriers were overcome by the introduction of e-learning.

Table 6: Tabular analysis of the content of the definition of e-learning as a means

Key definition category	Categories characterizing this concept
A means to remove barriers	barriers to traditional classroom learning, creating an innovative teaching and learning environment

E-learning is a means of providing educational content using ICT to ensure accessibility of learning (J. Huss, O. Sela, S. Eastep (2015) [9]).

Table 7: Tabular analysis of the content of the definition of e-learning as a means

Key definition category	Categories characterizing this concept
Means of providing educational content	using ICT, ensuring the availability of education

5. Electronic learning as a system

Examples of definitions and their analysis are presented in Tables 8-10. E-learning is a learning system that uses web browsers to impart an online learning (D. Shee, Y. Wang (2008) [32]).

Table 8: Tabular analysis of the content of the definition of e-learning as a system

Key definition category	Categories characterizing this concept
A learning system	use of web browsers, impart of online education

E-learning is the combination of a computer, a browser, and the Internet to provide online education and training (J.-K. Lee, W.-K. Lee (2008) [14]).

Table 9: Tabular analysis of the content of the definition of e-learning as systems

Key definition category	Categories characterizing this concept
A combination of a computer, a browser and the Internet	providing online education, provision of online education

6. E-learning as a mechanism

An example of the definition and its analysis is given in Table 10. E-learning is an electronic mechanism used to deliver educational material to students (S. Ozkan, R. Koseler (2009) [22]).

Table 10: Tabular analysis of the content of the definition of e-learning as a mechanism

Key definition category	Categories characterizing this concept
Electronic mechanism	delivery of educational material to students

7. Electronic learning as a process

Examples of definitions and their analysis are given in Tables 11-12. E-learning is a learning process that is prepared, transmitted, and managed using various ICT with local or global reach (E. Masie (2016) [17]).

Table 11: Tabular analysis of the content of the definition of e-learning as a process

Key definition category	Categories characterizing this concept
A learning process	prepared, transmitted, managed, various ICT tools of a local or global nature

E-learning is a learning process that involves online teaching to a network group and exchange resources in electronic form (K. MacKeogh, S. Fox (2009) [16]).

Table 12. Tabular analysis of the content of the definition of e-learning as a process

Key definition category	Categories characterizing this concept
A learning process	online teaching, network group, exchange of resources in electronic form

8. E-learning as a technological solution

Examples of definitions and their analysis are presented in Tables 13-14. E-learning is a broad set of programs and processes that use available electronic media and tools to provide professional education and training (Z. Abbas, M. Umer, M. Odeh, R. McClatchey, A. Ali, A. Farooq (2005) [1]).

Table 13: Tabular analysis of the content of the definition of e-learning as a technological solution

Key definition category	Categories characterizing this concept
Broad set of programs and processes	use of available electronic media and tools, provision of professional education and training

E-learning is the use of a variety of technological tools that are web-based, web-delivered, or support online learning (A. Muhammad, M. F. M. D. Ghalib, F. Ahmad, Q. Naveed, A. Shah (2016) [18]).

Table 14: Tabular analysis of the content of the definition of e-learning as a technological solution

Key definition category	Categories characterizing this concept
Use of various technological tools	are web-based, web-delivered, support online learning

9. E-learning as a model

E-learning is a model of a successful combination of technology and education, which has advantages in ensuring flexibility in learning, accessibility of education for everyone, that has radically changed the process of self-learning due to the ability to adjust the educational process to the needs of students and effectively satisfy them (Quyen Le Hoang Thuy To Nguyen, Phong Thanh Nguyen, Vy Dang Bich Huynh, Luong Tan Nguyen (2020) [27]). An example of the definition and its analysis is presented in Table 15.

Table 15: Tabular analysis of the content of the definition of e-learning as a technological solution

Key definition category	Categories characterizing this concept
A model of a successful combination of technology and education	ensuring flexibility in learning, accessibility of education for everyone, changing the process of self-learning, adjusting the educational process to the needs of students, effectively meeting the needs of students

Advantages and disadvantages of e-learning

Analysis of scientific sources revealed a number of advantages and disadvantages of e-learning. The advantages are described by scientists as follows:

- E-learning platforms have the potential to record all types of online activity, allowing lecturers to observe student behavior throughout the learning process and analyze observational data to identify trends in the learning process (H. Truong (2016) [35]).
- E-learning is cost-effective (Q. Naveed, A. Muhammad, S. Sanober, M. R. N. Qureshi, A. Shah (2017) [19]).
- The advantages of e-learning are its flexibility and the ability to use it remotely and at different times thanks to synchronous and asynchronous processes (L. Racovita-Szilagy, D. Munoz Carbonero, M. Diaconu (2018) [28]).
- E-learning practically realizes the opportunity for learning anytime, anywhere, and also promotes lifelong learning and interaction between participants (Aleman de la Garza L., S. Robinson, H. Neergaard, L. Tanggaard, N. Krueger N. (2016) [2]).
- E-learning is an opportunity to learn at own pace and complete courses and study sections in own order (D. Fellman, A. Lincke, E. Berge, B. Jonsson (2020) [6]).
- E-learning enables learning without any limitations in time and space, which improves organizational learning

capabilities (A. Widyanti, S. Hasudungan, J. Park (2020) [39]).

- Advantages of e-learning in transparent and quick assessment of students, introduction of innovative teaching methods (Vy Dang Bich, Huynh, Phong Thanh Nguyen, Quyen Le Hoang Thuy To Nguyen, Ngoc Bich Vu (2020) [38]).

An analysis of the results of a survey of lecturers of the Borys Grinchenko Kyiv University and the Ivan Franko National University of Lviv revealed that the lecturers of these institutions highlight the advantages of e-learning both for lecturers and for students.

We organized the results of the lecturers' questionnaire into three blocks.

In turn, the block of respondents' answers is a block of paying attention to the time resource. As shown in Diagram 1, all respondents without exception consider freed time as a regulator of their activities and point to freed time in the context of the introduction of e-learning.

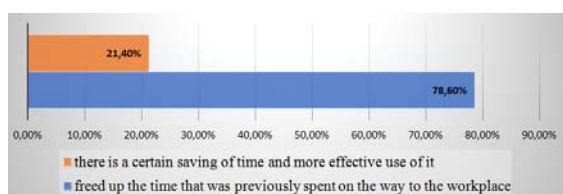


Figure 1. Opinions of respondents about freed up time as a result of the introduction of e-learning

Any process takes place over time - the educational process and the processes of self-learning, self-development and self-improvement are no exception. Since the respondents live in big cities, the time that was previously set aside for the trip to the university for the organization of studies was defined as freed up and was used by the respondents at their own will.

The second block of respondents' answers is a block of the relevance of self-development in the context of the introduction of e-learning. The analysis of respondents' questionnaires proved that e-learning in a certain way stimulated the course of various processes, including the process of self-development. Diagrams 2 and 3 show that in the conditions of e-learning, not only the process of self-development is relevant, but also its dominant focus is specified (mastery of new information technologies, development and improvement of skills for working with electronic resources).

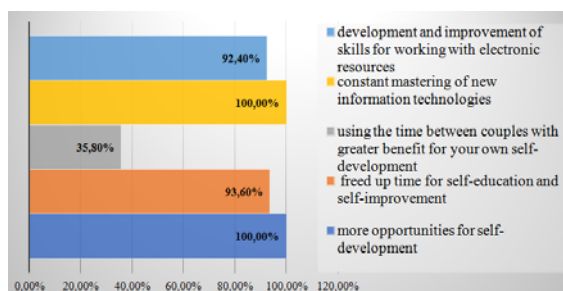


Figure 2. Opinions of respondents about the relevance of self-development for teachers in the context of the introduction of e-learning

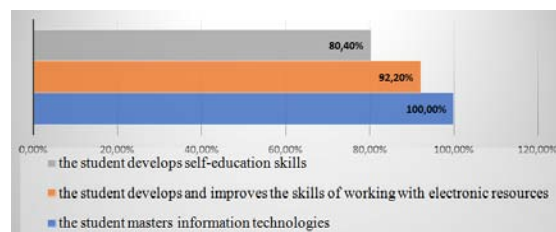


Figure 3. Opinions of respondents about the relevance of self-development for students in the context of the introduction of e-learning

The third block of respondents' answers is a block of opportunities that appeared as a result of the introduction of e-learning. As shown in Diagram 4, opportunities for lecturers relate to both pedagogical activity and social activity.

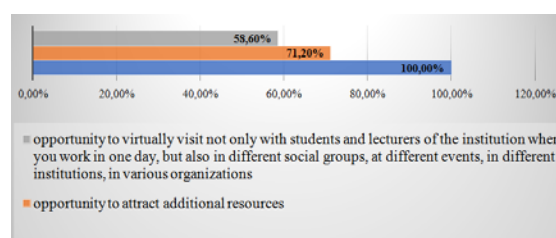


Figure 4. Opinions of respondents about the opportunities that appear for lecturers as a result of e-learning introduction

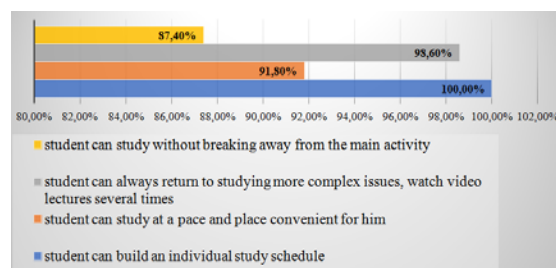


Figure 5. Opinions of respondents about the opportunities that appear for students as a result of the introduction of e-learning

According to teachers' opinions, the introduction of e-learning had a positive effect on student learning, as the learning process became manageable by each student and contributed to the practical implementation of the lifelong learning process based on practical actions combining professional activity with learning.

However, analysis of scientific sources also revealed a number of disadvantages of e-learning. Scientists believe that e-learning has certain limitations:

- Teachers and students need to have certain skills, knowledge, and experience in technology and teaching skills to deliver learning (D. K. Saini, M. R. S. Almamri (2019) [31]).
- The infrastructure of the e-learning system must be synchronous, efficient, and secure. This is required to support teacher-student interaction, data storage, and evaluation of learning performance (D. K. Saini, M. R. S. Almamri (2019) [31]).
- The digital nature of e-learning leads to less face-to-face interaction with lecturers, reducing the possibility of identifying the need for changes in the learning process and the individual structure of the learner (S. Robinson, H. Neergaard, L. Tanggaard, N. Krueger (2016) [30]).
- The mental load during distance learning is much higher than during face-to-face learning (A. Widyanti, S. Hasudungan, J. Park (2020) [39]).

An analysis of the results of a survey of lecturers of the Borys Grinchenko Kyiv University and the Ivan Franko National University of Lviv revealed that the lecturers of these institutions also paid attention to the shortcomings of e-learning. The results of the lecturers's survey are shown in Figure 6.

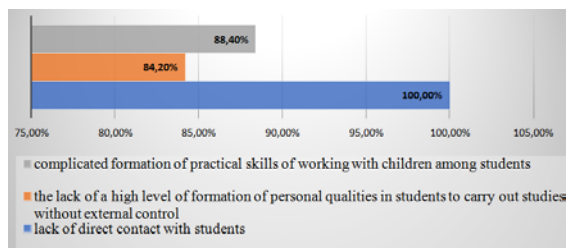


Figure 6. Lecturers' opinions about the shortcomings of the implementation of e-learning

During the interviews, the lecturers emphasized the need for increased motivation of students due to the lack of "live conversation", personal contact of the students with each other and with the lecturers.

4 Conclusion

The processes of formation and development of the leading ideas of sustainable development of society included other processes, namely: determination of the role of education in the information society (UNESCO, 1992); recognition of education as an indicator of sustainable development of society (2002); the declaration of 2005-2014 as the Decade of Education for Sustainable Development (UNESCO, 2002); determination of directions for the development of education and training to ensure the sustainable development of society (UNESCO, 2009), attribution of human potential to the value priorities of sustainable development of society. A person must learn to understand the complexity of the modern world, to effectively cooperate, express himself and act for positive changes in society (UNESCO, 2015). The adoption of the Agenda for Sustainable Development until 2030 (UNESCO, 2020) also should be mentioned, as well as the definition of the role of education in the process of changing a person's lifestyle, transformation of way of acting and thinking for the formation of more sustainable societies.

The directions of development of the future teacher in the context of promoting the sustainable development of society in the conditions of the information economy are determined with the inclusion of following tasks:

1. To understand one's own involvement in the processes that affect the sustainable development of society.
2. Constantly be aware of the need for new knowledge and skills and satisfy appropriate needs for self-realization in the conditions of the information economy.
3. To understand that in the conditions of the information economy, learning takes place "not just within an individual, but within networks and between networks" (T. Kidd (2010)).
4. To understand the impact of the existence of real and virtual spaces on the formation of new forms of learning.
5. To perceive e-learning both as an integration of technology, education and economy, and as an opportunity to learn at own pace, without time and space limitations.

Scientists explain the essence of e-learning in the conditions of the information economy using such key categories as:

- 1) Form of education (a special form of e-business in education mentioned by Q. Pham, T. Tran (2020) [24]);
- 2) An approach in education (an approach to learning that supports online teaching and learning (T. Theresiawati, H. Seta, A. Hidayanto, Z. Abidin (2020) [34]) ;
- 3) learning method (a learning method that uses online communication (P. Resta, M. Patru (2010) [29]); online

learning method researched by T. Nguyen, T. Nguyen, Q. Pham, S. Misra (2014) [20]; continuous innovative method of teaching and learning, which is based on the application of information technologies [(L. Alfita, A. Kadiyono, P. Nguyen, W. Firdaus, I. Wekke (2019) [4]);

- 4) Learning means (means for removing barriers to traditional classroom learning (S. Sotiriou, A. Lazoudis, F. Bogner (2020) [33]); means for providing educational content using ICT to ensure accessibility of learning (J. Huss, O. Sela, S. Eastep (2015) [9]);
- 5) Learning system (a learning system that uses web browsers (D. Shee, Y. Wang (2008) [32]); a combination of computer, browser, and Internet to provide online education and training (J.-K. Lee, W.-K. Lee (2008) [14]);
- 6) Electronic mechanism (electronic mechanism used to deliver educational material to students (S. Ozkan, R. Koseler (2009) [22]);
- 7) Learning process (a learning process that is prepared, transmitted, and managed with the help of various ICT tools of a local or global nature (E. Masie (2016) [17]); a learning process that involves online teaching to a network group and the exchange of resources in electronic form (K. MacKeogh, S. Fox (2009) [16]);
- 8) Technological solution (a wide range of programs and processes that use available electronic media and tools (Z. Abbas, M. Umer, M. Odeh, R. McClatchey, A. Ali, A. Farooq (2005) [2]); the use of various technological tools that are web-based, web-distributed, or support online learning (A. Muhammad, M. F. M. D. Ghalib, F. Ahmad, Q. Naveed, A. Shah (2016) [18]);
- 9) Model (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 (2020) [27]).

The analysis of the definitions of the concept of "e-learning" contributed to the compilation of the characteristics in the following areas:

- 1) The technological basis of e-learning: 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) The goal of implementing e-learning: 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) Activity of the teacher: provision of online learning, online teaching, online education;
- 4) Peculiarities of the organization of learning: creation of an innovative online environment; organization of training for each member of the network group; use of previously prepared educational materials; attraction of additional resources and materials; organization of online cooperation, online communication, online interaction, exchange of resources in electronic form.

The following list of advantages of e-learning has been compiled:

- Economic benefits for a sustainable society: the economic efficiency of e-learning in terms of reducing the cost of education and promoting lifelong learning to ensure the continuous development of the intellectual potential of members of society.
- Pedagogical advantages for lecturers: the possibility of electronic learning platforms to register data on the results of the participation of pupils and students in various types of online activities; the ability to implement synchronous

and asynchronous processes during online education; transparent and quick assessment, introduction of innovative teaching methods.

- Advantages for the development of future teachers: the possibility of organizing online learning at one's own pace, in the self-determined order of studying the educational material, with the possibility of several one-time processing of educational material, without time and space limitations.
- Organizational advantages for lecturers and future teachers: more efficient use of time resources, manifested in a quick change of virtual professional or educational activities to participation in various educational or social events, visits to various institutions, organizations, etc.

Literature:

1. Abbas, Z., Umer, M., Odeh, M., McClatchey, R., Ali, A., Farooq, A. (2005). A semantic grid-based e-learning framework (SELF). In Proceedings of the CCGrid 2005. IEEE International Symposium on Cluster Computing and the Grid 2005, CWL, UK, 9–12 May 2005; Volume 1, pp. 11–18.
2. Alemán de la Garza L., Gómez Zermeño M., Mochizuki Y., Bruillard E., Anichini A., Antal P., Beane A., Bruillard E., Burke D., & Henrique Cacique Braga P., et al. (2019). *Rethinking Pedagogy. Exploring the Potential of Digital Technology in Achieving Quality Education*; UNESCO MGIEP: New Delhi, India.
3. 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;
4. Camacho-Yáñez, I.; Gómez-Zermeño, M., & Pintor-Chávez, M. (2015). Competencias digitales en el estudiante adulto trabajador. *Revista Interamericana de Educación de Adultos* 37, 10–24.
5. Fellman D, Lincke A, Berge E & Jonsson B (2020). Predicting Visuospatial and Verbal Working Memory by Individual Differences in E-Learning Activities. *Front. Educ.* 5:22.
6. Forrester D. (1973). *Myrovaia dynamyka*. WRIGHT-ALLEN Press.
7. Education in Europe: Strasbourg: Council of Europe Press (1995), 37.
8. Gordon, J., Halsz, G., Krawczyk, M., Leney, T., Micehl, A., Pepper, D., Putkiewicz, E., Wisniewski, W. (2009). *Key Competences in Europe: Opening Doors for Lifelong Learners across the School Curriculum and Teacher's Education*; Centre for Social and Economic Research on behalf of CASE Network: Warsaw, Poland.
9. 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. *Aust. J. Teach. Educ.* 40, 72–86.
10. Kasraie, N., & Kasraie, E. (2010). Economies of eLearning in the 21st Century. *Contemporary Issues in Education Research*, 3(10), 57-62.
11. Kidd, T. T. (2010). A brief history of eLearning. In *Web-based education: Concepts, methodologies, tools and applications* (pp. 1-8). IGI Global.
12. Koshova O. P. (2011). Formuvannia informatsiino-analitychnykh umin maibutnykh ekonomistiv v protsesi vyvchennia dystsyplin tsykladu pryrodnycho-naukovoï pidhotovky. [PhD dissertation brief], 13.00.04 – teoriia ta metodyka profesiinnoi osvity. Poltava, p. 12.
13. Kovy, S (2005). *Vosma zvychka: vid uspishnosti do velychi* [The eighth habit: from success to greatness]. Kyiv: Vydavnytstvo Oleksiia Kapusty
14. 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.
15. Li, D., & Ching-Yeh, T. (2020). Antecedents of Employees' Goal Orientation and the Effects of Goal Orientation on E-Learning Outcomes: The Roles of Intra-Organizational Environment. *Sustainability*, 12(11): 47-59.
16. MacKeogh, K., & Fox, S. (2009). Strategies for embedding e-learning in traditional universities: Drivers and barriers. *Electronic Journal of E-learning*, 7(2), 147-154.
17. Masie, E. (2016), *E-learning definition of Masie Elliot Learning Center*.
18. Muhammad, A., Ghalib, M.F.M.D., Ahmad, F., Naveed, Q.N., Shah, A. (2016). A study to investigate state of ethical development in e-learning. *Journal of Advanced Computer Science Application*, 7, 284–290.
19. Naveed, Q. N., Muhammad, A., Sanober, S., Qureshi, M.R.N., Shah, A. (2017). A mixed method study for investigating critical success factors (CSFs) of e-learning in Saudi Arabian universities. *Methods*, 8.
20. 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.
21. Osvitohiia: vytoky naukovoho napriamu (2012). Kyiv: VP "Edelveis".
22. Ozkan S., & Koseler R. (2009). Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation. *Computer Education*, 53, 1285-1296.
23. Peccei, A. (1981). *One hundred pages for the future: reflections of the president of the Club of Rome*. New York: "Pergamon Press".
24. 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.
25. Phuc, P., & Quyen, L. (2017). Critical factors affecting the happiness: A Vietnamese perspective. *International Journal of Economic Research*, 14(01), 511-519.
26. Porokhovskii, A.A. (2002). Gosudarstvo i "Novaya ekonomika": Amerikanskii podkhod. *SShA, Canada - Ekonomika, Politika, Kultura*, 3, 3-10.
27. Quyen, L., T, N., Phong, T., Vy, D., Luong, T. (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.
28. Racovita-Szilagy, L., Carbonero, Munoz D., & Diaconu, M. (2018). Challenges and opportunities to eLearning in social work education: Perspectives from Spain and the United States. *European Journal of Social Work*, 21, 836–849.
29. Resta, P., & Patru, M. (2010). *Teacher development in an e-learning age: A policy and planning guide*. Paris: UNESCO.
30. Robinson, S., Neergaard, H., Tanggaard, L., & Krueger, N. (2016). New horizons in entrepreneurship education: From teacher-led to student-centered learning. *Educational Training*, 58, 661–683.
31. Saini, D. K., & Almamri, M. R. S. (2019). Social Sciences & Humanities Open Investigation of Technological Tools used in Education System in Oman. [pdf document]
32. 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. *Computer Education*, 50, 894–905.
33. 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.
34. 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.
35. Truong, H. M. (2016). Integrating learning styles and adaptive e-learning system: current developments, problems and opportunities. *Computers and Human Behavior*, 55, 1185–1193. doi: 10.1016/j.chb.2015.02.014
36. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf00000252423/PDF/252423spa.pdf.multi> (accessed on 1 April 2020).
37. Volungevičienė, A., Teresevičienė, M., & Ehlers, U., 2020. When is Open and Online Learning Relevant for Curriculum Change in Higher Education? Digital and Network Society Perspective. *The Electronic Journal of e-Learning*, 18(1), 88-101.
38. Vy, D., Huynh, P., Quyen, L., To, N., Ngoc, B. (2020). E-Learning Evolution and Development from the Perspectives of Technology, Education, and Economy. *Research in World Economy*, 11.

39. Widyanti, A., Hasudungan, S., & Park, J. (2020). E-Learning readiness and perceived learning workload among students in an Indonesian university. *Knowledge Management & E-Learning*, 12(1), 18-29.

Primary Paper Section: A

Secondary Paper Section: AM, IN