Implementation of Modern Distance Learning Platforms in the Educational Process of HEI and their Effectiveness

Viktoriia V. Kuleshova[1], Larysa V. Kutsak[2], Svitlana Y. Liulchak[2], Tetiana V. Tsoi[3] & Iryna V. Ivanenko[4]

[1]Department of Engineering Pedagogy and Psychology, Educational-Scientific Professional-Pedagogical Institute, Ukrainian Engineering Pedagogics Academy, Bakhmut, Ukraine

[2]Department of Innovation and Information Technology in Education, Educational and Scientific Institution of Pedagogy, Psychology, Training of Specialists of Higher Qualification, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Vinnytsia, Ukraine

[3]Department of Culture and Social and Humanitarian Sciences, Faculty of Theory and Art History, National Academy of Fine Arts and Architecture, Kyiv, Ukraine

[4]Department of Romance and Germanic Languages, National Academy of the Security Service of Ukraine, Kyiv, Ukraine

Correspondence: Viktoriia V. Kuleshova, Educational-Scientific Professional-Pedagogical Institute Ukrainian Engineering Pedagogics Academy, 5 Myra str., Bakhmut, 84510, Ukraine.

Received: June 10, 2020 Accepted: August 3, 2020 Online Published: August 7, 2020

doi:10.5430/ijhe.v9n7p217 URL: https://doi.org/10.5430/ijhe.v9n7p217

Abstract

The growing role of distance learning platforms at higher educational institutions in developing countries, and the inadequate study of their effectiveness have necessitated the elimination of this imbalance. An additional problem in studying the issue of platforms' effectiveness is the limitation of studies, which is based on qualitative methods of assessing the effectiveness. The quantitative assessment of the effectiveness and level of satisfaction with the implementation of distance learning platforms at higher educational institutions has been conducted in this academic paper. The assessment has been conducted using the System Usability Scale (SUS) to assess the Usability of the Moodle remote platform in Ukraine and the User Satisfaction Questionnaire (USQ) to assess students' satisfaction. The article proves the connection between the Usability of the distance learning platform and the level of satisfaction with its use. This provides an opportunity to improve the problem areas of the Usability platform in order to increase the efficiency of its use. The following effects of application have been revealed, namely: increase of internal motivation, involvement in the learning process, level of satisfaction from courses and training programs (curricula), recognition of homework's importance, increased interest in subjects, and students' self-efficacy. Effective communication and quick response, an automatic control system are factors that contribute to the introduction of modern distance learning platforms in the educational process of HEI. The important elements of the effectiveness of distance learning platforms in the educational process of HEI are interactivity, simplicity, convenience, the speed of student-teacher interaction, platform flexibility, and quality control.

Keywords: distance learning platforms, educational process, e-learning, e-learning effectiveness

1. Introduction

At the end of XX century, the traditional form of education could not satisfy the growing needs of the population in education. Thus, a new technology of education began to emerge, which was called "distance education". Over the past decades, distance learning has become a global phenomenon of educational and information culture, significantly affecting the nature of education in many countries of the world. Currently, a range of educational services is being developed around the world, using distance learning technologies, characterized by numerous students, the number of educational institutions involved, the size and complexity of the infrastructure, and the scale of funding.

In the era of turbulence, globalization, rapid change and technology, the educational process has been transformed by the introduction of distance learning platforms (E-learning platforms). The development of distance learning in the educational process is driven by a factor of the specific generation: generation Z is characterized by differences in motivation to learn, internal and external motives are also different. Modern distance learning platforms provide the

opportunity to develop new teaching techniques that include such elements, as: interactivity, self-control, intrinsic motive, rapid response and feedback, experimentation and learning through tests and patterns.

Taking into consideration the deficiency of studies on the effectiveness of the use of distance learning platforms in middle-income countries, the need arises to conduct an investigation aimed at eliminating the existing imbalance. This problem is exacerbated by the use of qualitative research methods (Barteit et al., 2020; Benta, Bologa & Dzitac, 2015; Pino, Mora, Diaz, Guarnizo & Jaimes, 2017), which are characterized by a high level of subjectivity. Recent researches on the issue of E-learning have been focused on the types of distance platforms (Mikheeva, 2019). Sampling of students does not make it possible to scale the results concerning different groups of students (Benta, Bologa & Dzitac, 2014).

The purpose of the investigation is to conduct a quantitative estimation of the effectiveness and level of satisfaction with the implementation of distance learning platforms at higher educational institutions.

The basic objectives of the study are defined as follows:

1. Analysis of the evolution of distance learning in advanced countries, the effectiveness of distance learning platforms.

2. Conducting a survey on the effectiveness and level of satisfaction with the introduction of distance learning platforms at higher educational institutions of Ukraine (Kompen, Edirisingha, Canaleta, Alsina & Monguet, 2019).

The basic hypotheses of the study are defined as follows:

1. The Usability of the distance learning platform determines the level of students' satisfaction with its use: the effectiveness of Usability provides high efficiency of the platform.

2. The level of satisfaction with the use of the distance learning platform is determined by the simplicity, the level of support of the technical specialist, the integration of functions, ease of use, usage skills.

2. Literature Review

Distance learning by using Internet technologies is a modern universal form of obtaining professional education, focused on the individual requests of students and their specialization. Distance learning confers the possibility for the student to continuously improve his / her professional level, taking into account individual characteristics. In the process of distance learning, a student independently studies educational content in an interactive mode for a certain part of the time; he also undergoes testing, performs control works under the guidance of a teacher and interacts with other students of the "virtual" study group (Abrosimov, 2018).

"Distance learning is divided into two main categories: synchronous and asynchronous" (Mikheeva, 2019). Depending on its main purpose E-learning platforms can be boxed services, where there are free ready-made solutions and paid; SaaS services, where a fixed rent is charged for the use of this platform; platforms for webinars and conferences at various levels.

"E-learning platforms are considered by students as a positive aspect in learning", however, the opportunities are arise for better integration and implementation into the educational process (Chivu, Turlacu, Stoica & Radu, 2020). Distance learning is perceived by students as an easier process that is as effective as traditional learning (Table 1). "The students' motivation is increased through the use of E-learning platforms, communication system and automatic control system" (Półjanowicz, Latosiewicz, Kulesza-Brończyk, Piekut & Terlikowski, 2011). Students' perceptions of E-learning platforms and the simplicity of E-learning platforms ensure the effectiveness of the educational process, which is influenced by self-efficacy and students' cognitive absorption, facilitating conditions and system interactivity (Moreno, Cavazotte, Cavazotte & Alves, 2016).

Table 1. E-learning platforms effectiveness

Author	Results	Effectiveness
Półjanowicz et al. (2011)	The study included a group of 132 students at the III-rd year of the first-degree full-time course in nursing, subject: "Obstetrics, Gynecology and Obstetrics-Gynecological Care" within the academic year 2010-2011.	Increase students' motivation through E-learning platforms, communication systems, automatic control systems. The motivation is a significant self-regulator of student's behavior in distance education process
Younie and Leask (2013)	12 case study sites, research funded by the British Educational Communications	Inter-operability problems between commonly used management information

	and Technology Agency in 2009	systems and the learning platforms were reported as hindering development of practice.
Benta et al. (2014)	The investigation was conducted on the basis of users' activity on the E-learning platform for the period of 2011-2012 and data from the Moodle server in a higher educational institution of Romania. Based on a sample of 98 students, the effectiveness of the E-learning system was assessed. The E-learning was compared with the traditional learning (sample of 104 students).	The improvement of communication between teachers and students was revealed, as well as the level of students' satisfaction from the learning process. The use of E-learning system has changed the perception of homework and its importance in the learning process. The high level of efficiency of the distance learning platform has been revealed.
Benta et al. (2015)	The analysis of work productivity of two samples of students has been carried out on the basis of thew following criteria: class attendance, homework.	The integration of the electronic distance system into the traditional learning system has improved students' productivity. The perception of homework has changed. Distance learning electronic systems have increased the level of intrinsic motivation.
Moreno et al. (2016)	251 students were enrolled in distance learning Business Administration programs. Results of structural equation modeling supported most hypotheses.	Self-efficacy та students' cognitive absorption, facilitating conditions та system interactivity are define E-learning platforms effectiveness
Chivu et al. (2018)	The study was led by the formation of a group of participants, a student, composed of 35 persons, an interview guide on the knowledge, awareness, interest, attitude and usage of the E-learning platforms	E-learning platforms are useful and effective tools for higher education, with a high degree of notoriety. E-learning platforms are a great addition to university environment by allowing them to access and read the materials of curriculum at any time, and anywhere, and that they no longer feel connected with this obligatory physics during the classroom, managing to combine studies with a job.
Barteit et al. (2020)	The study was conducted on the basis of a meta-analysis of 52 publications for the period of 2007-2017 with a total sample of 12294 participants.	The effectiveness of distance E-learning has been identified in the majority of studies. The potential benefits of distance learning in low-income countries and middle-income countries have been identified. The negative aspects of the research include a small sample of studies, studies' shortness, the reliability of assessment tools.

Source: author's research

Interactivity through gamification and use of video materials promotes the effectiveness of distance learning through engagement of a greater number of students. "Gamified learning improves students' attitude, engagement, and performance" (Subhash & Cudney, 2018). Flexible teaching formats at higher educational institutions are adapted to the needs of students (Arrosagaray, González-Peiteado, Pino-Juste & Rodríguez-López, 2019; Correa Gorospe & Paredes Labra, 2010). As a result, teaching becomes personalized, adapted to the specific needs of the student; it provides the student's active participation in learning.

The positive effect of using distance learning platforms has been proven in recent studies (Cacheiro-González, 2019). Distance learning platforms make it possible to provide access to materials for all subjects of education at any time (Adams et al., 2017). The use of platforms promotes the development of students' creativity, cooperation, critical

thinking, communication (Keane, Keane & Blicblau, 2016). Integration of distance learning platforms provides social, professional, catalytic and pedagogical effects (Jain & Tyagi, 2017; Yang, Xiang & Chun, 2018).

Digital technologies do not transform the system of education and teaching at the university (Fleaca & Stanciu, 2019; Henderson, Selwyn & Aston, 2017). At the same time, distance learning platforms promote the development of interactivity and forms of communication (Kebble, 2017).

3. Methodology

3.1 Approach, Tools and Methods

This investigation is based on the methodology of studying the effectiveness of distance learning platforms at higher educational institutions, which are presented in the works of Moreno et al. (2016) and Barteit et al. (2020). The study of the effectiveness of distance learning platforms in 90% of cases is conducted on the basis of one, two or three research methods, among which the survey predominates (47% among 52 studies) in the form of: Berlin questionnaire, System Usability Scale, the course experience questionnaire (CEQ), a teaching performance indicator for higher education or adapted other validated questionnaires. In addition, knowledge testing after the introduction of e-learning was conducted in 35% of studies among 52 studies. These methods are used simultaneously and provide the greatest effectiveness of the evaluation's results of distance learning platforms' use (the quality of research by using these methods is evaluated on the basis of the following three assessments: Medical Education Research Study Quality Instrument (MERSQI), Newcastle-Ottawa Scale (NOS), and Newcastle-Ottawa Scale-Education (NOS-E). Thus, taking into consideration the effectiveness of survey methods, including knowledge testing, this study uses descriptive research design to quantify the effectiveness of distance learning platforms at higher educational institutions.

The System Usability Scale (SUS) has been used to assess the Usability of the distance learning platforms, and the User Satisfaction Questionnaire (USQ) has been used to assess the level of students' satisfaction (Pusponegoro, Soebadi & Surya, 2015). We have used 10 out of the original 15 USQ items in SUS. The items were scored on a scale from 1 to 4, with 1 being ''strongly disagree'' and 4 being ''strongly agree.'' The total score was computed as the sum of the item scores. A total score of 30 or more indicated that the participant found the module satisfactory and acceptable. The scale of USQ consisted of 10 multiplechoice questions scored on a scale of 1 (''Disagree completely'') to 5 (''Agree completely'').

3.2 Data Collection Process and Sampling

The survey has been conducted at the University of Ukraine, Lviv. The university uses the Moodle system, which is widespread in Ukraine and provides support to students with educational materials (textbooks, articles, video lectures); it makes it possible to download homework and view courses' assessments by educators. All e-courses, available in the Moodle system, have a specialist who monitors students' activity on the platform, provides technical support to students, answers technical questions of students. In general, students spend at least 5 hours a day interacting with the Moodle platform. To collect data, links to e-questionnaires were sent to Moodle course administrators, who redirected the questionnaires via e-mail to students to fill out. In total, 378 students of different specialties of 1-4 courses were surveyed. We used an online survey tool made available on the Google Forms to collect our data. The questionnaire also included questions about the demographic profile of the respondents.

211 full-time students took part in the survey. Sampling was formed on a random basis. The questionnaire was sent to the coordinators of students' groups, each of whom could take the survey at his or her will. This ensured the objectivity of the results and the quality of the survey. Sampling included students aged 18-22 years, of II - V courses, which ensures the representativeness of sampling. The survey was conducted in May 2020.

3.3 Data Analysis of the Questionnaire

To analyze the effectiveness of the Moodle distance learning platform and the level of students' satisfaction with distance learning, descriptive statistical methods have been used to process the results.

1. Cronbach's alpha has been used to assess the reliability of the results. The value of Cronbach's alpha ranges from 0 to 1, where 0,01 – 0,20 - very low reliability, 0,21 – 0,40 - low, 0,41 – 0,60 - medium, 0,61 - 0, 80 - high, 0,81 – 1,00 - very high reliability.

2. Validity (Convergent and Divergent) has been evaluated using a matrix of correlations of variables. A value of more than 0,5 indicates a significant dependence between variables. In addition, the correlation coefficients have been the basis for determining the interconnection between the level of satisfaction of Moodle and Moodle Usability.

3. Descriptive statistics: mean value, deviation, minimum and maximum value of variables, scope and variation to summarize the survey results.

4. Method of statistical evaluation of Chi-Quadrat-Test hypotheses to determine the dependence of variables.

Statistical analysis using SPSS 22.0 has been used to process the results of the questionnaire. The level of significance of test results has been chosen at the level of 5% and 10%.

4. Results and Discussion

4.1 Foreign Experience in Implementing Distance Learning Platforms at Higher Educational Institutions and their Effectiveness

Eventually, universities will be forced to pay attention to the effectiveness and feasibility of transition to E-learning, as well as to methods for assessing the effectiveness of ICT use. If higher educational institutions (HEI) offer equal access to educational services, then those universities that can provide high quality education will win the competition. Such tendencies can be traced in those universities where ICT projects have been implemented for a long time.

For example, the experience of the University of Barcelona has been considered, which underwent a mutual review process using peer review, benchmarking, as part of a two-year European Commission project (E-learning Development Action Plan – MASSIVE). Despite the fact that the purpose of analyzing ten-year experience of ICT development and E-learning at the University of Barcelona as well as provision assistance to European universities, the fact of carrying out such an examination is quite symptomatic. Herewith, it should be noted that the economic impact assessment remained beyond the scope of this project.

The Open University of Great Britain, founded in 1969 in London, provided an opportunity to get an education thanks to the distance learning system. Over two million people from 157 countries received education there. The annual number of students accounts 174 000, including 24 000 people with disabilities. A number of technical innovations has been developed at the university, namely: scientific materials are available on smartphones, iTunes U application aware integration and others. Distance E-learning is integrated in the following higher educational institutions: National Distance Education University in Spain, Open University in Canada (14 thousand students), University of Hagen in Germany (55 thousand students), Baltic University with center in Stockholm (it unites 10 countries of the Baltic region), Shanghai Television University in China (500 thousand students), International University of Business in the USA (33 thousand students), Open University of the Netherlands (22 thousand students) (Yaroshenko, 2019).

In terms of distance education of students in HEI, there is a need to consider the stages of development of distance educational technologies and forms of educational activity.

Stage 1 (until 1992). The emergence of personal computers, communications and the first attempts to use them in education (Abrosimov, 2018). Since 1983, studies were conducted in the field of telecommunications in education. These studies were implemented in the form of telecommunication projects (International Project “Campus 2000”, cultural: “Theater”, “Holidays and customs of the two countries”; specific projects: “Chemical project” “Soviet-American Programming Course”). Telecommunication education projects were cross-curriculum.

Stage 2 (1993-1995). The rapid development of information and communication tools does not contribute to widespread of students’ learning in a high-tech educational environment.

Stage 3 (1996-1998). New terminology has steadily taken its place in the scientific community. Distance learning means in most cases distance learning, based on the use of information technology.

Stage 4 (1998-2002). At this stage new tasks and necessity to improve the level of development of technology use and construction of information systems and their structural basis - databases and Internet programming have been considered (Lytras, Sarirete & Damiani, 2020).

Stage 5 (2002-2005). Development of new means of communication, such as global (Internet), and local (Intranet) information systems that increase the efficiency of the educational process through the use of information and telecommunication technologies in education.

Stage 6 (2005-2007). The period has been characterized by a large number of DE systems and knowledge control systems; many of them are the simplest test systems and presentation of training material in the form of static hypertext or document archives.

Stage 7 (2007-2012). This period has been characterized by a high level of development of information and communication technologies. Distance education systems for specialists in various fields have been used extensively.

Stage 8 (2012-2014). Information and communication technologies and equipment have a high level of development, which makes it possible to increase the level of training efficiency. Mobile devices make learning accessible on an ongoing basis. At this stage, the concepts of "learning at any time, anywhere", the development of "cloud" technologies for the formation and advancing of open education systems are being formed (Aldiab, Chowdhury, Kootsookos, Alam & Allhibi, 2019).

It should also be noted that attempts to measure the effect of the use of computer technology in education and training is nothing new and has existed since the development of information technology (approximately since 60s of XX century). Moreover, the number of such studies is quite convincing; authors offer extremely diverse models and assessment criteria. Thus, Leakey (2011) in his investigation conducts a comparative study of the most successful assessment methods of distance learning platforms and uses as an example 6 assessment criteria developed by S. Shapel: "reliability, truthfulness, authenticity, interactivity, positive effect, functionality".

Nowadays, a sufficient number of systems have been developed in order to integrate the E-learning system in higher educational institutions. The following online servers and teaching tools are used to enhance the professional level of teachers and students of higher educational institutions, namely: Quizlet, Mozaweb, Zoom, Prometheus, Classtime, Google Classroom, Padlet, Classdojo, Moodle, etc. One of the forms of E-learning is the Moodle system, which runs on Mac OS X, Linux, Unix, Windows, FreeBSD, NetWare and other systems that support databases and PHP, including many hosting providers. The platform settings system is very flexible. If a course in the Moodle system is created by an experienced teacher, it looks like a structure with complementary elements, different in formatting and purpose. As of mid-2011, more than 55 000 sites used the Moodle platform, and their audience accounted more than 44 million users in 214 countries, where totally 4, 7 million courses were held in 75 languages. As of 2018, more than 50% of higher educational institutions on a worldwide scale use a distance learning system (or integrated one) in a certain way for training programs (curricula) and the creation of online courses (Yaroshenko, 2019). The E-learning market of higher educational institutions (academic) is expected to increase to 72, 41 billion dollars for the period of 2020-2024. The level of involvement in E-learning is steadily growing due to factors such as flexible courses' formats, the provision of certificates after graduation, curricula of higher educational establishments that provide further employment, advanced training, professional and career growth (Maida, 2020).

Therefore, over the period of its development, distance learning technology has gone through several stages. The content and tools of each of them in general are successfully implemented in various forms of modern distance learning. The educational process during distance learning of a student includes all the basic forms of the traditional organization of the educational process: lectures, seminars and workshops, laboratory practice, control system, research and independent work of students. All these forms of organization of the educational process make it possible to put into practice a flexible combination of independent cognitive activity of students with various sources of information, operational and systematic interaction with the leading teacher of the course, and group work of students.

The implementation of distance learning technologies, progressive ideas in the regions of Asia, North America and Europe in recent years allows to form a number of conclusions regarding technological achievements in this area:

– integration of mobile learning with the use of mobile devices, social networks;

– introduction of adaptive learning technologies;

– supplemented, virtual and hybrid reality;

– integration of the Internet of things concept;

– integration of the learning management system;

– use of artificial intelligence (Antonelli et al., 2019).

In Ukraine, the integration of distance learning platforms is characterized by the following trends:

– platforms began to be implemented in the 2000s with introduction of state policy; its main provisions are disclosed in the Distance Education Development Concept, which is reflected in other established legislative documents;

– numerous higher educational institutions use distance learning technologies;

– technological means of supporting distance learning are being advanced, primarily information and communication technologies;

– Internet connection is available at all HEI of Ukraine, however not all the HEI have high-quality broadband service access to the global network due to the low level of broadband penetration;

– software and hardware for distance learning is being developed, providing improvements in the technical base for the integration of distance learning at HEI (Sysoieva & Osadcha, 2019).

Distance learning can be implemented at all levels of the education system, although the most appropriate and acceptable is in higher education, as well as a method of self-education. The pioneers in introducing the elements of distance learning among the HEI of Ukraine were the National Technical University of Ukraine "Kyiv Polytechnic Institute", Khmelnitsky National University, Odessa National Academy of Food Technologies, Sumy State University, etc. (Yaroshenko, 2019).

At the same time, distance education in Ukraine is at the stage of formation compared to the practice of developed countries, mainly due to the perception of electronic platforms as those that do not ensure the quality of the educational process. The number of programs and universities offering distance learning is still limited. Technologies are integrated to improve traditional educational processes. Obstacles of distance learning's integration are: imperfect national standards, accreditation and regulation procedures; insufficient level of public information awareness of the benefits; low level of awareness; weakness of technical and technological infrastructure; lack of financing opportunities (Yaroshenko, 2019).

The effectiveness of distance education depends on a number of factors. The format of education is one of them. It can be synchronous, asynchronous, combined. Group or individualized distance learning is the next factor. The teacher and the curriculum are the next factors in the effectiveness of distance learning. The effectiveness of the distance learning depends on the professionalism of the teacher, his competencies, the ability to correctly emphasize, motivate, his skills and work experience.

Thus, at the present stage of development of society, distance education plays a significant role in the organization of learning, providing additional opportunities to improve skills, knowledge, competencies of students, ensuring self-development and self-education. Due to such advantages of the organization of distance education, it is future-oriented and popular in all spheres of human life and activity.

4.2 The Results of the Effectiveness of the Distance Learning Platform of Ukraine

The calculation of the statistical reliability coefficient of Alpha Cronbach indicates a high level of reliability of the results of the questionnaires (Table 2). This gives grounds to draw the correct conclusions about the effectiveness of the Moodle distance learning platform.

Table 2. Reliability statistics

Survey	Alpha Cronbach	Reliability	N (Items)
System Usability Scale (SUS)	0,718	0.61 – 0.80 High	10
User Satisfaction Questionnaire (USQ)	0,968	0.81 – 1.00 Very high	10

Source: author's research

The calculation of the descriptive indicators of the results according to the System Usability Scale questionnaire (Table 3) is the basis for the statement that students agree to some extent with the Usability distance learning platform. It is worth paying attention to certain statements on individual characteristics of the Moodle platform, with Usability of which students disagree to a certain extent, namely: complexity (average 2,222, trend 2), need for technical support (average 1,815, trend 1), platform mismatch (average 2,556), inconvenience of use (average 2,111, trend 1), the need for additional skills and knowledge to use the platform (average 2,259, trend 2).

Table 3. System Usability Scale Rating Descriptive statistics

	Average value	Trend	Standard deviation	Dispersion	Range	Minimum	Maximum
I think I would often use such system of education.	,741		,1298	,276			
I find the system too complex.	,222		,086	,179			
I thought the web-based learning system was easy to use.	,185		,7863	,618			
I think I need technical support to be able to use this system.	,815		,0391	,08			
I revealed that various functions in the system were well integrated.	,926		,8738	,764			
I think there are too many inconsistencies in this system.	,556		,1875	,41			
I believe that most people would learn to use this system very quickly.	,037		,126	,268			
The system is very inconvenient to use.	,111		,1875	,41			
I felt very confident using the system.	,037		,854	,729			
I had to learn a lot before I could start working with this system.	,259		,0952	,199			

Source: author's research

The highest scores have been given to the following characteristics of the Usability distance learning platform, namely: frequency of use (average 2,741, trend 4), ease of use (average 3,185, trend 3), good integration of different functions (average 2,926, trend 3), speed of platform's use (average 3,037, trend 4), confidence in use (average 3,037, trend 3).

The results of the level of satisfaction with the use of the distance learning platform indicate that in general students agree to some extent or fully agree with the effectiveness of the platform in education process (Table 4).

Table 4. User Satisfaction Questionnaire Rating

	Average value	Trend	Standard deviation	Dispersion	Range	Minimum	Maximum
Learning (training) objectives in the system were clear.	,667	,0	,3301	,769	,0	,0	,0
The training was well organized.	,630	,0	,1815	,396	,0	,0	,0

The material was presented in an interesting manner. I easily figured out where to find the material.	,296	,0	,3816	,909	,0	,0	,0	
There were enough examples, videos and illustrations.	,222	,0[a]	,3397	,795	,0	,0	,0	
Concepts (ideas, materials) were clearly presented and understood.	,519	,0	,2518	,567	,0	,0	,0	
Training duration was appropriate.	,444	,0	,2506	,564	,0	,0	,0	
Learning expanded my knowledge and skills.	,444	,0	,3681	,872	,0	,0	,0	
I feel able to apply the material in my future work.	,444	,0	,3681	,872	,0	,0	,0	
Online learning, a learning platform is as effective as traditional learning methods, helping me learn material.	,185	,0[a]	,3312	,772	,0	,0	,0	
In general, I was pleased with the training and will recommend it to others.	,407	,0	,4481	,097	,0	,0	,0	

[a] There are several modal meanings. The lowest value is shown

Source: author's research

The effectiveness of the Moodle platform is determined by numerous factors: clear learning objectives, organization of training, interesting form of presentation of materials and ease of orientation, the adequacy of examples, video materials, clarity of ideas and concepts, duration of training, expansion of knowledge and skills, the possibility of using materials in the future profession. In general, students are satisfied with learning through a distance learning platform, as well as with traditional methods.

The results of testing for dependence between Usability and Satisfaction (Table 5) indicate that not all variables are related.

Table 5. Chi-Quadrat-Test of Variable Independence

System Usability Scale Rating Items	User Satisfaction Questionnaire Rating Items		USQ1	USQ2	USQ3	USQ4	USQ5	USQ6	USQ7	USQ8	USQ9	USQ10	Age	Gender	Course
SUS1		c													
	hi-square		1,56	8,14	9,68	0,11	7,69	4,60	2,87	3,81	1,58	,07	,50	,56	,42
		p													
	-value		**,04***	,11	**,07****	,61	,13	,26	,38	,31	,48	,85	**,09****	,67	,59
SUS2		c													
	hi-square		,67	,70	,39	0,01	,19	1,67	1,17	,14	6,33	3,65	,70	,31	7,28
		p													
	-value		,73	,64	,67	,62	,91	,47	,52	,77	,18	,32	,87	,35	**,05***
SUS3		c													
	hi-square		2,71	4,69	3,90	9,14	6,51	2,98	4,97	0,85	5,05	6,49	,80	,82	,53
		p													
	-value		**,03***	,26	,31	**,09****	,17	**,03***	**,02***	**,05***	,24	,17	,42	,19	,79

SUS4	c hi-square	2,82	,93	3,17	,11	,39	0,80	,79	,18	6,97	0,52	,70	,34	8,13
	p -value	,38	,79	,36	,69	,75	,55	,93	,69	,15	,57	,13	,23	**,03**
SUS5	c hi-square	2,71	0,66	6,08	1,60	8,68	1,82	7,93	1,61	9,28	1,34	,46	,74	,78
	p -value	**,03***	**,00***	,19	**,04***	**,00***	**,00***	**,01***	**,00***	**,08****	**,05***	**,04***	,13	,46
SUS6	c hi-square	0,21	2,17	8,06	3,13	,60	0,18	7,79	5,29	,39	0,00	,57	,66	,09
	p -value	,60	,43	,11	,36	,65	,60	,12	,23	,67	,62	,90	,65	,63
SUS7	c hi-square	8,93	9,02	4,48	6,74	8,00	7,98	8,01	3,38	6,63	0,83	,56	,43	3,72
	p -value	**,09****	**,00***	**,02***	**,01***	,12	,12	**,01***	,34	,16	**,05***	**,06****	,14	,13
SUS8	c hi-square	3,21	6,22	4,66	7,25	6,28	0,97	7,70	3,96	6,22	5,17	,32	,86	,79
	p -value	**,03***	,18	,26	,14	**,01***	**,05***	,13	**,00***	,18	**,00***	,73	,18	,56
SUS9	c hi-square	1,56	8,14	9,68	0,11	7,69	4,60	2,87	3,81	1,58	,07	,50	,56	,42
	p -value	**,04***	,11	**,07****	,61	,13	,26	,38	,31	,48	,85	**,09****	,67	,59
SUS10	c hi-square	,80	4,90	4,14	,14	3,50	0,60	,95	6,82	2,00	3,54	,51	,45	,85
	p -value	,63	,25	,29	,69	,33	**,06****	,62	,16	,45	,33	,21	,14	,45

Source: author's research

Variables depend on the level of significance *p<0.05; **p<0.10

The connection between the desire to use the platform and the clarity of learning objectives has been revealed; interesting form of presentation of materials in the system; ease of orientation when searching for materials in the system, age of students. There is a connection between evaluating the simplicity of the platform and the clarity of learning objectives; the presence of examples, videos and illustrations; duration of study; expansion of knowledge and skills; a sense of the ability to further use the materials.

The connection has been revealed between the successful integration of platform's features and the clarity of learning objectives; successful organization of training; the presence of examples, videos and illustrations; duration of study; expansion of knowledge and skills; a sense of the ability to further use the materials. The assessment of the skills of using the platform and satisfaction indicators have been also related; inconvenience of use and assessments of clarity of learning objectives; clarity of training concepts and duration of training; a sense of the ability to further use the materials. The overall level of satisfaction with the use of the platform is related only to the duration of training.

4. Discussion

Distance learning platforms in the learning process are integrated for increasing the level of intensification and productivity. Electronic platforms support the direct learning process, although our study shows a major drawback - misunderstandings in the communication process. Interactive e-learning tools motivate students (Benta et al., 2014), but elements such as the necessity for technical support show a number of problems. Benta et al. (2015) pointed out rightly that distance learning platforms are a way to support teachers and students in motivating them to do their

homework and attend classes. Motivation to acquire skills, knowledge and abilities in the learning process remains a problematic issue. The most important personal characteristics to ensure the simplicity of the distance learning system are perception, attitude of students, cognitive abilities and self-efficacy. This determines the effectiveness of distance learning platforms. Our study confirms previous results: the necessity for information concerning the usage of the system and technical support. Students with lower levels of cognitive ability and performance had such necessity. Additional factors are the interactivity of the platform and the conditions that provide it (Moreno et al., 2016). In our study the necessity for technical support was assessed as below average. Students noted the complexity of usage and the need for additional skills and technical support. These factors are important for the effectiveness of platforms and are the first step in the success of their integration into the educational process (Barteit et al., 2020). Like other studies (Chivu et al., 2018) we confirm that the e-learning system is an advantage in learning, but still exists opportunities for improvement of technological solutions in the educational process. To increase the level of student involvement in the learning process should be one of the technological improvements (Kebble, 2017). Nowadays, the platform solves the process of automation of attendance control, homework and exchange of educational processes. This stimulates motivation to study, but internal motives still remain a little-studied issue.

5. Conclusion

Thus, E-learning, being a new form of education, which is being developed, has every chance of success among students as it facilitates the learning process. It means that learning becomes more accessible: the more people are able to get education, the more educated the society will be. Secondly, E-education allows developing educational services and improving their quality in those places where previously geographical remoteness and low population density has prevented this; however, this becomes possible only with the development of a certain infrastructure in the region (computerization, Internet connection, training of teachers to work in new conditions). Thirdly, E-learning helps reduce the cost of repetitive training programs (curricula). Needless to say that saving time for both the teacher and the student occupies a special position. The introduction of E-learning provides increased internal motivation, involvement in the learning process, the level of satisfaction with courses and training programs, recognition of homework importance, increasing interest in subjects, students' self-efficacy. Effective communication and quick response, an automatic control system are factors that contribute to the introduction of modern distance learning platforms in the educational process of HEI. Important elements of distance learning platforms' effectiveness in the educational process of HEI are: interactivity, simplicity, the speed of student-teacher interaction, flexibility of platforms.

Evaluation of the effectiveness and level of satisfaction with the implementation of distance learning platforms at higher educational institutions of Ukraine proves that the usability of the distance learning platform determines the level of students' satisfaction with its use. Efficiency of Usability platform provides high efficiency. The level of satisfaction with the use of the distance learning platform is determined by the simplicity, the level of support of the technical specialist, the integration of functions, ease of use, usage skills.

This study is limited to investigating the effectiveness of distance learning platforms on a sample of 211 students in Ukraine's territory. This makes it impossible to scale the data to other countries in drawing conclusions regarding other countries. Further investigations should focus on the experience of other countries in order to compare and take into account social-demographic, cultural characteristics in the use of distance learning.

References

Abrosimov, E. (2018). The use of cloud technologies in the framework of remote students. *Education, Management Economics: Current State and Innovation, 3,* 4-9.

Adams, S., Cummins, M., Davis, A., Freeman, A., Hall, C., & Ananthanarayanan, V. (2017). *NMC horizon report: 2017 higher education edition.* Austin, TX: The New Media Consortium.

Aldiab, A., Chowdhury, H., Kootsookos, A., Alam, F., & Allhibi, H. (2019). Utilization of learning management systems (LMSs) in higher education system: A case review for Saudi Arabia. *Energy Procedia, 160,* 731-737. https://doi.org/10.1016/j.egypro.2019.02.186

Antonelli, D., D'Addona, D. M., Maffei, A., Modrak, V., Putnik, G., Stadnicka, D., & Stylios, Ch. (2019). An open networked platform for higher education on industry 4.0. *Procedia CIRP, 79,* 706-711. https://doi.org/10.1016/j.procir.2019.02.128

Arrosagaray, M., González-Peiteado, M., Pino-Juste, M., & Rodríguez-López, B. (2019). A comparative study of Spanish adult students' attitudes to ICT in classroom, blended and distance language learning modes. *Computers & Education, 134,* 31-40. https://doi.org/10.1016/j.compedu.2019.01.016

Barteit, S., Guzek, D., Jahn, A., Bärnighausen, T., Jorge, M. M., & Neuhann F. (2020). Evaluation of e-learning for medical education in low- and middle-income countries: A systematic review. *Computers & Education, 145,* 103726. https://doi.org/10.1016/j.compedu.2019.103726

Benta, D., Bologa, G. & Dzitac I. (2014). E-learning platforms in higher education. Case study. *Procedia Computer Science, 31,* 1170-1176. https://doi.org/10.1016/j.procs.2014.05.373

Benta, D., Bologa, G., & Dzitac I. (2015). University level learning and teaching via e-learning platforms. *Procedia Computer Science, 55*, 1366-1373. https://doi.org/10.1016/j.procs.2015.07.123

Cacheiro-González, M. L. (2019). The learning platform in distance higher education: Student's perceptions. *Turkish Online Journal of Distance Education*, *20*(1), 71-95. https://doi.org/10.17718/tojde.522387

Chivu, R.-G., Turlacu, L.-M., Stoica, I., & Radu, A. V. (2018). Identifying the effectiveness of e-learning platforms among students using eye-tracking technology. *Conference: Fourth International Conference on Higher Education Advances*. https://doi.org/10.4995/HEAD18.2018.8046

Correa Gorospe, J. M., & Paredes Labra, J. (2010). E-learning platforms use and the European higher education area: Institutional policies in Spanish universities. *2010 4th International Conference on Distance Learning and Education* (pp. 178-180). San Juan, PR. https://doi.org/10.1109/ICDLE.2010.5606009

Fleaca, E., & Stanciu, R. (2019). Digital-age learning and business engineering education – A pilot study on students' e-skills. *Procedia Manufacturing, 32*, 1051-1057. https://doi.org/10.1016/j.promfg.2019.02.320

Henderson, M., Selwyn, N., & Aston, R. (2017). What works and why? Student perceptions of 'useful' digital technology in university teaching and learning. *Studies in Higher Education*, *42*(8), 1567-1579. https://doi.org/10.1080/03075079.2015.1007946

Jain, M., & Tyagi, R. (2017). Education standard can be improved by integrating. ICT in education. *International Education & Research Journal, 3*(10), 77-80. http://ierj.in/journal/index.php/ierj/article/view/1452/1383

Keane, T., Keane, W. F., & Blicblau, A. S. (2016). Beyond traditional literacy: Learning and transformative practices using ICT. *Education and Information Technologies, 21*(4), 769-781. https://doi.org.ezproxy.uned.es/10.1007/s10639-014-9353-5

Kebble, P.G. (2017). Assessing online asynchronous communication strategies designed to enhance large student cohort engagement and foster a community of learning. *Journal of Education and Training Studies, 5*(8), 92-100. https://doi.org/10.11114/jets.v5i8.2539

Kompen, R. T., Edirisingha, P., Canaleta, X., Alsina, M., & Monguet, J. M. (2019). Personal learning environments based on web 2.0 services in higher education. *Telematics and Informatics, 38*, 194-206. https://doi.org/10.1016/j.tele.2018.10.003

Leakey, J. (2011). *Evaluating computer-assisted language learning.* Bern, Switzerland: Peter Lang AG. https://doi.org/10.3726/978-3-0353-0131-1

Lytras, M., Sarirete, A., & Damiani, E. (2020). Technology-enhanced learning research in higher education: A transformative education primer. *Computers in Human Behavior, 109.* 106350. https://doi.org/10.1016/j.chb.2020.106350

Maida, J. (2020). *Global academic e-learning market 2020-2024*. Retrieved from https://www.businesswire.com/news/home/20200320005177/en/Global-Academic-E-Learning-Market-2020-2024-Increasing-E-Learning

Mikheeva, M. (2019). Educational platforms for foreign language e-learning at Russian and foreign universities. *SSRN Electronic Journal.* http://dx.doi.org/10.2139/ssrn.3350665

Moreno, V., Cavazotte, F., Cavazotte, F. & Alves, I. (2016). Explaining university students' effective use of e-learning platforms: Effective use of e-learning platforms. *British Journal of Educational Technology*, *48*(4). https://doi.org/10.1111/bjet.12469

Pino, S., Mora, C., Diaz, A., Guarnizo, P., & Jaimes, D. (2017). Improving skills in pediatric rheumatology in Colombia: A combined educational strategy supported by ILAR. *Clinical Rheumatology*, *36*(7), 1631-1635. https://doi.org/10.1007/s10067-016-3294-x

Półjanowicz, W., Latosiewicz, R., Kulesza-Brończyk, B., Piekut, K., & Terlikowski, S. J. (2011). The effectiveness of education with the use of e-learning platform at the faculty of health sciences. *Medical University of Bialystok. Studies in logic, grammar and rhetoric*, *25*(38), 159-172.

Pusponegoro, H. D., Soebadi, A., & Surya, R. (2015). Web-based versus conventional training for medical students on infant gross motor screening. *Telemedicine and E-Health*, *21*(12), 992-997. https://doi.org/10.1089/tmj.2015.0024

Subhash, S., & Cudney, E. A. (2018). Gamified learning in higher education: A systematic review of the literature, *Computers in Human Behavior, 87*, 192-206. https://doi.org/10.1016/j.chb.2018.05.028

Sysoieva, S. O., & Osadcha, K. P. (2019) The state, technology and perspectives of distance learning in higher education in Ukraine. *Information Technology and Learning Tools: Specialized Electronic Scientific Edition*, *70*(2). 271-284. https://doi.org/10.33407/itlt.v70i2.2907

Yang, G., Xiang, H., & Chun, L. (2018). Chinese as a second language teachers' cognition in teaching intercultural communicative competence. *System, 78*, 224-233. https://doi.org/10.1016/j.system.2018.09.009

Yaroshenko, T. (2019). Distance learning in higher education: Current trends. *Engineering and Educational Technologies*, *7*(4), 8-21. https://doi.org/10.30929/2307-9770.2019.07.04.01

Younie, S., & Leask, M. (2013). Implementing learning platforms in schools and universities: Lessons from England and Wales. *Technology, Pedagogy and Education, 22*(2), 247-266. https://doi.org/10.1080/1475939x.2013.802118