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Abstract	The pandemic's impact on junior students' educational process was analyzed based on a survey conducted by the authors. The study is supplemented by an analysis of the effects of the war on learning based on open data. It is concluded that the conditions of natural disasters, which create both a pandemic and war, have caused and continue to cause significant damage to both the educational process and the psychological state of students. The ongoing online educational process is essential for continuing education and psychological support for young people throughout the educational process.

Keywords (separated by '-')	Covid-19 - COVID-19 outbreak pandemic influence - Real war conditions - War Ukraine against Russian - Education at the University - Higher education - Online learning

The Empirical Study of Pandemic and War Influence on the University Students' Education

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Abstract. The pandemic's impact on junior students' educational process was analyzed based on a survey conducted by the authors. The study is supplemented by an analysis of the effects of the war on learning based on open data. It is concluded that the conditions of natural disasters, which create both a pandemic and war, have caused and continue to cause significant damage to both the educational process and the psychological state of students. The ongoing online educational process is essential for continuing education and psychological support for young people throughout the educational process.

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1 Introduction

The entry of world civilization in a period of significant environmental challenges has led to the intensification of scientific research in this area. The announcement of the WHO pandemic and the significant restrictions caused by lockdowns has caused unprecedented challenges in the world education system; UNESCO created some recommendations supporting education in pandemic conditions [1]. Educators and scholars have been actively looking for ways to maintain an adequate level of education, ensuring equal access to educational opportunities for all population segments. Here an important role was given to the informatization of education. The transition from education to cyberspace during a pandemic has been somewhat easier in university settings, where the experience and motivation of learners are more significant than in high school. However, with the transition of the educational process to the online learning system, higher education institutions are forced to solve complex and diverse problems directly related to the technical aspects of implementing information technology and adapting online learning to the requirements and needs of modern students. All these problems have arisen now in higher education in Ukraine. The material for the study of the impact of the COVID-19 pandemic on the training of IT students was processed in early 2022. It is clear that with the beginning of the full-scale war of the Russian Federation on Ukraine on February 24, 2022, all Ukrainians, particularly teachers and students, faced

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much more significant challenges than those caused by the pandemic, and the relevance of this material decreased sharply. During the month of this war, 869 educational institutions were damaged by bombing and shelling, 83 of which were utterly destroyed as of April 1, 2022. The worst situation is in Donetsk, Kharkiv, Mykolaiv, Sumy, Kyiv, Kherson, Zhytomyr, Chernihiv regions, and the city of Kyiv, according to the Office of the Prosecutor General of Ukraine [2]. However, studies were conducted as a reference to peacetime; when there was no immediate threat to human life, the authors decided to publish this material. The following studies will be devoted to studying the impact of war conditions on students' education. The method of investigation was a direct survey using Google Form. During the inquiry, there were about 180 students in the first year of schooling at the Computer Sciences and Information Technologies Institute at Lviv Polytechnic National University. The survey took place in January 2022. The authors prepared the questions for the study due to some previous publications [3, 4]. The system approach was presented in [5, 6]. The investigation of pandemic influence is improved by new empirical research and some facts about the impact of real war conditions on the high education process in Ukraine.

2 State of Art

The analysis of recent publications shows that pandemic conditions significantly influence education in high schools worldwide. The paper [7] presented a systematic literature review of studies covering online flipped classroom (FC) approaches in higher education during the pandemic. The FC is generally defined as a strategy that reverses the traditional education setting, i.e., the information transmission component of a traditional face-to-face lecture is moved out of class time. Therefore, the FC relies on technology and is suitable for online or blended learning, the predominant form of learning during the COVID-19 pandemic (March 2020–July 2021). The authors analyzed 205 publications in total and 18 in detail. The research has shown the successful implementation of online FC during online education.

As noted in [8], the most influence was on medical students' education because of their education process. This study examined the level of satisfaction of medical students with online lectures and identified factors that affect the assimilation of material remotely. The investigation method was a survey of 114 medical students and 17 lecturers. In [9], Saudi Arabia described the situation with medical specialties students. The 1984 respondents took placed a survey from May to June 2021. Students expressed concern about the inability to study medical specialties and the lack of clinical knowledge gained through online learning. However, some motivated students have coped with these challenges.

The subsequent analysis was realized at the University of Southampton, University of Edinburgh, and University College London [10]. The study convincingly proves that the closure of schools and universities and the rules of social distancing are tough for young people because they were applied during critical periods of social and emotional development in their lives. As a result, the authors argue that young people want to be heard and felt and to play a role in responding to the crisis caused by the COVID-19 epidemic. The paper [11] found that it is optimal to maintain a physical distance of

one meter or more; face masks, respirators, and eye protection in public and medical institutions are crucial to prevent the spread of Covid-19. In the investigation [12], participants from 30 August to 30 September 2020 of 7 disciplines in all 16 higher technology colleges in the United Arab Emirates were involved. Research has shown that due to pandemic constraints, most students have a significant burden of psychological stress, which requires further preventive measures to maintain their psychological well-being. The influence of pandemic conditions was studied by Ukrainian scientists [13, 14] prognosis of the impact of pandemic conditions is presented in [18–21]. Multi-Criteria Decision Making based on an approach with the influence of pandemia is presented in [22, 23]. A brief review of the latest investigations shows that pandemic conditions significantly influence the education process in high school worldwide.

3 Investigation of Pandemic Influence

The study was conducted at Lviv Polytechnic National University (NULP). The experimental part of the work (online survey) was attended by 179 students majoring in 122 "Computer Science," mainly in the first and second year of study. The survey was conducted in Ukrainian at the end of January 2022, when students had an examination session according to NULP curricula. The survey was conducted online using Google Forms tools. It contained ten questions about the direct impact of full or partial lockdown conditions and other constraints caused by the pandemic on students' subjective perceptions of learning change.

The first survey question was: "How much has the pandemic increased the number of hours spent at the computer per day?" (Answer: Fig. 1 to 10). The most common changes are from 3 to 6 h (see Fig. 1). There are 86,6% that changes are equal or bigger than 3 h. Compared to the year before, in the authors' survey with 161 respondents, the same changes are comparable at 93,7% (see Fig. 2) [3].

We think that the result shows some adaptation of students to pandemic conditions. The correctness of this assumption is evidenced by the fact that the number of students with the maximum number of increased hours (10 h) decreased from 16,1% to 6,1%. The second question is:" Which area of your life has been most affected by the pandemic?" the answers were: study, work, family relationships, leisure, and group relationships (see Fig. 3).

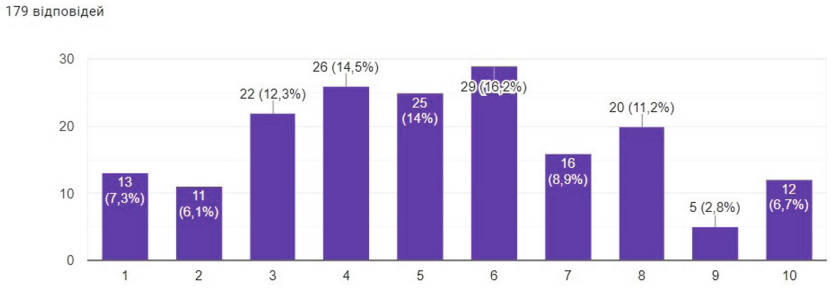

Fig. 1. Illustration of work hours changes with a computer for students during pandemia in January

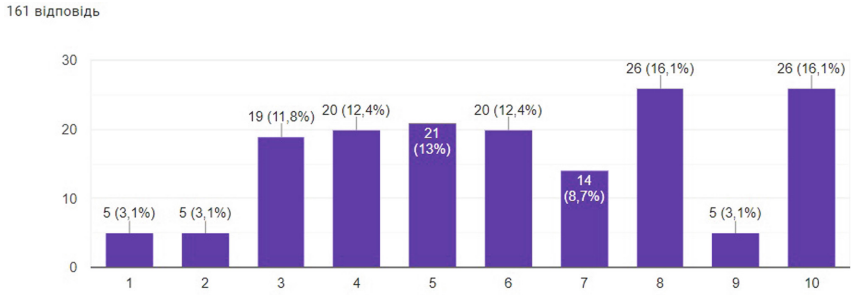

Fig. 2. Illustration of how long work hours are with computers for students after pandemia changes in January 2021 [3].

The results were: study −77,7%; leisure – 11,7%; family relationships −4,3%; group relationships −3,7%; work −2,6%. The results show the significant influence of pandemic conditions for study process for students.

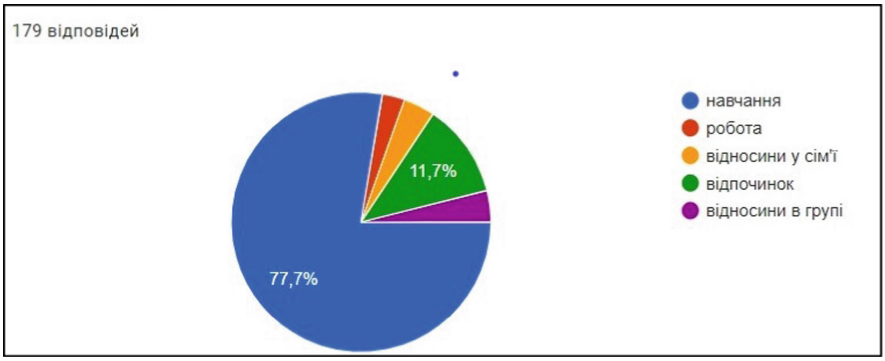

Fig. 3. Impact pandemic condition on students life area.

The third question was about vaccination: "What is your position on vaccination?" For the answer, there were three options: positive, negative, and "I don't know" (see Fig. 4). The positive responses were 57%, negative – 31,3%, and neutral – 11,7%. The answers show that there are many people in Ukrainian with antivaccination positions. So it is necessary to do a lot of explanatory work.

The fourth question was: "How many hours per day has increased your time for self-study or study material (number from 1 to 10)". The answers are presented in Fig. 5.

The maximum hours are three, and the result is better than presented in Fig. 1 because the most common changes are from 1 to 4 h. There are 60,8% that changes are equal to or bigger than 3 h.

The fifth question was about attitude to conducting an online exam. Results are presented in Fig. 6. According to the results, most students (95,6%) did not have an opposing position, and 76% had a favorable position on online controls.

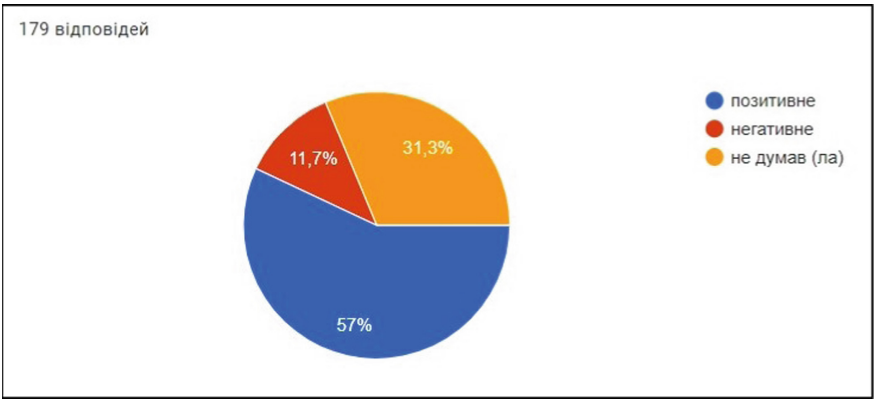

Fig. 4. Impact pandemic condition on students life area.

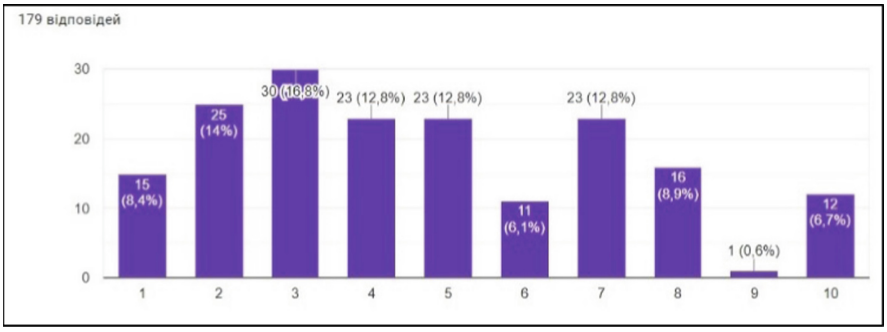

Fig. 5. Impact pandemic condition on students life area.

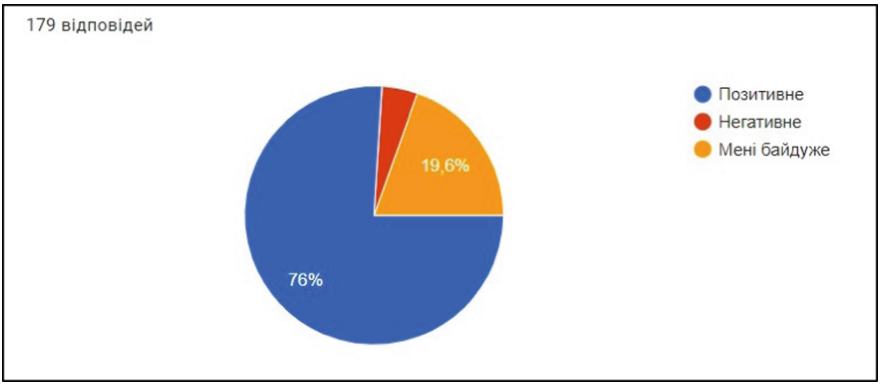

Fig. 6. Impact pandemic condition on students life area.

The sixth question was, “Has the pandemic affected streaming pages?” The goal of the question is to understand a new form of student resting during the pandemia. Results are presented in Fig. 7 and show that the time on streaming pages was increased by 34,4%.

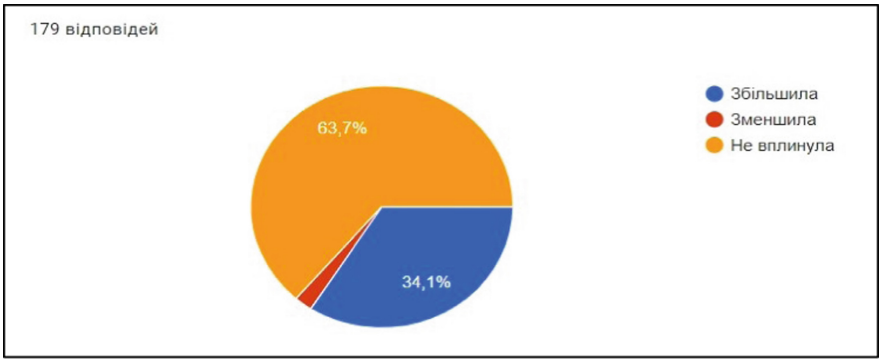

Fig. 7. Impact pandemic condition on students life area.

The seventh question: “Is there a sense of uncertainty about the future due to the pandemic?” 69,3% don’t worry about the future, but 30,7% worry due to the pandemic. The eighth question: “What is most annoying in connection with quarantine?” Proposed answers with respondents answer are: Wearing masks (40,8%); Closed cafes, bars, restaurants (16,2%); Impossibility to travel (26,8%); Unable to attend concerts, music festivals (11,2%); Closed museums 5 (2.8%); Closed cinemas 4 (2.2%). Results are presented in Fig. 8.

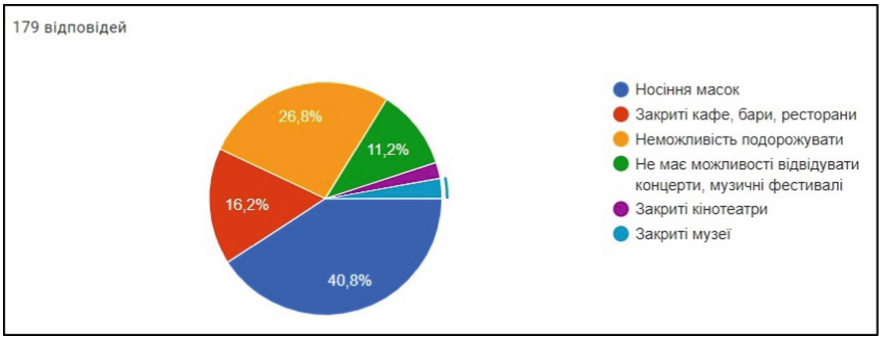

Fig. 8. Impact pandemic condition on students life area.

The mask-wearing is the most discomfort restriction in pandemic conditions. Also, things that connect with rest, vacations, and recreation are essential. For young people, especially students, the possibility of traveling is significant. The ninth question was: “Do you consider yourself sufficiently informed about methods to prevent the spread of coronavirus?” Answers visualization is presented in Fig. 9.

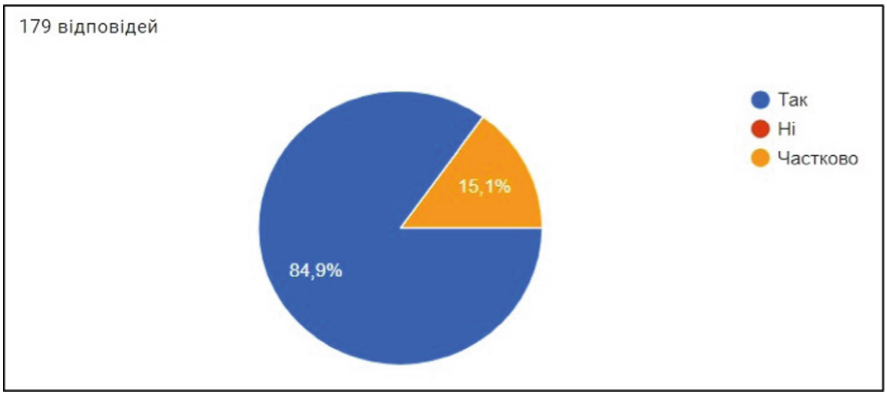

Fig. 9. Impact pandemic condition on students life area.

The answers show no students without information about the Covid-19 spread. In comparison with 2021 results the results are almost the same (yes-84,5%; no-0,6%; partially −14,9%) [3]. The tenth question was about an attitude to online learning; the results are in Fig. 10.

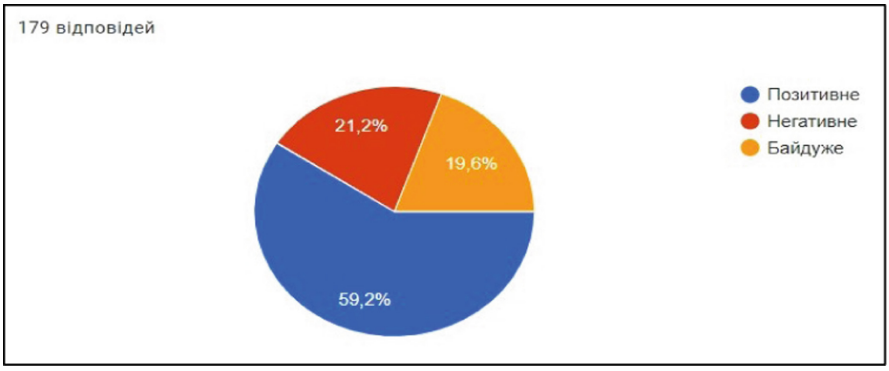

Fig. 10. Impact pandemic condition on students life area.

Most students are favorable to online education. The pandemic conditions have a significant influence on the system of high education. But students and lecturers can adopt the new requirements.

4 Real War Conditions Influence Education in Ukraine

For writing the chapter, the authors used the data from CEDAS monitoring from 24.02.2022 until 20.06.2022 actual during the natural war conditions, 1819 educational institutions were affected by bombings and shelling. One hundred and two of them

were utterly destroyed (see Table 1). According to these data, the Kharkiv region suffered the most - 50 educational institutions were destroyed there. In the Donetsk region, 309 institutions were damaged; one was destroyed; in the Sumy region, 45 institutions were damaged; in the Kyiv region - 12 institutions were destroyed; and in the capital, 76 educational institutions were damaged. The data are connected with all educational institutions, not only high education. A severe loss for the higher education system in Ukraine is the partial destruction of almost all of the best Ukrainian Universities system.

Table 1. War impact on educational buildings [17] (date 20.06.2022)

Type of educational school	Damaged	Destroyed
Professional education institutions	801	105
Institutions of professional higher education	102	10
Higher education	28	2
Total all educational types, not only higher	1819	209

Here we presented the Top 5 Ukrainian higher education institutions included in the ranking [16]; four of them are damaged, and two of them in Kharkiv are seriously damaged:

35. Taras Shevchenko National University of Kyiv;-damaged;
63. National Technical University of Ukraine «Ihor Sikorsky Kyiv Polytechnic Institute»;- damaged;
69. Karazin Kharkiv National University; - destroyed;
105. National Technical University «Kharkiv Polytechnic Institute»; - damaged;
106. Lviv Polytechnic National University – not damaged.

The destruction is not only on building the main; the worst part is defeating and destroying people, especially people with high education. The Ministry of Education and Science of Ukraine recommended stopping the educational process from 25 February in educational institutions of all levels and sending students and educators on a two-week vacation. During this time, part of the territory of Ukraine was under temporary occupation, and several towns and villages (Mariupol, Chernihiv, Sumy, Kharkiv, and others) became the scene of active hostilities. More than 10 million people have been forced to flee their homes: 12 million within the country and 6 million abroad. UNICEF reports that more than half of Ukraine's children - 4.3 million out of 7.5 - have been forced to flee their homes due to the war [16, 17]. From March 14, the educational process in areas where the security situation is allowed began to recover—decided where and in what format to conduct classes and hosted regional administrations and educational institutions. For example, according to the Rector's order, the education at Lviv Polytechnic National University started on 14.03.2022 in online mode. Internally displaced persons (IDP) are placed in vocational, professional, and higher education institutions' dormitories. Also, IDPs can work and study at universities in the Western part of Ukraine.

5 Conclusion

The study convincingly proves that despite the challenging conditions of the coronavirus pandemic, the Ukrainian higher education system has overcome these difficulties and stabilized the situation as a whole. When the fight against the consequences of the pandemic had already entered the final stage, and students and teachers had adapted to online learning, Ukraine suffered the next natural disaster, the scale of which far exceeded the previous one. However, educators withstand the enemy's aggression and continue to work in harsh conditions. Huge material and moral damage were inflicted, especially in the East, South of Ukraine, and the city of Kyiv. It is still difficult to fully assess the effects of the war on Ukraine's higher education system. This will be the subject of further research.

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Chapter 44

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