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Use of the Moodle Platform in Higher Education Institutions During Training Masters: Experience Under Martial Law

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Abstract: With the development of information technologies, elements of distance learning were gradually introduced into the educational process. Today in Ukraine, in the conditions of a full-scale war, distance learning is a means that helps preserve the functioning of Ukrainian universities. But at the same time, the emergency deployment of distance learning and the rapid filling of the resources of the Moodle distance platform highlighted many problems that students face during adaptation to online learning and, in particular, when using the Moodle platform. The purpose of the study was to establish the advantages and disadvantages of distance learning in universities of Ukraine. To conduct the research, a questionnaire was developed, which contained three main blocks of questions: experience with the Moodle platform, advantages of the platform, problems that arose during use. 237 full-time master's students at the economic, medical, economic and philological faculties took part in the survey. According to the results of the survey, 64.14% of girls took part in the survey. 30% are students of the Faculty of Economics and 17% are students of the Faculty of Philology. When asked about adaptation, 50% of students answered positively. 56% of respondents answered that Moodle is the main source of information for them



when preparing for practical classes. 45% answered that their knowledge did not change, 25% indicated that their knowledge improved. Main advantages of distance learning as the ability to study from home, not to spend time getting to the university, but among the disadvantages, it was noted that many students feel lack social contacts. Distance learning, as a result of technical progress, has quite reliably entered education and has proven itself on the positive side, but it has created certain problems that will require solutions.

Keywords: distance learning, e- learning, Moodle, face-to-face learning.

Introduction

The use of modern technologies has long become an integral part of the learning process. All participants of the educational process use Internet resources to search for information, which reduces the time spent visiting the library, makes information more accessible and provides it in a larger volume. Since 2002, electronic resources have been introduced into the educational process of many universities (Gamage et al., 2022). The Moodle platform gained the most popularity. E-learning was not intended to replace the traditional form of face-to-face learning, but was only an addition to traditional learning. A well-designed online course in combination with a traditional form can significantly improve the learning of the material (Wang et al., 2023). Moodle resources serve as a source of information, and the teacher can pay more attention to the consideration of problematic issues and discussion during classroom classes. An important point in education is taking into account the psychotypes of students. Introverts and extroverts reveal themselves in different ways during face-to-face learning. Introverts may feel discomfort in front of the audience, which prevents them from revealing themselves to the full extent and will create a false opinion of the student's knowledge in the teacher. And the electronic system can help such students convey their knowledge (Berényi & László, 2023).

Over the past 10 years, society has faced challenges not only in health care (Covid 19 pandemic), but also a full-scale war in Ukraine. It was a real challenge for educators (Bozkurt & Sharma, 2020). It is important to understand that the educational process should be continuous and waiting for the end of the pandemic, which lasted for 2 years, was inappropriate (Nuryani et al., 2022). It was then that the Moodle platform, which was just a source of additional information and training, became the leading source in the transition to distance learning in the conditions of the Covid pandemic and in the conditions of war. Recently, distance learning has become commonplace (Murillo et al., 2019).

The 2019-2021 Covid pandemic demonstrated that higher education institutions will be able to continue their educational activities only by implementing distance learning as a backup learning method during situations when physical contact is dangerous, or as in the conditions of the realities of today's Ukraine, when physical presence can be life-threatening. Universities with a rich history and a large volume of scientific assets must be preserved. Distance learning is an alternative, but in order for learning to be effective and the teacher's role to be visible and his presence to be felt at a distance, Moodle distance platforms must be filled with informative, meaningful content (Gamage et al., 2022; Wang et al., 2023).

The mode of joint interaction of the educational group using the Moodle distance learning server makes it possible to improve the educational process. Evaluation of the effectiveness of



the educational process is possible through continuous monitoring (Murillo et al., 2019). Pedagogical assessment can be summative and formative. Formative assessment is carried out constantly during the course of study, when the tutor or teacher offers to fill out a questionnaire about the quality of the educational process. Summative evaluation is conducted at the end of the course and gives the opportunity to develop new courses taking into account mistakes and shortcomings (Yoshioka-Maeda et al., 2019).

Research Problem

The use of distance learning in the conditions of martial law has become a guarantee of continuous learning. But the implementation of this form of education at the university has its own characteristics among different fields of science. The Moodle platform has gained the most popularity for distance learning and has features that can significantly affect the effectiveness of the educational process. Despite the positive experience of using the distance learning platform, there are still some difficulties when using Moodle that require a response from tutors and IT specialists.

It is important to constantly improve the course, which can be improved by surveying students about the organization of the educational process of those registered for one or another course. The growing interest in distance learning and the growing number of participants in this form of education require studying this issue today. Clarifying the advantages and disadvantages of distance learning among the process participants will reveal problem areas in education and give an opportunity to correct them. Conducting this research will be another step in helping academics develop strategies to improve distance learning.

Research Focus

In the conducted research, it is necessary to find out what are the features of distance learning in different fields of orientation: medical, philological, technical, and how distance learning affected the level of knowledge of students of these faculties.

Research Aim and Research Questions

The purpose of the study was to conduct a qualitative and quantitative assessment of the effectiveness of distance learning on the Moodle platform under the conditions of martial law in Ukraine.

Literature Review

The literature review was carried out in three main directions: the first direction contains general information about distance learning and the Moodle platform as an auxiliary learning tool. The next question is what advantages distance learning with the Moodle platform gives students. And the third direction highlights problematic issues when working on the Moodle distance learning server (Rivers, 2021).

According to the results of the 2015–2020 research, the Moodle program became the most popular for e-learning. The program offers many active courses that are available in many languages. The number of Moodle users has been growing steadily since 2015 and amounted to 294 million users in 2021. The platform has a convenient interface and allows you to add a



resource: text file, video material; and also create activities in the form of online workbooks, tests, online tasks, surveys (Gamage et al., 2022; Yoshioka-Maeda et al., 2019).

The Moodle system was developed with the aim of active learning and the possibility of interaction of all participants in the process. The system allows you to divide a complex course into modules, which is basically implied in the very name of the system. The Moodle platform is accessible to students 24 hours a day from anywhere in the world (Aflalo et al., 2020).

The Moodle system is a dynamic educational environment, the purpose of which is to store methodological information, educational materials in the form of Word or PDF files, MP4 files, etc. A characteristic feature of the Moodle system is that the content of the web resource and its design are not subject to general rules of unification. Moderators of Moodle have the right to fill the resource with material, the expediency of which is determined by the institution of higher education, that is, the persons responsible for Moodle can independently decide how to design the web resource (Bozkurt & Sharma, 2020; Wang et al., 2023).

This system allows you to teach the complete material, which gives the student the opportunity to comprehensively prepare for classes, and provides tools for monitoring the quality of the mastered material (Kharchenko et al., 2021).

An important point for successful work in Moodle is the skills of the tutor (teacher) of the course, as the tutor fills in all the necessary information for the course. Students' acquisition of knowledge begins before face-to-face classes, and the quality of completed Moodle depends on the teacher's competence (Kharchenko et al., 2021).

Researchers found that the Moodle platform as an auxiliary distance learning tool improves students' academic performance, but similar studies conducted among medical and biology students found a slight difference in academic performance with online and traditional learning. In the review analysis, Gianoni-Capenakas et al. (2019) indicates that distance learning enables the student to learn the material at his own pace, which is definitely a positive side of online learning.

Gianoni-Capenakas et al. (2019) in their studies point to the improvement of motivation and cooperation between the participants of the educational process.

On the other hand, information in Moodle can be in a large volume, which overloads the student and causes cognitive overload, which reduces (Aflalo et al., 2020; Kharchenko et al., 2021).

For extroverts, online learning in Moodle can be a challenge, as there is an important social presence of other participants in the process. Neuroticism may develop, which may indirectly affect academic performance, but there is no evidence of this. Researchers indicate that personal qualities influence the perception of Moodle (Gianoni-Capenakas et al., 2019).

Despite the fact that distance education using the Moodle platform has received mostly favorable evaluations from both teachers and students in terms of improving the quality of education and the ability to independently control the time spent on preparation, there are a number of shortcomings that require more detailed consideration (Rivers, 2021). Unstable Internet connection and technical limitations in some regions are relevant in wartime conditions



(Gamage et al., 2022). Martial law creates a certain stress, and the isolation of students from the team can cause depression and impair learning results (De Medio et al., 2020). It is very important to provide high-quality content, which does not always meet the requirements of students, which forces the student to turn to other information servers.

Materials and Methods

This study used a qualitative approach to assess ease of use, availability of materials and organization of the educational process. The research was conducted in two stages. At the first stage, a questionnaire was developed, which included three main blocks of questions with 5 questions in each block: experience of working with the Moodle platform, advantages of the platform, problems encountered during use. Data was collected using a questionnaire. At the second stage, the received data were analyzed and interpreted.

Sample and Participants

237 full-time master's students from four universities of Ukraine: medical, national university: economic, philological and information technology faculty completed a voluntary anonymous online survey in the Moodle system. According to the results of the questionnaire, 152 females and 85 males aged 18 to 25 took part in it.

Instruments and Procedures

For formative assessment, we used a qualitative method. The qualitative method contained many open questions, which made it possible to assess the quality of education of students at the medical, philological, economic, and information technology faculties.

Students were asked to answer 15 questions of the questionnaire, which consisted of the following blocks: experience with the Moodle platform, advantages of the platform, problems that arose during use.

Data Analysis

The validity of the test was determined using a qualitative approach using expert panel evaluation, followed by a quantitative approach using a content validity index (CVI). The CVI measures the proportion or percentage of judges who agree with certain aspects of an instrument and its items. This method consists of a four-point Likert scale, where: 1 = non-equivalent item; 2 = the item needs to be carefully reviewed so that equivalence can be assessed; 3 = equivalent product requiring minor adjustments; and 4 = fully equivalent subject. The consistency index in the expert group should be at least 0.80, and preferably more than 0.90 (Souza et al., 2017).

Results

According to the results of the questionnaire, more girls took part (Fig. 1). The distribution of students by faculty was as follows: the largest number of students who took part in the survey studied at the Faculty of Economics (38%), 28% were students of the Faculty of Medicine, and the least participated in the survey were 17% students of the Faculty of Philology (Fig. 2).



Figure 1

Distribution of Students by Gender

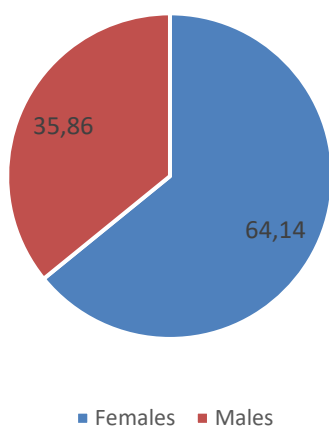
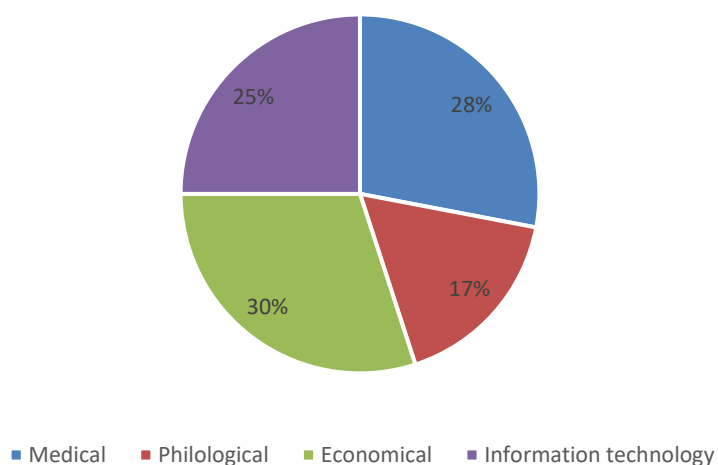


Figure 2

Faculty of the Study

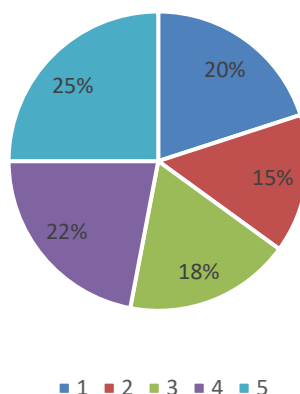


The percentage distribution by years of study showed that the largest number of Moodle users were graduate students (Fig.3).



Figure 3

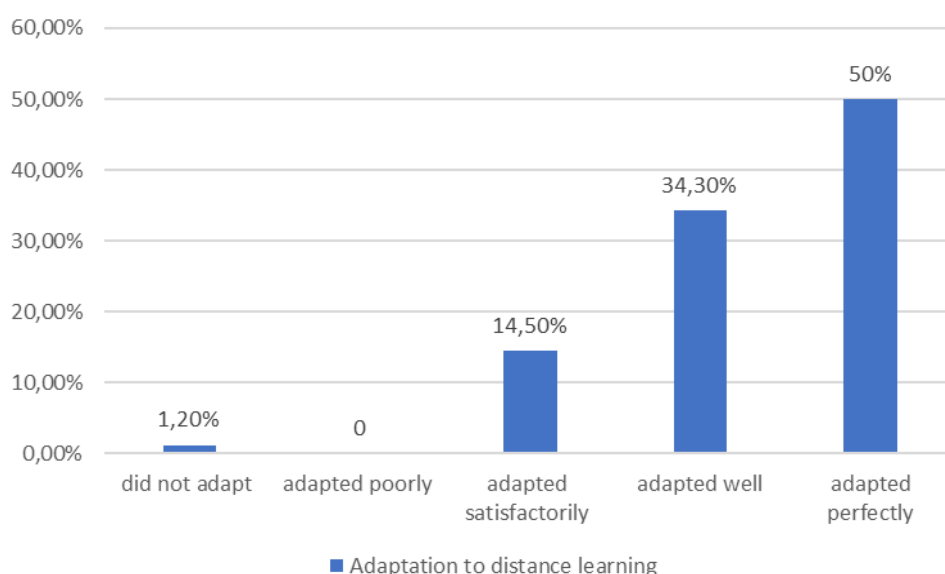
Year of Studying



According to the results of the questionnaire, 50% of master's students adapted to distance learning, and only 1.2% could not adapt to distance learning (Fig.4).

Figure 4

Adaptation to Distance Learning



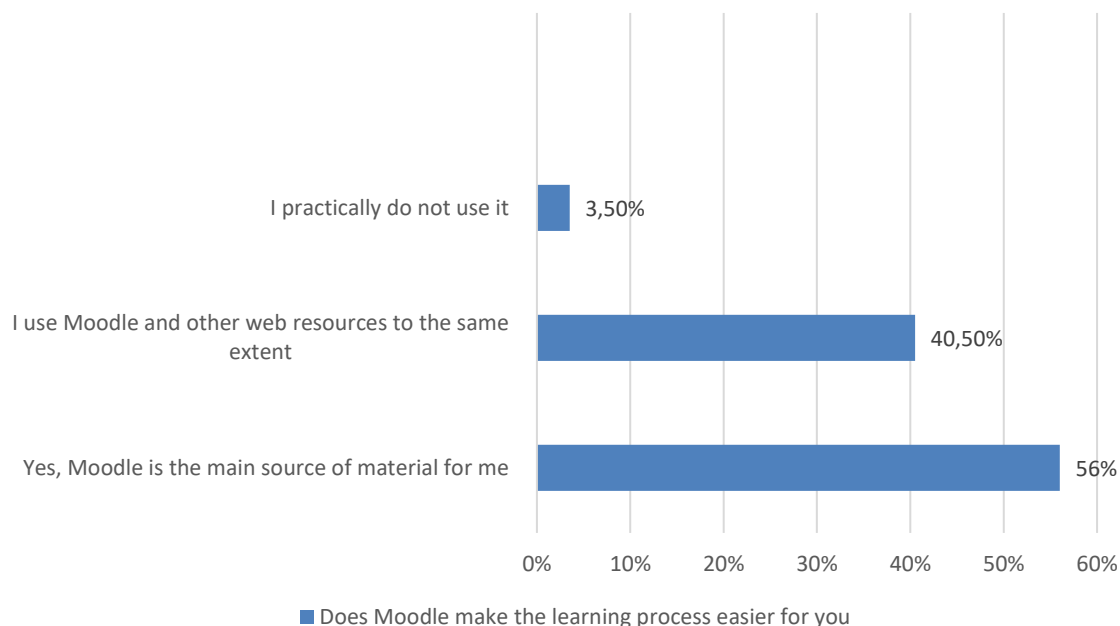
Among the respondents, 50% preferred distance learning and 20% of students would like to attend classroom classes. 30% of education seekers would like a mixed form of education, in which the lecture course and some seminar classes are held remotely and the student attends practical and laboratory classes face-to-face.

When asked whether the use of the Moodle platform facilitates the process of preparing for classes, more than 50% of respondents answered that they mainly use Moodle as a source of information. Regarding the question of whether there is feedback between teachers and students, 45% of those who took part in the survey answered that they were satisfied with the level of feedback and 5% pointed to the lack of communication, and 25% answered that they were not satisfied with the level communication during distance learning (Fig.5).



Figure 5

Does Moodle Make the Learning Process Easier for You?



When asked about students' use of visual materials (videos/images), only 32% use Moodle visual content and 38.4% prefer other thematic visual content.

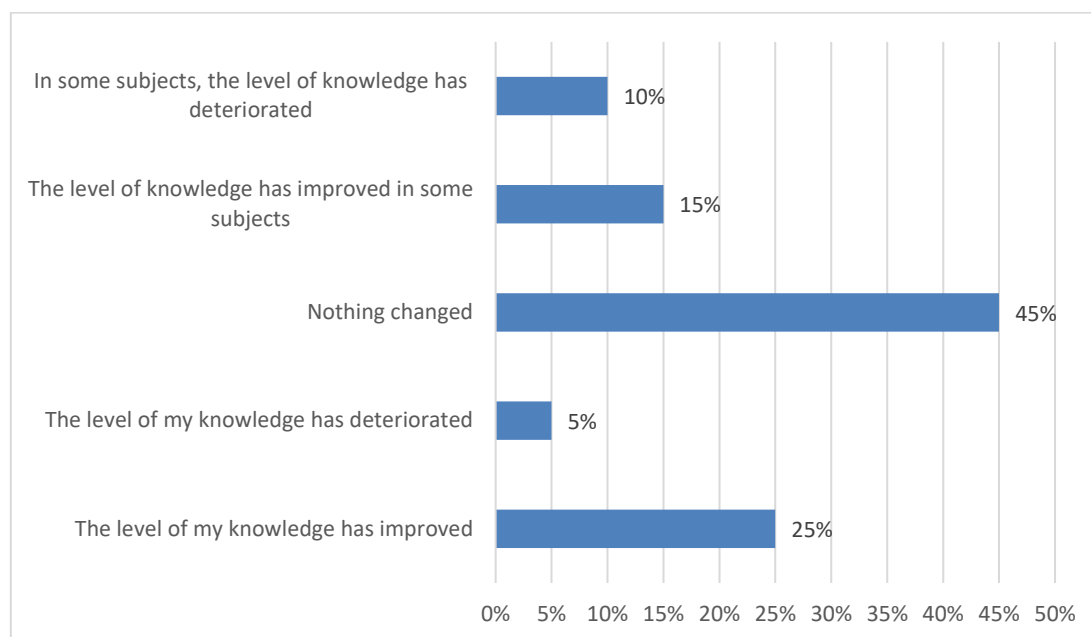
The students' answers regarding the informativeness of the lectures showed that only 32.3% of the students used the lecture material for preparation and 24% did not use the lectures at all to master the subject, 15% partially used the lecture material.

How the level of students' knowledge changed when switching to distance learning is presented in the diagram (Fig. 6).



Figure 6

How do You Assess the Level of Your Knowledge when Switching to Distance Learning?



To the questionnaire question: what exactly do you like about distance learning - 95% answered that they consider it an advantage that you can choose a convenient time for studying and study at home in comfortable conditions. 65% noted as a positive point the opportunity to independently choose the pace of learning, and 74% noted that there is an opportunity to independently determine the amount of time needed to complete tasks, 56% answered that more time and opportunities for individual communication with teachers and only 23% noted positive - interest in a new form of education.

Students consider text materials in the form of methodical recommendations and text files for preparing for classes to be the most informative. 1% of students do not use materials to prepare for classes.

When asked if there are difficulties when working on the Moodle platform, 8% noted the poor quality of work on the Internet, 45% of students noted that problems arise quite often, and 35% noted that sometimes pages take a long time to load, but not often.

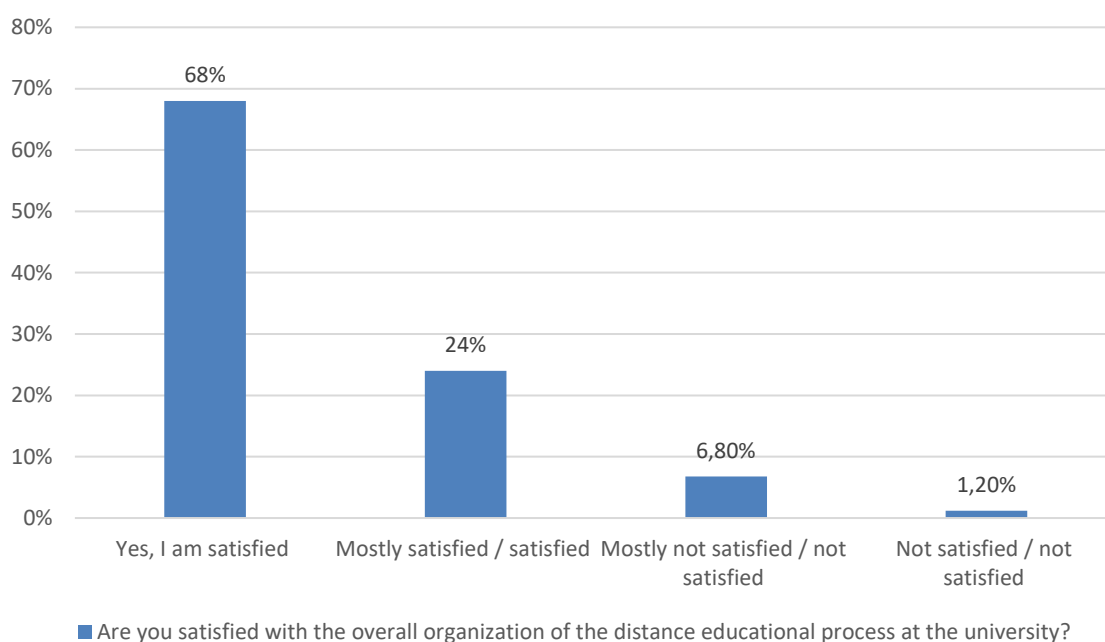
The answers to the question of what students are not comfortable with in distance learning when working with the Moodle platform were distributed as follows.

Unsatisfactory technical conditions (poor Internet connection, lack of modern gadgets) - 22%. Teachers do not follow the schedule of classes - 14%. Feedback with teachers is reduced to receiving tasks and sending answers - 43%. I feel the deterioration of the level of my own knowledge - 18%. The level of motivation to study decreased - 24%. Lack of "live" communication with teachers and peers - 79%. Unclear criteria for evaluating completed tasks - 56%. Lack of information about the results of evaluation of one's own educational achievements - 53% (Fig.7).



Figure 7

Are You Satisfied with the Overall Organization of the Distance Educational Process at the University?



Source: Author's development.

When asked whether students are generally satisfied with distance learning using the Moodle platform

Discussion

Interest in the e-learning system increased during the years of the Covid pandemic, and for Ukraine, distance learning allows solving problems related to the impossibility of physical presence in university classrooms (Kim et al., 2021).

To assess the quality of online education, certain criteria must be taken into account: the requirements of the target group, educational programs, content that is uploaded to distance learning servers, infrastructure and equipment. In the USA, a standard for online courses has been developed, which takes into account: how many students are involved in this course, the quality of the material on the distance learning servers, the availability of the course and the evaluation of the course by the participants of the educational process (Wu et al., 2020).

Moodle is an open source learning system or learning management system. In addition, it is a large number of tools that serve students to successfully master the material and also help teachers to teach the material (Al-Qaysi et al., 2020). It is a web platform with a mobile interface that allows you to access from anywhere in the world through different web browsers or devices (Byrnes et al., 2021).

According to the results of the survey, the majority of students evaluated distance learning positively - 50% adapted perfectly to distance learning, 34% adapted well and only 1% did not



adapt (Dalmina et al., 2019). Distance learning provides an opportunity to study in comfortable conditions, choose the pace of learning independently, and not waste time on the road (Kononchuk, 2022). More than 60% of the respondents approved the placement of educational materials on the Moodle platform (Rissanen & Costello, 2021). It is noted in the literature that educational institutions all over the world, when transitioning to distance learning, mainly used this platform. Its popularity increased by 250% from 2015 to 2021. The remote form using the Moodle platform expands the possibilities and allows teachers to place educational material on servers. Educational material can be in the form of text files, images, video materials (Raza et al., 2021). According to the results of surveys, it was found that the majority of students use text materials to prepare for practical classes, lectures and video materials turned out to be less informative for students. The Moodle platform provides an opportunity for interactive interaction, as it provides for student activity in the form of: tests, online tasks, work in a workbook. 43% of students noted feedback from teachers (Aljawarneh, 2020).

The Moodle system duplicates the system of division of universities into faculties and departments (De Medio et al., 2020). A first-year student is offered a login and password, with the subsequent possibility of changing the password. A student can register for an unlimited number of courses.

Despite extensive experience, distance education was developed in emergency conditions, and at that time the main task was to implement and start training students and pupils (Li et al., 2020). But today, many proposals are received from the participants of the educational process who were involved, which can improve distance learning and improve the quality of resources on the Moodle server (Dias et al., 2020).

Among the main disadvantages, students named technical failures when working with Moodle, since a large number of users can work in Moodle at the same time. Everyone needs to prepare for tomorrow. Students noted a particularly high workload on the day of testing or during the period of preparation for modules. In foreign publications, which studied the quality of training of nurses using distance learning, it was noted that Internet technology is a new form for them and participants have technical problems, or there is not enough time to study the material (Granić & Marangunić, 2019).

Other participants of the educational process during distance learning and using the Moodle system noted the difficulty in understanding the material and the impossibility of getting answers to questions in time. Students of economics, philology, and the faculty of information technologies mostly positively evaluate distance learning, students of the medical university note the impossibility of replacing practical classes in clinical disciplines with online learning (Abdula et al., 2020). Among medical universities, distance learning has always been perceived only as a temporary phenomenon, as a forced necessity (Makruf et al., 2022). Today, in the conditions of war, medical universities are forced to work in a mixed mode: practical classes in clinical disciplines are held face-to-face, and lecture classes and seminars are held online. Satisfaction with online education depends on technological support, workload, pedagogical skills and feedback (Ullrich et al., 2021).

The concept of an e-learning system is a great field for innovation. It is obvious that Moodle should be subject to constant updating, since the introduction of the latest information technologies affects most electronic media. Researchers in the electronic space see a perspective



in the development of Moodle applications for smartphones, which would significantly expand the learning opportunities of students (Gamage et al., 2022; Kim et al., 2019). An important stage in the development of the Moodle system would be to focus on maintaining the uniqueness of resources. So today, those responsible for formatting Moodle are guided by materials from the public domain: electronic textbooks and video on video - YouTube hosting (Gamage et al., 2022; Morze et al., 2021). Experts on electronic resources recognize the fact that the information should be unified and confirmed by at least several sources, but note that this way universities deprive themselves of the opportunity to publish materials that were created directly by research staff of the university department (De Medio et al., 2020).

This approach reduces the possibility of self-realization of scientists in universities and leads to the use of outdated information by students, which worsens the quality of education, creates misunderstandings among students (Asamoah et al., 2024). Memorization of false information by students will definitely not contribute to successful learning, therefore, in order to avoid such errors, constant synchronization with electronic resources of the health care system is necessary, on which new treatment protocols are published, the results of the latest research are reported at conferences of scientists, congresses of doctors, etc. (Asamoah, 2019). A large section of the Moodle is devoted to self-control of students, which is extremely important for checking the acquired knowledge. Students of medical universities should have access to test tasks in the "STEP" format. According to Moodle users, the risk of a test with a coded potentially wrong answer when using Moodle is quite high. In addition, some tests may be incorrectly formed, answers may be duplicated, which reduces the quality of this evaluation system. regarding the correctness of the answer (Wei & Chou, 2020). In addition, Moodle control is a significant problem. A team of IT specialists should work on improving the e-learning system (Beighton, 2024).

Since not all universities have powerful equipment, the question of improving the inventory component of e-learning remains open. Acquaintance of a freshman with electronic educational systems of higher medical educational institutions should be as simplified as possible (Al-Nuaimi et al., 2022). In the first year, the main theoretical subjects are. A large number of academic hours are devoted to anatomy and histology. Students need a large number of visual materials to successfully learn the basics of anatomy in primary courses (Dmello et al., 2023). Today, web resources with 3D atlases of the anatomy of the human body are especially popular, so the moderators of the Moodle need to take this fact into account (Bernacki et al., 2020). Very important is the issue of design of the department of anatomy. According to the rules of web design, visual materials must have a clearly defined place on the web page. It should be noted that quite often image files with anatomical structures are saved on the site in jpg format, which is not always convenient, as students need to spend additional time downloading files (Campbell et al., 2022). For a better memorization of anatomical structures, it is necessary to develop tasks for self-control in the form of matching matches between the image of the structure and its signature in Latin. To study the muscles and the movements that are provided with their help, animations are recommended for a better understanding of the scope of movements by students (Luo & Watts, 2023).

As for the study of the anatomy of the nervous system, students must have skills in recognizing cranial and spinal nerves, knowing their innervation areas, which is quite a difficult task if the student is in forced online learning and does not have access to anatomy classrooms or museums (Gallardo-López et al., 2022; Wang et al., 2023). The basics of neurology should be



studied with the help of interactive maps, atlases, etc. The same applies to splanchnology, the study of internal organs, the arrangement of which is rather difficult to imagine for first-year students who do not yet possess the necessary preparation skills and the ability to apply the acquired knowledge in practice (Berényi & László, 2023; Zakaria et al., 2019). The experience of evaluating senior students studying surgery in practical classes shows that a large number of students refer to methodological materials from the first year when they studied anatomy (Hempel et al., 2020). Gaps in the knowledge of future healthcare workers can be eliminated thanks to an innovative approach to presenting materials that will help develop students' imaginations and shape their clinical thinking for the future.

Improving the Moodle system for students of the Faculty of Economics is also a very important contribution to the training of future specialists. For simplified assimilation of the basics of economic theory by students, it should be presented in the form of visual diagrams. In order to avoid students memorizing methodical information without understanding it, e-learning needs to pay more attention to specific examples that confirm the laws of economic theory in practice. This can be achieved by reducing the addition of basic textbook material and focusing on solving test problems (Rissanen & Costello, 2023).

Basically, students use Moodle to download educational material, and they don't spend time listening to online lectures, but only flipping through the slides. Therefore, teachers should design many highly interactive activities (Gamage et al., 2022). The design and content of the Moodle web resource for students of philological faculties should have its own characteristics. The specificity of studying at the Faculty of Philology consists in long-term reading and analysis of literary works in their entirety, so the materials for filling the Moodle are generally text files (Li et al., 2020). However, it would be impractical to fill the Moodle exclusively with text files, since the use of this web resource involves the use of visual and audio files. Therefore, a radically new approach is needed to manage the Moodle of the Faculty of Philology. The predominance of different types of materials depends on a specific section of philology. When placing materials, for example, in the "Phonetics" section, you can use audio files of the pronunciation of sounds, words, etc. (Gamage et al., 2022).

Conclusions

Distance learning, as a result of technical progress, has quite reliably entered education and has proven itself on the positive side. Most researchers note that the introduction of remote platforms into the educational process in most cases improved the quality of students' knowledge. Experts attribute the increase in the quality of training to the fact that the student does not need to spend time looking for the necessary material, this material is concentrated on the server, in a certain course. In this case, it is the responsibility of the tutors who fill in the content on the Moodle server. In view of this, the universities should standardize the taught material. A large percentage of surveyed students feel a lack of social support, which also requires certain steps. For extroverts, this can become a problem and cause neuroses, which can affect the results of studies.

Suggestions for Future Research

Our research on the use of the Moodle platform in distance learning during martial law highlighted many issues that require further study. It is necessary to carry out a thorough analysis



of the correspondence of materials posted on the distance learning server to the educational needs of students and develop recommendations for improving educational materials. Studying under martial law creates a certain psychological pressure, so it is promising to create recommendations by teachers to support students. It is important to develop measures that will help solve the problems of Internet access with the possible development of content for low-speed Internet. One of the important issues that needs careful study is the consequences of long-term use of distance learning. IT specialists and tutors are faced with the issue of improving the distance learning server, which will improve the quality of students' knowledge and improve knowledge quality control.

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References

- Abdula, A. I., Baluta, H. A., Kozachenko, N. P., & Kassim, D. A. (2020). Peculiarities of using of the Moodle test tools in philosophy teaching. In A. E. Kiv & M. P. Shyshkina (Eds.), *Proceedings of the 7th Workshop on Cloud Technologies in Education (CTE 2019)* (Vol. 2643, pp. 306-320). CEUR Workshop Proceedings. <http://ceur-ws.org/Vol-2643/paper18.pdf>
- Aflalo, E., Montin, R., & Raviv, A. (2020). Learning outdoors or with a computer: The contribution of the learning setting to learning and to environmental perceptions. *Research in Science & Technological Education*, 38(2), 208-226. <https://doi.org/10.1080/02635143.2019.1603141>
- Aljawarneh, S. A. (2020). Reviewing and exploring innovative ubiquitous learning tools in higher education. *Journal of Computing in Higher Education*, 32(1), 57-73. <https://doi.org/10.1007/s12528-019-09207-0>
- Al-Nuaimi, M. N., Al Sawafi, O. S., Malik, S. I., & Al-Marroof, R. S. (2022). Extending the unified theory of acceptance and use of technology to investigate determinants of acceptance and adoption of learning management systems in the post-pandemic era: A structural equation modeling approach. *Interactive Learning Environments*. <https://doi.org/10.1080/10494820.2022.2127777>
- Al-Qaysi, N., Mohamad-Nordin, N., & Al-Emran, M. (2020). Employing the technology acceptance model in social media: A systematic review. *Education and Information Technologies*, 25, 4961-5002. <https://doi.org/10.1007/s10639-020-10197-1>
- Asamoah, M. K. (2019). Learner support services for postgraduate students: A qualitative approach. *E-Learning and Digital Media*, 16(5), 367-392. <https://doi.org/10.1177/2042753019860613>



- Asamoah, M. K., Kwablah, E., & Amoah, A. (2024). University learners' educational experience survey: A gender dimensional analysis. *Cogent Social Sciences*, 10(1), Article 2312654. <https://doi.org/10.1080/23311886.2024.2312654>
- Beighton, C. (2024). Trainee teachers and academic literacy: process, pedagogy and practice. *Educational Studies*. <https://doi.org/10.1080/10494820.2022.2091604>
- Berényi, L., & László, G. (2023). Lecturers' Evaluation of Moodle at the University of Public Service. In *Proceedings of the Central and Eastern European eDem and eGov Days 2023* (pp. 178-184). <https://doi.org/10.1145/3603304.3603331>
- Bernacki, M. L., Vosicka, L., & Utz, J. C. (2020). Can a brief, digital skill training intervention help undergraduates "learn to learn" and improve their STEM achievement?. *Journal of Educational Psychology*, 112(4), Article 765. <https://psycnet.apa.org/doi/10.1037/edu0000405>
- Bozkurt, A., & Sharma, R. C. (2020). Emergency remote teaching in a time of global crisis due to CoronaVirus pandemic. *Asian Journal of Distance Education*, 15(1), i-vi. <https://doi.org/10.5281/zenodo.3778083>
- Byrnes, K. G., Kiely, P. A., Dunne, C. P., McDermott, K. W., & Coffey, J. C. (2021). Communication, collaboration and contagion: "Virtualisation" of anatomy during COVID-19. *Clinical Anatomy*, 34(1), 82-89. <https://doi.org/10.1002/ca.23649>
- Campbell, L. O., Heller, S., & Pulse, L. (2022). Student-created video: An active learning approach in online environments. *Interactive Learning Environments*, 30(6), 1145-1154. <https://doi.org/10.1080/10494820.2020.1711777>
- Dalmina, L., Barbosa, J. L. V., & Vianna, H. D. (2019) A systematic mapping study of gamification models oriented to motivational characteristics. *Behaviour and Information Technology*, 38(11), 1167-1184. <https://doi.org/10.1080/0144929X.2019.1576768>
- De Medio, C., Limongelli, C., Sciarrone, F., & Temperini, M. (2020). MoodleREC: A recommendation system for creating courses using the moodle e-learning platform. *Computers in Human Behavior*, 104, Article 106168. <https://doi.org/10.1016/j.chb.2019.106168>
- Dias, S. B., Hadjileontiadou, S. J., Diniz, J., & Hadjileontiadis, L. J. (2020). DeepLMS: a deep learning predictive model for supporting online learning in the Covid-19 era. *Scientific Reports*, 10(1), Article 19888. <https://doi.org/10.1038/s41598-020-76740-9>
- Dmello, V. J., Jagannathrao, V., Rajendran, A., Bidi, S. B., Ghosh, T., Kaur, J., & Haldorai, K. (2023). Antecedents promoting e-learner's engagement behavior: Mediating effect of e-learner's intention to use behavior. *Cogent Education*, 10(2), Article 2226456. <https://doi.org/10.1080/2331186X.2023.2226456>
- Gallardo-López, N. E., Sánchez-Sánchez, M. E., Feijóo-García, G., & Caleyá, A. M. (2022). Edpuzzle versus Moodle: Learning tools in pediatric dentistry practice: A study pilot. *Healthcare*, 10(12), Article 2548. <https://doi.org/10.3390/healthcare10122548>
- Gamage, S. H. P. W., Ayres, J. R., & Behrend, M. B. (2022). A systematic review on trends in using Moodle for teaching and learning. *International journal of STEM education*, 9(1), Article 9. <https://doi.org/10.1186/s40594-021-00323-x>



- Gianoni-Capenakas, S., Lagravere, M., Pacheco-Pereira, C., & Yacyshyn, J. (2019). Effectiveness and perceptions of flipped learning model in dental education: A systematic review. *Journal of Dental Education*, 83(8), 935-945. <https://doi.org/10.21815/JDE.019.109>
- Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. *British Journal of Educational Technology*, 50(5), 2572-2593. <https://doi.org/10.1111/bjet.12864>
- Hempel, B., Kiehlbaugh, K., & Blowers, P. (2020). Scalable and practical teaching practices faculty can deploy to increase retention: A faculty cookbook for increasing student success. *Education for Chemical Engineers*, 33, 45-65. <https://doi.org/10.1016/j.ece.2020.07.004>
- Kharchenko, T., Semashko, T., Dolynskiy, I., Bespala, L. V., & Ivanova, T. (2021). Use of Moodle LSM-based tests for enhancing linguistic competence of students majoring in foreign language philology. *Journal of Curriculum and Teaching*, 10(4), 67-81. <https://doi.org/10.5430/jct.v10n4p67>
- Kim, H. J., Kang, H. Y., & Kim, H. R. (2021). Development of a web-based Korean triage and acuity scale learning program for emergency department nurses. *CIN: Computers, Informatics, Nursing*, 39(11), 821-827. <https://doi.org/10.1097/CIN.0000000000000723>
- Kim, E., Park, H., & Jang, J. (2019). Development of a class model for improving creative collaboration based on the online learning system (Moodle) in Korea. *Journal of Open Innovation: Technology, Market, and Complexity*, 5(3), Article 67. <https://doi.org/10.3390/joitmc5030067>
- Kononchuk, A. (2022). The Third Age University as a Way to Implement the Active Aging Policy in Ukraine. In R. Baikady, S. Sajid, J. Przeperski, V. Nadesan, I. Rezaul, & J. Gao (Eds.), *The Palgrave handbook of global social problems*. Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-68127-2_15-1
- Li, Y., Wang, K., Xiao, Y., & Froyd, J. E. (2020). Research and trends in STEM education: A systematic review of journal publications. *International Journal of STEM Education*, 7, Article 11. <https://doi.org/10.1186/s40594-020-00207-6>
- Luo, Y., & Watts, M. (2023). Teachers' readiness to adopt smartphone-based teaching methods: Evidence from China. *Computers in the Schools*. <https://doi.org/10.1080/07380569.2023.2244493>
- Makruf, I., Rifa'i, A. A., & Triana, Y. (2022). Moodle-based online learning management in higher education. *International Journal of Instruction*, 15(1), 135-152. <https://doi.org/10.29333/iji.2022.1518a>
- Morze, N., Varchenko-Trotsenko, L., Terletska, T., & Smyrnova-Trybulska, E. (2021). Implementation of adaptive learning at higher education institutions by means of Moodle LMS. *Journal of Physics: Conference Series*, 1840(1), Article 012062. <https://doi.org/10.1088/1742-6596/1840/1/012062>
- Murillo, G. R. G., Novoa-Hernández, P., & Rodríguez, R. S. (2019). Usabilidad en Moodle: un meta-análisis a partir de experiencias reportadas en WOS y Scopus. *Revista Ibérica de Sistemas e Tecnologías de Informação*, (E18), 108-121.



- Nuryani, S. N. A., Arnyana, I. B. P., Parwati, N. N., Dantes, G. R., & Juanamasta, I. G. (2022). Development of blended learning model integrated nursing leadership training using web-based in Indonesia. *Journal of Education and Health Promotion*, 11(1), Article 222. https://doi.org/10.4103/jehp.jehp_1170_21
- Raza, S. A., Qazi, W., Khan, K. A., & Salam, J. (2021). Social isolation and acceptance of the learning management system (LMS) in the time of COVID-19 pandemic: an expansion of the UTAUT model. *Journal of Educational Computing Research*, 59(2), 183-208. <https://doi.org/10.1177/0735633120960421>
- Rissanen, A., & Costello, J. M. (2021). The effectiveness of interactive online tutorials in first-year large biology course. *Journal of Applied Research in Higher Education*, 15(3), 632-649. <https://doi.org/10.1108/JARHE-09-2020-0312>
- Rissanen, A., & Costello, J. M. (2023). The effectiveness of interactive online tutorials in first-year large biology course. *Journal of Applied Research in Higher Education*, 15(3), 632-649. <https://doi.org/10.1108/JARHE-09-2020-0312>
- Rivers, D. J. (2021). The role of personality traits and online academic self-efficacy in acceptance, actual use and achievement in Moodle. *Education and Information Technologies*, 26(4), 4353-4378. <https://doi.org/10.1007/s10639-021-10478-3>
- Souza, A. C. D., Alexandre, N. M. C., & Guirardello, E. D. B. (2017). Psychometric properties in instruments evaluation of reliability and validity. *Epidemiologia e servicos de saude*, 26, 649-659. <http://dx.doi.org/10.5123/s1679-49742017000300022>
- Ullrich, D., Cope, V., & Murray, M. (2021). Common components of nurse manager development programmes: A literature review. *Journal of Nursing Management*, 29(3), 360-372. <https://doi.org/10.1111/jonm.13183>
- Wang, S., Kong, X., & Zhu, Q. (2023). E-learning software development and teaching application based on simulation technology: A case study. In *Proceedings of the 2023 6th International conference on educational technology management* (pp. 129-136). <https://doi.org/10.1145/3637907.3637965>
- Wei, H. C., & Chou, C. (2020). Online learning performance and satisfaction: Do perceptions and readiness matter?. *Distance Education*, 41(1), 48-69. <https://doi.org/10.1080/01587919.2020.1724768>
- Wu, X. V., Chi, Y., Chan, Y. S., Wang, W., Ang, E. N. K., Zhao, S., ... Devi, M. K. (2020). A web-based clinical pedagogy program to enhance registered nurse preceptors' teaching competencies-An innovative process of development and pilot program evaluation. *Nurse Education Today*, 84, Article 104215. <https://doi.org/10.1016/j.nedt.2019.104215>
- Yoshioka-Maeda, K., Shiomi, M., Katayama, T., & Hosoya, N. (2019). Impact of web-based learning for health program planning competency, knowledge and skills among mid-level public health nurses: A randomized controlled trial. *Public Health Nursing*, 36(6), 836-846. <https://doi.org/10.1111/phn.12642>
- Zakaria, N. A., Saharudin, M. S., Yusof, R., & Abidin, Z. Z. (2019). Code pocket: Development of interactive online learning of STEM's subject. *International Journal of Recent Technology and Engineering*, 8(2), 5537-5542. <https://doi.org/10.35940/ijrte.B3297.078219>