

## Statistical analysis of the impact of the blackout caused by the Russian attack on the infrastructure of Ukraine on the educational process at NTUU «KPI»

Mulyk Olena<sup>1</sup> and Tetiana Pryhalinska<sup>2</sup> and Lineana Svystun-Zolotareno<sup>3</sup>

<sup>1</sup> NTUU Igor Sikorsky Kyiv Polytechnic Institute, Ukraine  
e-mail: [mulyk.olena@gmail.com](mailto:mulyk.olena@gmail.com)

<sup>2</sup> NTUU Igor Sikorsky Kyiv Polytechnic Institute, Ukraine  
e-mail: [tania.krivorot@gmail.com](mailto:tania.krivorot@gmail.com)

<sup>3</sup> Medical Statistics Office of Kyiv Clinical Hospital of Ukrzaliznytsia No. 1, Ukraine  
e-mail: [lineana.sv@gmail.com](mailto:lineana.sv@gmail.com)

### Abstract

For three years, humanity has been living under the influence of the Covid-19 pandemic. Now, in addition to the problems related to the Covid-19 pandemic, our state has faced another extraordinary hard challenge the decision by President Vladimir Putin and all of Russia to launched a full-scale re-invasion of Ukraine a year and a half ago. It has tragically been changing of the lives of children and young people in Ukraine. Everyone knows that last year, starting from October, Russia has been targeting Ukraine's energy infrastructure with missiles and drones. Since October 10, 30% of Ukraine's power stations have been destroyed, causing massive blackouts across the country. Therefore, students had to search connection to the Internet in "points of unbreakability (Invincibility points).

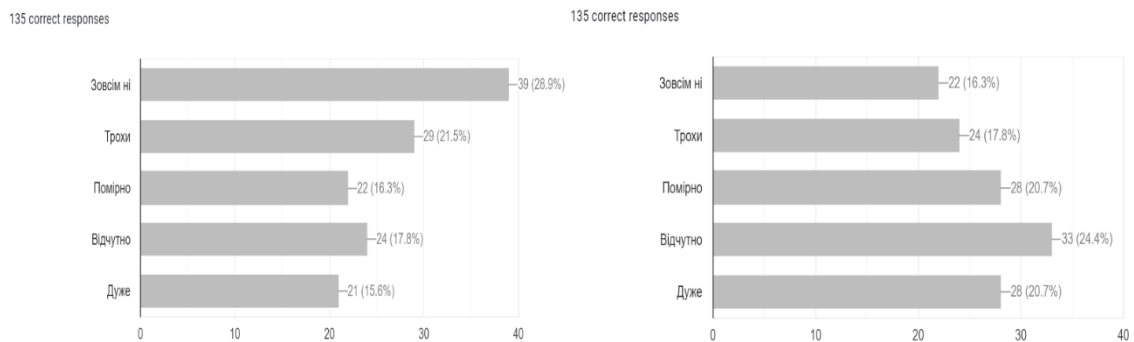
**The goal** of the work is to discuss the peculiarities of the university educational process in the conditions of war. Peculiarities and problems of teaching higher mathematics are considered in the example of our own experience in the under-bombing period in Ukraine and causing massive blackouts across the country. To consider the results of tests provided for medical engineering faculty NTUU "KPI" students about investigating the level of stress caused by a power outage affects. Find out the ability and problems of students to continue their studies under this kind of stress

**Content and methods.** Last three years distance education was continued as the main form of education, but in October 2022 it was interrupted. The teachers and students had significant tests in the use of distance education when there was a power outage. We want to investigate the level of stress caused by a power outage affects. Find out the ability and problems of students to continue their studies under this kind of stress

From the middle of October we began to observe a decline in the learning results of our students. We had seen their passivity in online classes or great anxiety and worry in behavior, they handed in their papers with great delays. They had written in personal messages that they cannot do tasks by the deadline and do not understand the material. Also, they are unable to perform practical and control tasks because they do not have access to the Internet and the electricity is turned off in their region. Because of this, we have conducted a questionnaire in order to identify the needs and problems of students during the power outage period. We meant had the goal of finding and implementing available forms of presentation and control of educational information.

As the results of the survey showed, among the interviewed students of NTUU "KPI" 20.6% were forced to go abroad. Almost 80% remained in Ukraine and had to continue their studies in the difficult conditions of the war. 64.8% of respondents admitted that the events related to Russia's military

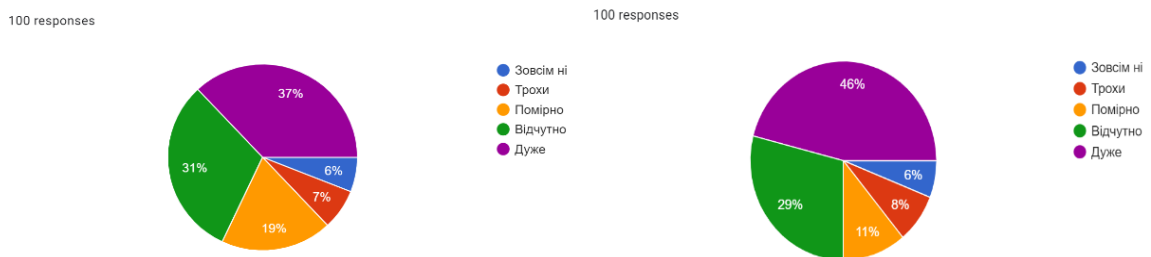
invasion of Ukraine became a significant stressful experience for them. For 27.3% of students, the war had a significant impact on their further education plans; 65.6% of the surveyed respondents noted that in connection with the Russian invasion, the educational process became "very" and "tangibly" stressful for them. Almost 60% of students felt negative emotions (fear, anger); 25% experienced problems in experiencing positive emotions (joy and love); 33% of students began to feel strong physical reactions, such as heart palpitations, difficulty breathing, sweating at the mention of the Russian invasion. 78% of students were stressed even if the power outage occurred on schedule; more than 75% of respondents had obsessive thoughts that the lights would switch off, and they wouldn't have time to complete their homework or test, or wouldn't have time to send the assignment to the teacher for review by the deadline. The lack of mobile and Internet connection became a tangible stress for 68% of surveyed students. The test results are shown in Fig. 1 and Fig. 2.



**Fig.1.** Results of answers to questions:

**Left:** Have you had strong physical reactions (palpitations, difficulty breathing, sweating) when something reminds you of the events of the Russian invasion?

**Right:** During the Russian invasion, did you experience problems in experiencing positive emotions (for example, inability to feel joy or love)?



**Fig.2.** Results of answers to questions:

**Left:** How stressful was it for you to lose contact during your studies?

**Right:** How much did the stress of the sudden blackout affect your ability to concentrate on your studies?

The remote form in the pre-war period allowed testing students of technical specialties on the Moodle platform, but it became unusable during a blackout. Therefore, we began to use Google Forms

more actively (95% of students were inclined to this form of monitoring the learning of the lesson tasks, compared to the Moodle platform). The Google form developed by the teacher can be opened at any time and, by personal agreement between the teacher and students, executed several times. This adds flexibility to the system of self-monitoring of the level of knowledge both for the student himself and for control by the teacher while maintaining the objectivity of the assessment. Google Forms has proven to be extremely effective when combining theoretical questions with practical ones. In addition, the advantage of a Google form compiled in this way is that it can be given to students several times if the result obtained was low. Repeated tasks contribute to a better understanding of the content because students are forced to review the educational material more carefully and not much stress on the student.

Also, we have been videotaping the all lessons (and continue doing) and using the YouTube network and the Telegrams channel to contact students.

In conclusion, we can say that the system of higher education should be based on the study of the state, conditions, and development of the main indicators of the field of education, the application of statistical methods allows solving this problem. The training of specialists in Ukraine must be based on a systematic approach, which is why the organization of the process of managing the training of specialists must take into account all the conditions and factors that shape this process. Therefore, to study the state and development of the higher education system in Ukraine, it is suggested to use such statistical methods as distribution analysis, expert evaluations, and factor analysis.

Since the results of student testing have shown a high level of stress, we will continue the research in more detail and adapt conclusions to the educational process in the future.

## References

Nikolaev E., Riy G., Shemelinets I. (2023) Higher education in Ukraine: changes due to the war: analytical report. *Borys Grinchenko Kyiv University*.

Кудзіновська І. П., Трофіменко В. І. Особливості викладання математичних дисциплін у закладах вищої освіти в умовах воєнного стану. *Інтернаука. Сер. : педагогічні науки*. URL: <https://www.inter-nauka.com/uploads/public/16606360462734.pdf>.

Програма великої трансформації «Освіта 4.0: український світанок». URL: <https://mon.gov.ua/storage/app/media/news/2022/12/10/Osvita-4.0.ukrayinskyy.svitanok.pdf>

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