

**USE OF ELECTRONIC COURSES ON THE MOODLE PLATFORM
IN THE EDUCATIONAL PROCESS AT KHARKIV NATIONAL MEDICAL UNIVERSITY
DURING MARTIAL LAW**

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ABSTRACT

Background. The paper examines the organization of the educational process for students at Kharkiv National Medical University (KhNMU) under martial law, with a focus on the use of electronic courses. It highlights key challenges of online learning: hazardous conditions, power and internet disruptions, and the need to balance studies with work or volunteering.

Aim. To assess the attitudes of students at KhNMU toward the use of electronic courses in the learning process, as well as the effectiveness of the Moodle platform's resource base offered by the academic staff of the departments, to improve and optimize the structure of electronic courses.

Materials and Methods. The study was carried out as a private initiative of the authors, without additional funding and state registration of the scientific topic, using bibliosemantic, sociological, and systems analysis methods. The survey involved 124 students: 67 first-year, 45 third-year, and 12 fourth-year students. The study evaluated the advantages and disadvantages of learning through electronic courses, challenges encountered in using the Moodle distance learning system, and the level of knowledge acquisition during distance learning supported by the electronic courses. Statistical analysis was performed using descriptive statistics (frequency distribution analysis) with Excel 2016 (Microsoft, USA).

Research Ethics. The study was conducted in accordance with the principles of the Declaration of Helsinki of the World Medical Association (1964–2024). All respondents signed an informed consent to participate in the study.

Results. Among 124 respondents, 87.9% were in Ukraine (66.1% in eastern regions, close to the combat zone), 67.7% could join online classes, and 32.2% experienced power/internet disruptions. Most (66.1%) had experience with electronic courses, 52.4% reported no difficulties with Moodle, and 44.0% encountered no significant learning challenges. Students valued self-paced study and combining education with work or military service.

Conclusions. Electronic courses enable students to continue studying during martial law, even in frontline areas, supporting flexible, individualized learning. Given frequent power and internet disruptions, they are often the only means of maintaining educational continuity.

Keywords: *distance learning, online platforms, educational trends.*

Introduction

The COVID-19 pandemic has fundamentally transformed higher education worldwide, forcing institutions to rapidly adopt digital technologies and remote learning modalities [1; 2]. The pandemic catalyzed digital transformation in education, revealing both the potential and the limita-

tions of online learning platforms [3; 4]. As noted by Sahi P.K. et al. (2020) [1], the emergency shift to online education during COVID-19 provided critical lessons for maintaining educational continuity during crises.

A substantial body of research has examined the effectiveness of online teaching and learning. Martin F. et al. (2020) [5] conducted a systematic review of research on online teaching and learning from 2009 to 2018, identifying key trends, benefits, and challenges. Their findings demonstrated that well-designed online courses can be as effective as traditional face-to-face instruction when appropriate pedagogical approaches are employed. However, the distinction between emergen-

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cy remote teaching and planned online learning is crucial: Hodges C.B. et al. (2020) [2] emphasized that the rapid transition during COVID-19 represented a crisis response rather than thoughtfully designed online education. This distinction that remains relevant for understanding educational responses to the war in Ukraine.

The Russian invasion of Ukraine on February 24, 2022 created unprecedented challenges for the country's higher education system [6–8]. Universities were forced to suspend face-to-face instruction and transition to distance learning formats to ensure student safety and educational continuity [7]. Unlike the COVID-19 pandemic, which primarily presented health-related disruptions, the war introduced entirely new categories of challenges: active hostilities, missile attacks on civilian infrastructure, mass displacement of populations, destruction of educational facilities, and systematic attacks on energy infrastructure, causing widespread power outages [6; 8].

The impact of war on medical education in Ukraine has been particularly severe, given the critical role of medical universities in training healthcare professionals [9–11]. As Volodarets S. et al. (2022) [10] demonstrated in their study on biochemistry teaching at Ukrainian medical universities, the use of e-learning tools became essential during the COVID-19 crisis and remained vital during the war. Odintsova T.A. et al. (2022) [11] analyzed the pros and cons of remote medical education in Ukraine, identifying both opportunities and limitations of distance learning formats. König et al. (2026) [12], in their recent study, documented the use of blended online modules to sustain medical education in Ukraine during the war, confirming the viability of digital educational approaches even under extreme conditions.

Distance learning in the Ukrainian context combines synchronous and asynchronous modes of instruction supported by information and communication technologies [13; 14]. Shevchenko A.S. & Shevchenko V.V. (2023) [13] analyzed the use of synchronous and asynchronous distance learning in Ukrainian higher education institutions from 2020 onward, highlighting the adaptability of these approaches to crisis conditions. The innovative educational environment, including digital platforms such as Moodle, has been identified as a condition for developing resilience competence among future specialists [15]. Shevchenko A.S. et al. (2024) [14] examined motivational and regulatory instruments of pedagogical education, demonstrating the pedagogical value of electronic

courses for student engagement and self-directed learning.

Despite its benefits, distance learning during wartime presents numerous challenges that cannot be overlooked. These difficulties arise primarily from the broad impact of ongoing hostilities on all aspects of life [6; 7; 8]. Frequent attacks on critical infrastructure, particularly the power grid, result in widespread outages that prevent students from attending online classes in real time. The constant shelling of residential areas has triggered large-scale migration both within Ukraine and abroad, with many displaced individuals relocating to areas lacking stable internet access or the necessary resources for remote learning [7]. Some students are unable to participate in online education because they are serving in the Armed Forces of Ukraine as combat medics, or are actively engaged in volunteer work. Many students have been forced to take up jobs to support their families, as their relatives have lost employment due to the war. Even students who have found safety abroad face obstacles, including the need to take part-time jobs and attend local language courses, which limits their availability for online classes [6]. Finally, there remains an unresolved issue concerning students who remain in temporarily occupied territories but wish to continue their education at Ukrainian institutions.

These factors collectively undermine the effectiveness and inclusivity of distance learning during wartime conditions. As noted by Dost S. et al. (2020) [16], medical students' perceptions of online teaching are significantly influenced by their learning environment and the support they receive. Their national survey of 2721 UK medical students during the COVID-19 pandemic demonstrated that, while online learning was generally acceptable, students expressed concerns about the development of practical skills and the quality of interaction with instructors.

In response to these challenges, institutions of higher education in Ukraine have increasingly turned to online courses to maintain educational continuity [7; 9]. Electronic courses comprise structured content that includes lectures, practical sessions, and independent work, aligned with the educational program. They offer extensive opportunities for interactive learning, which is particularly valuable in medical education [17; 18]. The Moodle platform, as a learning management system, has been widely adopted in Ukrainian universities due to its flexibility, accessibility, and robust feature set [17; 19; 20].

Reis L.O. et al. (2015) [18] provided empirical evidence of Moodle's effectiveness in medical education, by comparing an online urology course delivered via Moodle with traditional didactic lectures. Their findings demonstrated that Moodle-based instruction achieved comparable or superior learning outcomes, supporting the use of this platform for medical training. Bordazan N. (2022) [17] further confirmed the viability of Moodle-based learning management systems in medical education during emergencies. Liaw S.S. (2021) [19] investigated students' satisfaction and behavioral intentions to use Moodle e-learning systems, identifying key factors that influence acceptance and engagement with the platform. Fawaz M. & Samaha A. (2021) [20] examined e-learning satisfaction and challenges among nursing students, highlighting the importance of user-friendly interfaces and adequate support systems.

The use of electronic courses in medical education is particularly critical because graduates of medical institutions not only become practicing physicians but also serve as frontline responders in the most challenging situations [10; 11]. The urgent need to develop effective approaches to continuing medical education stems from their irreplaceable role in the healthcare system, which is especially strained during wartime [9; 12].

The competency-based approach in Ukrainian higher education standards emphasizes the formation of program learning outcomes through various educational tools, including digital resources [21]. Shevchenko A.S. et al. (2024) [21] analyzed the definition, content, and requirements for competency formation levels, highlighting the importance of flexible learning environments. Additionally, the concept of individual educational trajectory has been proposed as a mechanism for student adaptation to changing educational conditions, which electronic courses can effectively support [22]. Shevchenko A. & Zhoga R. (2023) [22] explored how individualized learning paths enhance adaptability, an essential feature for students facing disruptions due to war.

Aim of study was to assess the attitudes of students at Kharkiv National Medical University toward the use of electronic courses in the learning process, as well as the effectiveness of the Moodle platform's resource base offered by the academic staff of the departments to improve and optimize the structure of electronic courses.

Materials and Methods

The study was carried out using bibliosemantic, sociological, and system analysis methods.

Within the framework of the bibliosemantic method, scientific sources from 2015 to 2025 were selected in Google Scholar and PubMed using the following keywords: *distance learning, online learning, Moodle, medical education, COVID-19, war, martial law, and Ukraine*. The selection focused on publications addressing distance learning in crisis conditions, the use of learning management systems in medical education, and the experience of Ukrainian universities during the pandemic and war.

Within the framework of the sociological method, a cross-sectional survey was conducted in May 2025, using Google Forms, to anonymously survey 124 students of Kharkiv National Medical University: 67 first-year, 45 third-year, and 12 fourth-year students. The average age of the respondents was 21 years (range: 17–25 years), and 77.3% were females.

The questionnaire included 17 items with multiple response options, allowing participants to select one or more answers per question.

The first block of questions focused on demographic information, including respondents' age, gender, academic year, and place of residence.

The second block addressed challenges related to access to electricity and the Internet in the respondents' current location. It also explored whether students had to balance their studies with work, volunteer activities, or military service as combat medics.

Several questions assessed the shortcomings and challenges students faced while studying through electronic courses. Respondents were asked whether they encountered difficulties in mastering the Moodle distance learning system, how they assessed the quality of knowledge acquisition during distance learning, and which technical devices they most frequently used to access the Moodle platform. The final block of questions addressed suggestions for improving the university's distance learning system, particularly the structure and effectiveness of electronic courses.

System analysis was used to integrate and interpret the findings from the bibliographic review and survey data.

System analysis also helped to reveal the interdependencies between various factors affecting students' learning experience.

Research Ethics

The study was conducted in accordance with the principles of the Declaration of Helsinki of the World Medical Association (1964–2024) and the Order of the Ministry of Health of Ukraine No.690

dated September 23, 2009. All participants were informed about the purpose of the study and provided electronic informed consent before completing the questionnaire. The survey was anonymous, and all data were processed confidentially.

Results

Of the 124 respondents, 87.9% were currently in Ukraine and 12.1% abroad. Among those in Ukraine, 66.1% were in the eastern regions, 10.5% in the western regions, 12.1% in the central regions, 6.5% in the northern regions, and 4.8% in the southern regions (Fig. 1).

The analysis of the questionnaires revealed that 66.9% of respondents reported that their location was close to the combat zone, 28.1% reported that it was not, and 5.0% reported that they were in the frontline zone.

In response to the question about the possibility of joining online classes, 67.7% of students indicated that they almost always have this opportunity (Fig. 2). In contrast, 32.2% reported difficulties due to power outages and unstable internet connectivity following enemy attacks on energy infrastructure. Additionally, many of them are forced to miss lectures and practical classes due to the frequent threat of shelling.

Regarding the devices used to access the Moodle platform, 58.1% of students use a laptop, 24.0% a smartphone, 8.9% a tablet, and 9.0% a computer (Fig. 3).

When asked whether they had ever studied using electronic courses, 66.1% of students responded affirmatively, while 33.9% answered negatively (Fig. 4).

Regarding difficulties in mastering the Moodle platform, 52.4% of respondents reported no problems, 46.8% reported minor problems, and 0.8% reported significant problems (Fig. 5).

Analysis of work and study balance revealed that 28.4% of respondents reported having to work to help their families cope with financial difficulties due to forced relocation and loss of parents' permanent income, 51.6% did not work, and 20.0% were currently looking for work. Among the respondents, 16.1% noted that they could not combine work and study without harming their studies, while 8.9% noted that they had to combine study and work – that is, be at their workplace (hospitals, donor centers, ambulances, etc.) and simultaneously attend a lecture or practical session, which impacted the quality of their learning, as they were forced to miss classes.

If you are in Ukraine, please indicate which regions you are in from

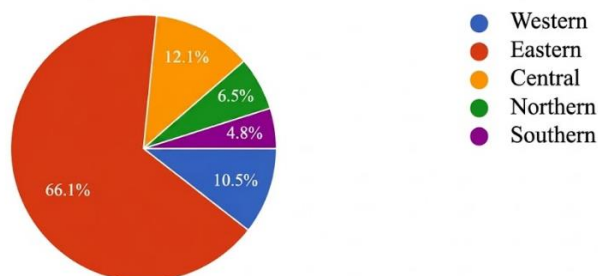


Fig. 1. Distribution of students based on their current location.

Do you have regular access to participate in online classes?

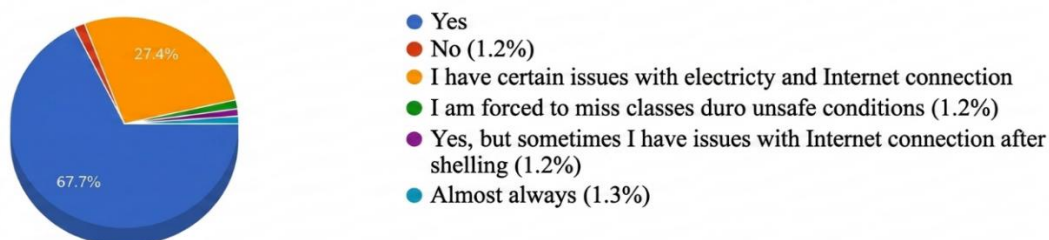


Fig. 2. Distribution of responses concerning the ability to participate in online learning.

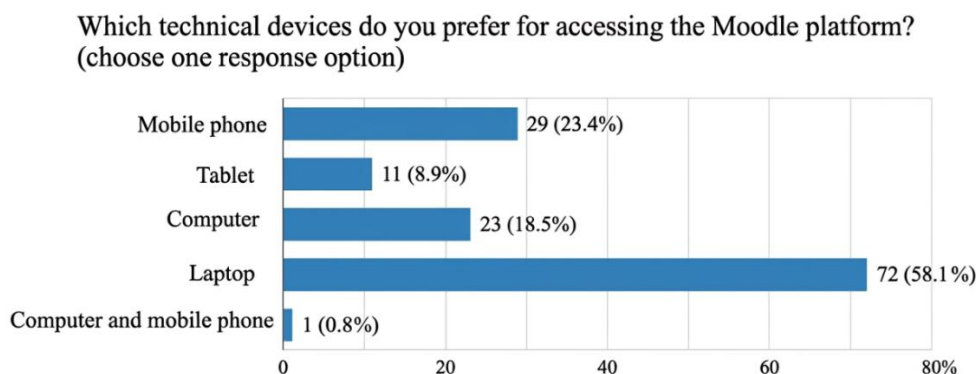


Fig. 3. Distribution of students' preferred technical devices for accessing the Moodle platform.

Did you use electronic courses during your study?

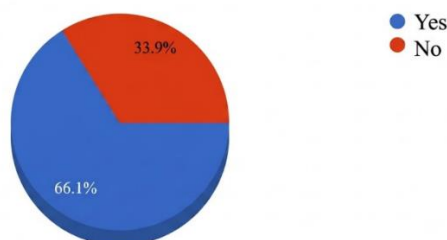


Fig. 4. Distribution of students based on their experience with electronic courses.

Did you encounter any problems when mastering the Moodle platform?
(choose one response option)

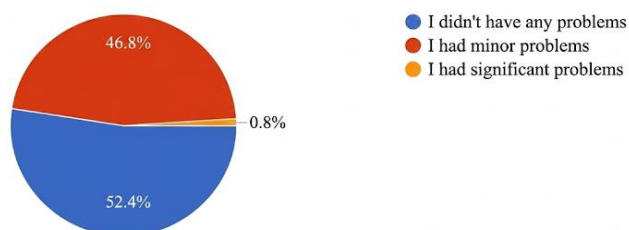


Fig. 5. Distribution of students' reported difficulties in mastering the Moodle platform.

Regarding their experience with electronic courses, respondents' answers were distributed as follows: 35.0% stated that they liked it because they could study anytime and from any place; 10.3% appreciated the convenience of studying at their preferred time without needing to make up missed classes; 8.1% valued the ability to study at their own pace; 4.8% noted that they did not have to choose between work and study; 7.3% indicated that they could study whenever they had access to

electricity and an internet connection; 1.6% mentioned the possibility of combining volunteer work with their studies; and 4.0% expressed a preference for live online classes with a teacher instead, indicating they did not like electronic courses.

Regarding difficulties encountered while studying via electronic courses, students reported the following: 50.0% experienced no significant difficulties; 8.0% had problems organizing their study schedule; 11.3% found navigating the system chal-

lenging; 10.0% noted a lack of necessary educational materials; 10.5% expressed reluctance to study independently; 8.1% cited time constraints in completing tasks; 6.5% felt there was insufficient support from instructors; and 1.6% were concerned about the lack of transparency in assessment (Fig. 6).

The quality of knowledge acquisition during distance learning was evaluated by students using a five-point scale, where 1 represented the lowest and 5 the highest level of satisfaction. According to the results, 27.4% rated their experience 5, 40.3% rated it 4, 29.0% rated it 3, 2.4% rated it 2, and only 0.8% rated it 1.

It is important to note that 100% of respondents reported encountering no problems while completing tasks in the distance learning system, including those within electronic courses. This finding specifically concerns the technical usability of the Moodle platform and task submission functionality, rather than the broader challenges associated with power outages and connectivity disruptions reported elsewhere in the survey.

Discussion

The findings of this study provide valuable insights into the use of electronic courses on the Moodle platform at Kharkiv National Medical University during martial law. The results demonstrate both the potential and the limitations of digital learning approaches in extreme crisis conditions.

The transition to distance learning in Ukraine during wartime presents similarities to the emergency remote teaching implemented during the COVID-19 pandemic, but with important distinctions. As Hodges C.B. et al. (2020) [2] emphasized, emergency remote teaching is fundamentally different from planned online learning. The Ukrainian experience during war represents a more extreme form of educational disruption, where not only educational institutions but also critical infrastructure, energy systems, and basic living conditions are under constant threat.

The challenges faced by Ukrainian students – power outages, internet disruptions, displacement, and direct exposure to hostilities – are more severe than those typically encountered during pandemics or natural disasters [6; 7]. Dost S. et al. (2020) [16] found that UK medical students' primary concerns during COVID-19 related to practical skills development and reduced interaction with instructors. In contrast, Ukrainian medical students must contend with existential threats, frequent displacement, and the challenge of studying in frontline areas or while serving in military roles.

The experience of Kharkiv National Medical University is consistent with findings from other Ukrainian institutions. Vygivska L.A. et al. (2023) [9] described the reaction of medical educational institutions in Ukraine to distance learning, identifying similar challenges related to infrastructure, motivation, and quality assurance. Their study

Which difficulties did you most often encounter during your study (electronic courses) (choose all the appropriate response options)

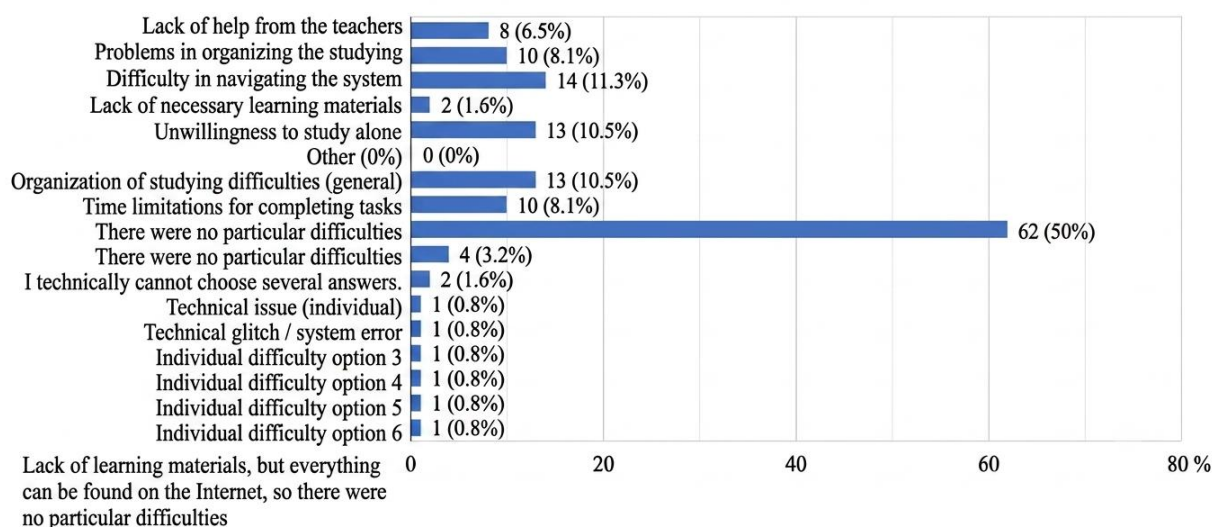


Fig. 6. Distribution of students' reported challenges during study.

confirmed that Ukrainian medical universities demonstrated significant adaptability in transitioning to digital formats, while also highlighting persistent problems with practical skills training.

Volodarets S. et al. (2022) [10] documented the use of e-learning tools in biochemistry instruction at a Ukrainian medical university, demonstrating that even highly specialized theoretical subjects could be effectively delivered via digital platforms. Their approach, which included video lectures, interactive materials, and online assessments, aligns with the structure of electronic courses at Kharkiv National Medical University.

Odintsova T.A. et al. (2022) [11] provided a balanced analysis of the pros and cons of remote medical education in Ukraine, noting that while distance learning offers flexibility and accessibility, it also presents challenges related to practical skills development and quality assurance. These findings are consistent with the present study, where students reported both advantages (flexibility, individual pace, ability to combine work and study) and difficulties (time management, navigation, lack of educational materials).

König et al. (2026) [12] documented the use of blended online modules to sustain medical education in Ukraine during the war. Their study confirmed that digital educational approaches can maintain educational continuity even under extreme conditions, while emphasizing the importance of appropriate course design and student support. The findings from Kharkiv National Medical University align with these observations, particularly regarding the critical role of electronic courses in enabling students to continue their education from frontline areas or while engaged in military service.

The experience of Ukrainian universities under martial law can be meaningfully compared with distance learning during other crises. Sahi P.K. et al. (2020) [1] analyzed medical education during the COVID-19 pandemic, emphasizing the need for rapid adoption of digital technologies and the development of new pedagogical approaches. The Ukrainian context has amplified these needs, as the war has created additional barriers to access, including physical danger and infrastructure destruction.

Treve M. (2021) [3] argued that COVID-19 accelerated digital transformation in higher education, forcing institutions to confront long-standing resistance to technological change. The war in Ukraine has similarly accelerated digital adoption, but under conditions of far greater urgency. While

Garcia-Peñalvo F.J. & Corell A. (2020) [4] described the pandemic as a catalyst for digital transformation, the war has made digital education not merely an option but, in many cases, the only means of maintaining educational continuity.

Martin F. et al. (2020) [5] systematically reviewed research on online teaching and learning from 2009 to 2018, and identified factors contributing to effective online education. Their findings emphasized the importance of course design, instructor presence, and student engagement. The present study confirms that these factors remain critical in the Ukrainian context, with students expressing appreciation for well-structured electronic courses while also identifying areas for improvement, such as better navigation and more educational materials.

The Moodle platform has proven to be a robust and flexible tool for delivering electronic courses in Ukrainian medical education [17; 18]. Reis L.O. et al. (2015) [18] demonstrated the effectiveness of Moodle-based courses in urology education, comparing them favorably with traditional didactic lectures. The present study confirms that Moodle supports a wide range of educational activities, from structured content delivery to interactive assessments.

Liaw S.S. (2021) [19] investigated students' satisfaction and behavioral intentions to use Moodle, identifying factors that influence adoption and engagement. The present study similarly found that most students were satisfied with the Moodle platform, with 52.4% reporting no problems and 46.8% reporting only minor difficulties. The high acceptance rate may reflect both the platform's usability and the necessity of distance learning under wartime conditions.

Fawaz M. & Samaha A. (2021) [20] examined e-learning satisfaction and challenges among nursing students, emphasizing the importance of user-friendly interfaces and adequate support. The present study confirms these findings, as students identified navigation challenges (11.3%) and insufficient instructor support (6.5%) as areas of concern.

However, the present study also identified significant challenges specific to the Ukrainian context. The high proportion of students working (28.4%) or serving in military roles (8.9%) highlights the competing demands that students face. The ability of electronic courses to accommodate asynchronous learning and provide anytime access is therefore particularly valuable, as it allows students to balance their academic responsibilities

with employment, volunteer work, and military service.

A notable finding of the study is the apparent contradiction between students' reports of difficulties with power outages (32.2%) and the observation that 44.0% experienced no significant difficulties, with 100.0% reporting no problems completing tasks. This requires careful interpretation. The 100.0% figure regarding task completion likely reflects the technical functionality of the Moodle platform – meaning students did not encounter issues with submitting assignments, uploading files, or navigating the system interface once they had access. This is distinct from the broader environmental challenges of attending classes, accessing materials, and maintaining connectivity in the context of war. The study clearly documents that students face significant external barriers, and the high satisfaction with electronic courses reflects appreciation that these courses allow some educational continuity even during periods of disruption, rather than indicating the absence of challenges.

The present study has several limitations. The sample is relatively small ($n=124$) and limited to a single institution, which restricts generalizability. The survey was conducted at a single time point, and longitudinal data would provide additional insights into how student perceptions evolve. The study relied on self-reported data, which may be subject to recall bias. Additionally, the unequal distribution of participants across academic years (67 first-year, 45 third-year, 12 fourth-year) limits the ability to conduct robust comparative statistical analysis between groups. Further research with larger and more balanced samples is needed to confirm these findings.

Conclusion

Electronic courses offer students the flexibility to study at their convenience, regardless of location. During the learning process, students develop research skills and elements of clinical rea-

soning while receiving access to the necessary volume of educational material. The Moodle platform provides a user-friendly, accessible resource base, that supports all types of assessment and control.

Based on the survey results, it is advisable to offer students predominantly asynchronous electronic courses that incorporate opportunities for feedback and collaborative learning, as this format best accommodates the unpredictability and constraints of wartime conditions.

The use of online courses in the educational process enables students to continue their studies during martial law in Ukraine, even in frontline areas, allowing them to combine learning with employment, volunteer activities, and service as combat medics in the Armed Forces of Ukraine. Moreover, this format supports flexible, individualized learning modes, which are essential under such challenging and unpredictable conditions. Given the dangerous environment and frequent disruptions in electricity and internet connectivity caused by ongoing enemy attacks on critical infrastructure, electronic courses are, in some cases, the only viable means of continuing education.

Prospects for Further Research

Future studies will focus on developing standardized virtual clinical simulation modules within Moodle and evaluating their effectiveness in enhancing clinical reasoning skills among senior medical students during emergency remote teaching. Additionally, research is needed to compare the experiences of students from different Ukrainian regions and different universities, as well as to evaluate the long-term outcomes of distance learning on clinical competence and professional readiness.

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Authors' Contributions

Contribution	A	B	C	D	E	F
Authors						
Zhuravel Ya.V.	+	+			+	+
Domnich V.Ye.			+	+		+

Notes: A – concept; B – design; C – data collection;

D – statistical processing and interpretation of data;

E – writing or critical editing of the article;

F – approval of the final version for publication and agreement to be responsible for all aspects of the work.

Declarations

Conflict of interest is absent.

All authors have given their consent to the publication of the article under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License and a public agreement with the publisher, to the processing and publication of their personal data.

The authors of the manuscript state that in the process of conducting research, preparing, and editing this manuscript, they did not use any generative AI tools or services to perform any of the tasks listed in the Generative AI Delegation Taxonomy (GAIDeT, 2025). All stages of work (from the development of the research concept to the final editing) were carried out without the involvement of generative artificial intelligence, exclusively by the authors.

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