

# Improving the quality of higher technological education by overcoming educational losses

Oksana Zazymko, Larysa Klikh and Volodymyr Nazarenko

National University of Life and Environmental Sciences of Ukraine, 15 Heroiv Oborony Str., Kyiv, 03041, Ukraine

**Abstract.** The study explores the urgent problem of educational losses in Ukraine's higher technological education system caused by the COVID-19 pandemic and the full-scale Russian invasion. These crises have disrupted academic continuity, hindered practical training, and adversely affected student performance across technological disciplines. The study is based on empirical data from the National University of Life and Environmental Sciences of Ukraine. It analyses trends in student expulsion rates, grade point averages, and academic debts over five years. The findings reveal a systemic decline in academic outcomes and emphasise the compounding impact of external disruptions and internal organisational deficiencies. To address these challenges, the article proposes a multifaceted strategy combining adaptive curriculum planning, integrating blended learning models, digital transformation, individualised academic support, and psychological services. Special attention is given to diagnostic monitoring and developing personalised educational trajectories. The proposed solutions aim not only to mitigate current losses but also to build institutional resilience and ensure the quality of education in times of crisis. The study contributes to the ongoing discourse on educational recovery and provides practical insights for academic institutions operating under extreme conditions.

**Keywords:** educational losses, technological higher education, blended learning, COVID-19 pandemic, wartime education disruption, digital transformation in education, academic performance decline

## 1. Introduction

Unprecedented challenges caused by the COVID pandemic and subsequent full-scale Russian aggression have profoundly affected Ukraine's higher education system. The quality of the educational process has become significantly more complicated, which, in turn, reduces the quality of training of highly qualified specialists, critically necessary for the stable functioning of all sectors of our country's economy. Technological personnel become even more apparent. These specialists will be key in preventing a food crisis, ensuring sustainable industrial development, and facilitating the country's post-war reconstruction.

In this context, technological education is essential and strategic in shaping the nation's future intellectual and professional potential. The problem of significant educational losses in higher education institutions due to long periods of distance learning, interruptions in the educational process, and the psychological impact of crisis phenomena has become highly relevant. This requires an in-depth analysis of the root causes of such losses, identification of their scale, the development of practical, scientifically grounded, practice-oriented ways of their prompt overcoming, and minimisation of negative consequences for the country's future growth.

ORCID: [0009-0008-2588-6756](https://orcid.org/0009-0008-2588-6756) (O. Zazymko); [0009-0003-9705-8048](https://orcid.org/0009-0003-9705-8048) (L. Klikh); [0000-0002-7433-2484](https://orcid.org/0000-0002-7433-2484) (V. Nazarenko)

Email: [zazymko\\_oks@nubip.edu.ua](mailto:zazymko_oks@nubip.edu.ua) (O. Zazymko); [lklih@nubip.edu.ua](mailto:lklih@nubip.edu.ua) (L. Klikh); [volodnz@nubip.edu.ua](mailto:volodnz@nubip.edu.ua) (V. Nazarenko)

Website: <https://nubip.edu.ua/node/142692> (V. Nazarenko)

*Educational  
Dimension*



© Copyright for this article by its authors, published by the Kryvyi Rih State Pedagogical University. This is an Open Access article distributed under the terms of the Creative Commons License Attribution 4.0 International (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## 2. Literature review

As evidenced by the analysis of recent publications related to the study of the phenomenon of “educational losses”, their authors focus on several key areas, including the formation of an assessment of the impact of crisis phenomena on the quality of knowledge acquired by higher education applicants, search for and evaluate the effectiveness of various strategies for overcoming them, and also offer innovative pedagogical approaches aimed at improving the quality of higher education in the face of educational losses.

Topuzov, Holovko and Lokshyna [12] investigates the problem of educational losses that arose due to the war and emphasises their cumulative nature. The key factors of such losses are limited access to education, destruction of infrastructure, and a decrease in students’ performance in distance learning. International approaches to compensation for losses include increasing the duration of education due to shortening holidays, introducing a six-day school week, and developing and implementing accelerated education programs by condensing educational material. Attention is focused on the need to adapt them to Ukrainian realities. The importance of digital competence for effective online learning is emphasised.

Moroz [8] describes educational losses in Ukraine caused by the pandemic and war, identifies their causes and consequences, and proposes comprehensive compensation mechanisms, including diagnosis, adaptation of programs, and support for teachers and students. Creating a bank of self-assessment tests is mentioned, and the importance of developing students’ creativity is discussed.

Kripak [7] focuses on the destructive consequences of the war, considering the psychological, methodological, and technological components of this impact and ways to increase the effectiveness of blended learning. Ways to maximise the effectiveness of blended learning resources during the war and the post-war recovery period are substantiated, including recommendations for psychological support, adaptation of training materials, and the use of technology.

Korinchuk et al. [4] analyse theoretical approaches and practical solutions aimed at restoring the educational achievements of students and focus on international experience, in particular on programs implemented with the support of UNESCO, UNICEF, EU and other organisations that contributed to the creation of digital educational centers, the development of educational materials and the introduction of modern teaching methods.

Overchenko [9] study the problem of educational losses in Ukraine caused by the full-scale military aggression of the Russian Federation against Ukraine. It is proven that they have a cumulative effect; in particular, they can cause losses at the following stages of education. The article presents the results of a sociological study among students, analyses their access to electronic resources and educational tools, and summarises the results of teachers’ analytical reports.

Trubacheva, Mushka and Zamaskina [13] summarises approaches to compensation of educational losses in international educational practice, defines the role of individual organisations in implementing these approaches, and substantiates the feasibility of using international experience, considering the specific needs of Ukrainian participants in the educational process. Special attention is paid to the timely identification and compensation of educational losses through the partnership interaction of all participants in the educational process, cooperation between educational institutions, parents, and the community, as well as participation in the process of international and public organisations.

Fidanian [3] highlights the features of the technology of designing the educational environment caused by the development of the digitalisation process in society, new

opportunities created in education, educational losses that arose during the war in Ukraine, and the need to be diagnosed and overcome. The main result is identifying the features of designing an academic institution's educational and developmental environment in the context of digitalisation of society during martial law and their presentation in the form of technology design.

The main factors that cause educational losses under martial law and are associated with the lack of access to educational services due to the security situation, the destruction of educational infrastructure, the forced movement of subjects of the educational process, and the lack of technical means of distance learning have been identified by Kotun, Banit and Radomskyi [6].

Recent research underscores the profound and multifaceted impact of the COVID-19 pandemic and ongoing military conflict on higher education in Ukraine, particularly in the realm of technological disciplines. Kotun, Banit and Radomskyi [6] analysed the pedagogical challenges posed by the war and advocated for the strategic implementation of blended learning as a resilient educational approach. In a related study, Kotun [5] emphasised the practical aspects of deploying blended learning in pedagogical institutions, highlighting the methodological innovations required for success. Pasichnyi et al. [10] explored the digital transformation of Ukrainian higher education, identifying it as a key driver for integration into the European educational space and as a catalyst for resilience. Sedochenko and Shyyan [11] provided a comprehensive overview of the crisis in Ukrainian higher education, focusing on institutional adaptations to large-scale disruptions caused by the pandemic and war.

Complementing these academic perspectives, the Donnelly, Patrinos and Gresham [1] issued policy recommendations for mitigating learning losses in Ukraine, advocating for protecting education funding and implementing targeted learning recovery programs. Similarly, the Eurydice Unit Ukraine [2] emphasised the strategic importance of digital transformation for Ukraine's educational resilience and alignment with broader European integration goals. Finally, the World Bank [14] report on the war's educational impact quantified the scope of learning losses. It stressed the urgent need for robust digital and blended learning solutions to maintain educational continuity.

Thus, the analysis of recent studies and publications shows that the problem of educational losses in higher technological education is serious and requires an integrated solution. At the same time, it can be noted that today, there is no universal solution or practical strategies for overcoming educational losses, as they can vary depending on the discipline, the level of student training, and the context of learning.

The most promising approach may be a combination of intensive catch-up programs, individualised learning, and active learning methods. Digital technologies can also be essential in diagnosing, supporting, and overcoming educational loss. Psychological support for students becomes an integral part of the successful recovery of the educational process. Therefore, further research is needed to assess the long-term effects of educational losses and the effectiveness of various strategies to overcome them.

The study aimed to determine the directions for improving the quality of higher technological education by overcoming educational losses.

### **3. Materials and methods**

Methodological research methods used include data analysis, synthesis, generalisation, and systematisation, which are carried out to substantiate the conclusions.

The National University of Life and Environmental Sciences of Ukraine (NULES) became the basis for studying the directions for improving the quality of higher technological education and ways to overcome educational losses. This higher education

institution trains specialists in many technological and technical specialities, including the technology of production and processing of livestock products, agronomy, plant protection, food technology, biotechnology, agricultural engineering, industrial engineering, etc.

## 4. Results

### 4.1. General factors that deepen educational losses

During the COVID-19 pandemic, the university gained significant experience adapting the educational process to distance learning requirements. The full-scale military invasion deepened the problem of educational losses in Ukraine. Still, the university withstood this test with dignity, adapting the educational process and its material, methodological, and information resources to ensure high-quality organisation and conduct of the educational process. The most significant complexity of such an organisation was felt precisely in technological specialities, since the training of students there involves mastering many technological processes, devices, and laboratory equipment, making it impossible to conduct distance learning.

Among the factors that gave a significant impetus to the development of educational losses, in our opinion, are those related to external critical and internal processes, which are associated with the low quality of the organisation of the educational process, the quality of teachers, and students. External factors are based on the consequences of the COVID-19 pandemic, such as the transition to distance learning and related challenges. They also include the impact of a full-scale war with its instability and psychological stress (table 1).

Internal factors relate to the organisation of the educational process, particularly ineffective teaching methods, problems with curricula, methodological materials, etc.

**Table 1**

External factors that deepen educational losses.

| <b>Factors that deepen educational losses</b> | <b>Characteristic</b>  |
|---|--|
| <b>COVID-19 pandemic</b>                      |  |
| Transition to distance learning               | Insufficient readiness of teachers and students for the online format, lack of necessary skills and infrastructure (Internet, equipment) |
| Decreased motivation and engagement           | The difficulty of maintaining students' concentration and active participation in the online environment                                 |
| Limitations of practical training             | Difficulties in conducting laboratory work in a remote format, which is critical for technological and technical specialities            |
| Deterioration of social interaction           | Limiting communication with teachers and classmates affects the learning environment and knowledge sharing.                              |
| <b>Full-scale war</b>                         |  |
| Instability and security risks                | Interruption of the educational process due to hostilities, evacuation, or threat to life  |
| Psychological stress and trauma               | The impact of the war on the emotional state of students and teachers, which complicates learning and teaching                           |
| Infrastructure issues                         | Damage to educational institutions, equipment, power, and internet outages   |
| Forced migration and change of place of study | Adaptation to new learning environments in other institutions or countries   |

Internal factors include students’ qualitative composition and motivation, as well as their preliminary training and personal issues (table 2).

Thus, educational losses are a multifactorial phenomenon caused by global external shocks and internal factors related to the organisation of the educational process itself and students’ individual characteristics and living conditions. External factors create crisis conditions and destroy the usual established formats. In contrast, internal factors can both increase the negative impact of external events and exist independently of them, creating systemic problems in higher education. Understanding these factors is key to effectively countering and developing strategies to overcome them and improve the quality of training of future technologists, engineers, and technicians.

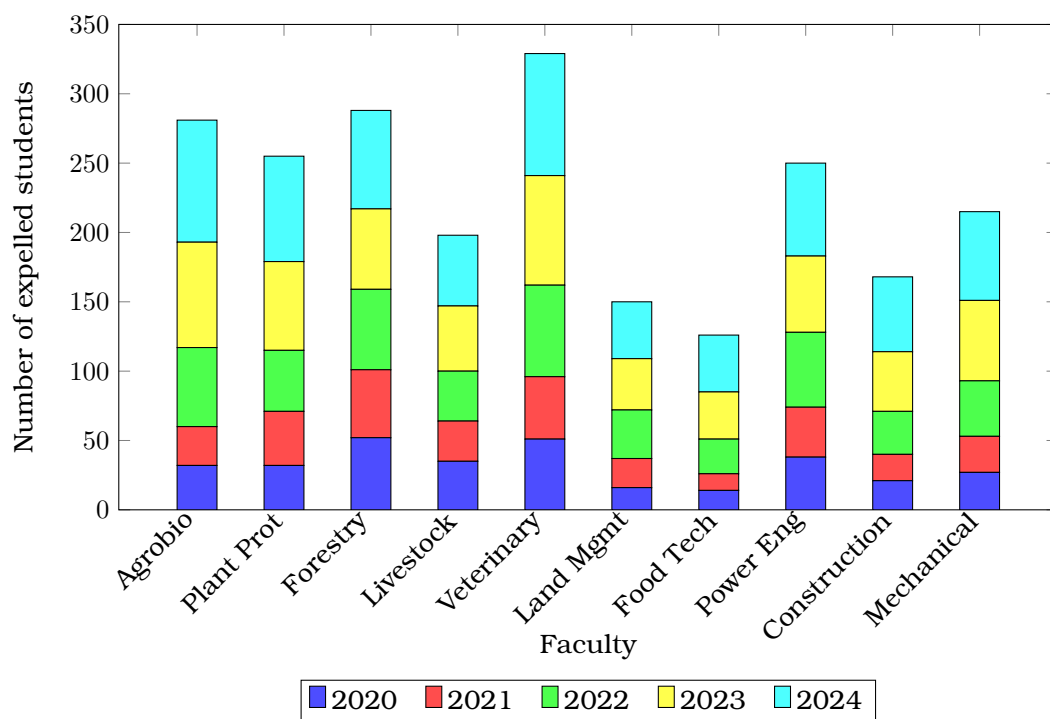
Educational losses have been studied (figure 1), which are illustrated by the state of expulsion of students of technological specialties of NULES over the past five years, when the distance learning format was more actively used.

#### 4.2. Students’ academic performance during the summer examination session (2019–2024)

According to the study results, the total number of expelled students of technical and technological specialties has significantly increased. In 2020, 318 students were expelled; in 2024, this number increased significantly to 641. It should be noted that many expelled students are subsequently renewed and continue their studies.

**Table 2**  
Internal factors that deepen educational losses.

| <b>Factors that deepen educational losses</b>                  | <b>Characteristic</b>   |
|--|---|
| <b>Organization of the educational process</b>                 |   |
| Ineffective teaching methods                                   | The use of passive teaching methods, insufficient practical orientation, and a lack of an individual approach         |
| Overloaded Curricula   | A large amount of theoretical material without enough time to assimilate and apply it in practice                     |
| Insufficient quality of educational materials                  | Outdated textbooks, lack of modern interactive resources  |
| Problems with assessment                                       | Unfair or ineffective methods of knowledge control that do not reflect the real level of assimilation of the material |
| Insufficient academic support for students                     | Lack of consultations, tutoring, and support programs for students with learning difficulties                         |
| <b>Quality composition and motivation of students</b>          |   |
| Low level of pre-training                                      | Gaps in knowledge acquired at previous levels of education  |
| Problems with self-organisation and self-discipline            | Difficulty in planning study time and independent work, especially in the context of online learning                  |
| Psychological and emotional problems                           | Stress, anxiety, and depression that affect cognitive function and learning ability                                   |
| Socio-economic factors   | Financial difficulties, combining study with work, and a lack of conditions for studying at home                      |
| Lack of motivation and awareness of the importance of learning | Lack of a clear goal of study, low interest in the future profession  |



**Figure 1:** Number of expelled students in technological and technical specialties of NULES in 2020–2024.

Thus, the general trend is a rapid increase in the number of expelled students of the university’s technical and technological specialties, which is especially pronounced in the war years of 2023 and 2024. Most faculties and ESIs, with some exceptions, clearly demonstrate the growing dynamics of the number of expelled students during the specified period.

The average GPA and the number of students with academic debts were also studied. Thus, tables 3 and 4 and figures 2 and 3 present statistics on the results of the summer examination session of undergraduate and graduate students from the 2019 to 2024 academic year (pre-war period and martial law), namely the average score and the number of students with three or more academic debts.

Table 3 contains information on the average GPA of undergraduate students based

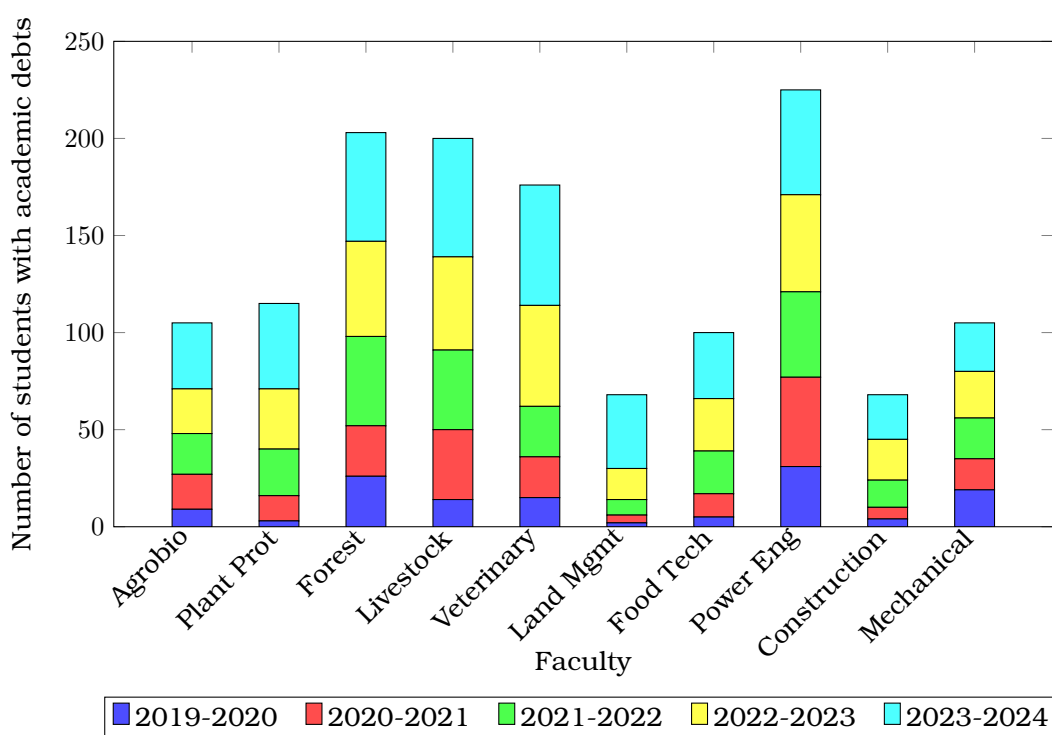
**Table 3**

Average score (for a 100-point school) based on the results of the summer examination session of undergraduate students (2019–2024).

| Faculty   | 2019-2020 | 2020-2021 | 2021-2022 | 2022-2023 | 2023-2024 |
|---|-----------|-----------|-----------|-----------|-----------|
| Agrobiological                                  | 74.0      | 73.0      | 70.3      | 71.2      | 69.3      |
| Plant Protection, Biotechnology and Ecology     | 80.1      | 79.3      | 79.8      | 75.1      | 73.8      |
| Forest and landscape Economy                    | 65.8      | 65.7      | 63.7      | 61.2      | 61.1      |
| Livestock and Aquatic Bioresources              | 75.7      | 76.8      | 74.0      | 73.3      | 73.0      |
| Veterinary Medicine                             | 75.1      | 75.9      | 73.9      | 70.1      | 69.9      |
| Land management                                 | 68.7      | 68.5      | 63.6      | 64.1      | 63.6      |
| Food Technology and Management product quality  | 78.8      | 77.0      | 75.4      | 76.2      | 72.4      |
| Power Engineering, Automation and Energy saving | 78.2      | 79.7      | 76.0      | 74.9      | 73.0      |
| Construction and design                         | 75.7      | 76.0      | 74.6      | 73.4      | 71.6      |
| Mechanical and technological                    | 75.2      | 74.5      | 74.0      | 72.3      | 71.0      |

on the results of summer examination sessions from 2019–2020 to 2023–2024 academic years on a 100-point scale for 11 technological and technical faculties of the NULES. Thus, the general trend indicates a decrease in the average grade of students of most faculties during the period under study. For example, at the Faculty of Agrobi-ology, the average score decreased from 74 in the 2019–2020 academic year to 69.3 in the 2023–2024 academic year; at the Faculty of Plant Protection, Biotechnology and Ecology, from 80.1 to 73.8, respectively.

Figure 2 presents the number of undergraduate students who, according to the results of the summer examination session, had a different number of academic debts from the 2019–2020 to the 2023–2024 academic years. There is a clear tendency to increase the number of such students in almost all specialities of different faculties during the analysed period. For example, at the Faculty of Forestry and Landscape Gardening, the number of students with three debts increased from 26 to 56, and at the Faculty of Veterinary Medicine, from 15 to 62.



**Figure 2:** Number of undergraduate students who, according to the results of the summer examination session, have academic debts (2019–2024).

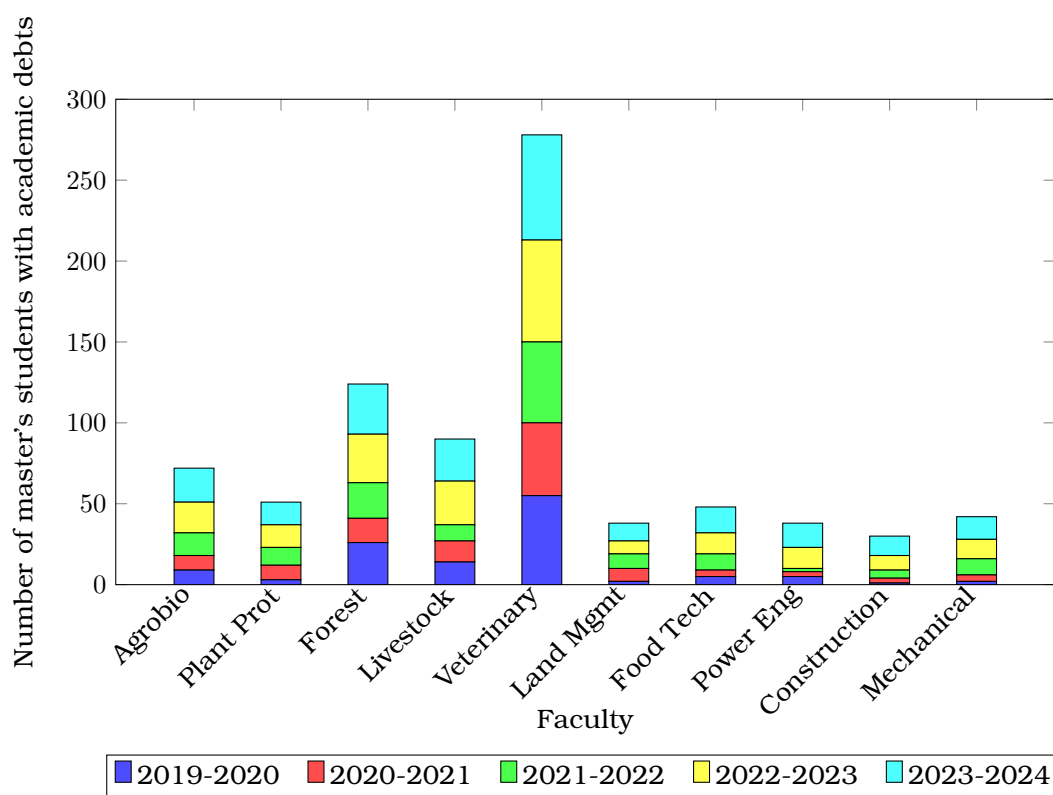
As for undergraduate students, there is also a general tendency for future master’s students to decrease the average score during the study period, although the dynamics of decline in individual faculties may differ. Thus, at the Faculty of Energy, Automation and Energy Saving, there is a decrease from 88.7 to 73.04 points. At the same time, students of the Faculty of Plant Protection, Biotechnology and Ecology scored the highest scores in the 2020–2021 academic year (86.3), and then there was a decrease in the average score to 73.8 in the 2023–2024 academic year.

In the master’s degree program (table 4), there is not such a homogeneous dynamics of the number of students who had a different number of academic debts after the summer session from 2019–2020 to 2023–2024 academic year than for the bachelor’s. Thus, in some faculties, the number of students with debts has increased significantly. In the Educational and Scientific Institute of Forestry and Landscape Gardening, their number increases from 26 to 31 between 2019 and 2023, while in others it fluctuates

**Table 4**

Average score (according to the 100-point scale) according to the results of the summer examination session of master’s students (2019–2024).

| Faculty   | 2019-2020 | 2020-2021 | 2021-2022 | 2022-2023 | 2023-2024 |
|---|-----------|-----------|-----------|-----------|-----------|
| Agrobiological                                  | 73.9      | 73.5      | 70.3      | 69.6      | 69.3      |
| Plant Protection, Biotechnology and Ecology     | 81.1      | 86.3      | 83.4      | 79.2      | 73.8      |
| Forest and landscape Economy                    | 71.6      | 69.0      | 68.0      | 65.3      | 61.1      |
| Livestock and Aquatic Bioresources              | 77.9      | 79.9      | 75.4      | 72.5      | 72.0      |
| Veterinary Medicine                             | 76.4      | 75.4      | 75.9      | 72.1      | 69.9      |
| Land management                                 | 79.6      | 74.8      | 66.2      | 67.6      | 63.6      |
| Food Technology and Management product quality  | 84.5      | 83.0      | 82.1      | 79.5      | 74.4      |
| Power Engineering, Automation and Energy saving | 88.7      | 79.4      | 78.9      | 79.4      | 73.0      |
| Construction and design                         | 79.0      | 78.0      | 76.6      | 74.9      | 71.6      |
| Mechanical and technological                    | 86.4      | 80.0      | 75.3      | 74.2      | 71.0      |



**Figure 3:** Number of master’s students who, according to the results of the summer examination session, have academic debts (2019–2024).

or slightly increases.

Thus, for the period from 2019–2020 to 2023–2024 academic year, there is a general trend towards a decrease in the average score in most faculties, which indicates a general deterioration in academic performance among undergraduate students over the past five years, which may be due to various factors, including changes in the educational process, for example, the transition to distance learning. Master’s students, with minor exceptions, also have a general negative trend, demonstrating a decrease in overall academic performance.

The trend of a significant and consistent increase in undergraduate students with different academic debts based on the summer session results from 2019–2020 to

2023–2024 academic year is also alarming. The analysis of the dynamics of this indicator for master's is less homogeneous compared to bachelor's, indicating the debt problem. Still, it does not have such a sharply growing trend.

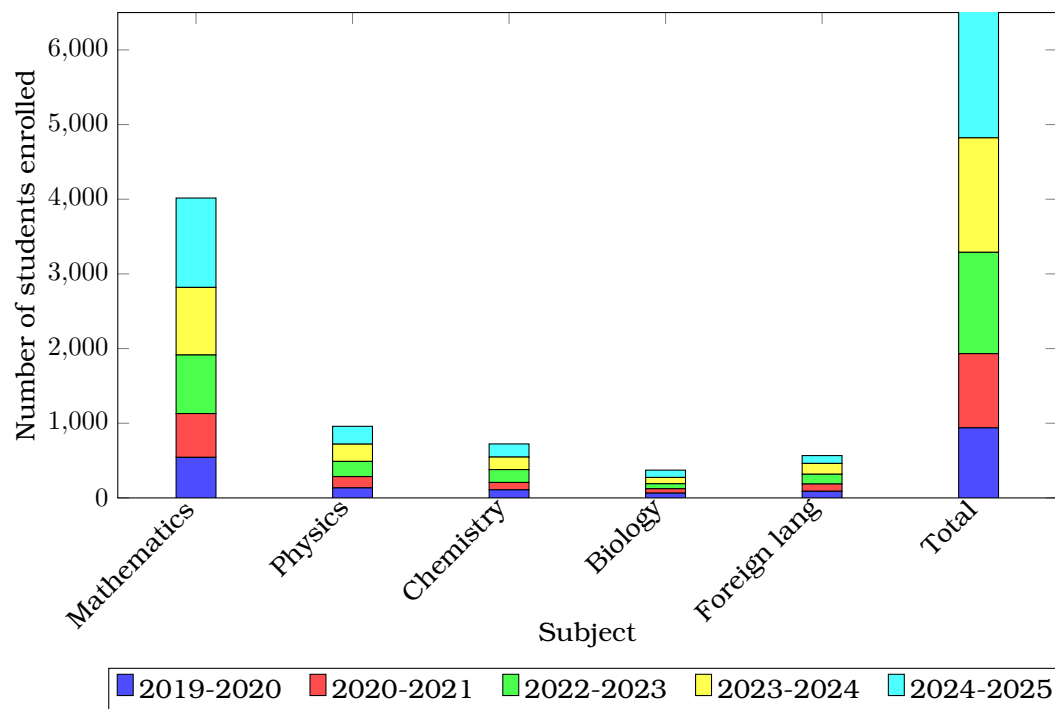
Summing up the data of the study, it can be stated that from 2019 to 2024, there is a general decrease in the academic performance of both bachelor's and master's, and a significant increase in the number of undergraduate students with substantial academic debts. This indicates systemic challenges in the educational process and a decrease in students' adaptation to learning conditions in recent years.

Thus, the introduction of online and blended learning formats, due to the COVID-19 pandemic and partially preserved in educational practice to this day, which is associated with the university's response to a full-scale military invasion, creates significant obstacles to the complete formation of practical skills in students of technical and technological specialities. This is a significant problem, since the practical component is much more important for technical and technological education than humanitarian areas. At the same time, existing studies confirm that such education formats do not contribute to academic performance growth and sustainable motivation to study among higher education students in technical and technological areas.

Demographic changes, competition in the market of educational services, changes in the priorities of young people, and a decrease in teachers' motivation can also be considered factors that complicate the implementation of academic activities at the university today. Demographic changes include a significant outflow of student youth and scientific and pedagogical workers abroad, which is associated with the security situation. We associate competition in the educational services market with the excessive supply in Ukraine and a significant increase in the availability of higher education abroad. The change in the priorities of young people can be explained by a substantial reduction in demand among today's youth for obtaining complex professions in engineering and natural sciences. At the same time, the decrease in teachers' motivation is associated with psychological burnout, low wages, and high pedagogical load, which reduces the overall quality of the educational process and the interest of applicants for academic services.

These factors form a complex and multidimensional challenge for universities and their technical and technological specialities in particular. The demographic crisis, together with external competition, reduces the potential contingent of students and scientific and pedagogical workers, and the change in the educational priorities of young people leads to a decrease in demand for specialities, which have become key for the development of the modern economy. Furthermore, finally, reducing teachers' motivation significantly slows down the processes of high-quality updating of educational programs and the introduction of innovative pedagogical approaches. Comprehensive consideration of such factors is critical for developing effective adaptation strategies and further development of university education.

To significantly reduce and overcome possible educational losses, first-year bachelor's students hold free courses in natural, mathematical, and humanitarian disciplines, considerably improving their school training (figure 4). During 2022–2025, significantly more students were enrolled in the courses than in the pre-war years of 2019–2021. The most significant number of students in such classes is in technical and technological specialities: mechanical and technological, design and design, plant protection, biotechnology and ecology, land management, food technology, veterinary medicine, agrobiological, and others.



**Figure 4:** Comparative analysis of the number of involved first-year students for additional study of natural, mathematical, and humanitarian disciplines in 2019–2025.

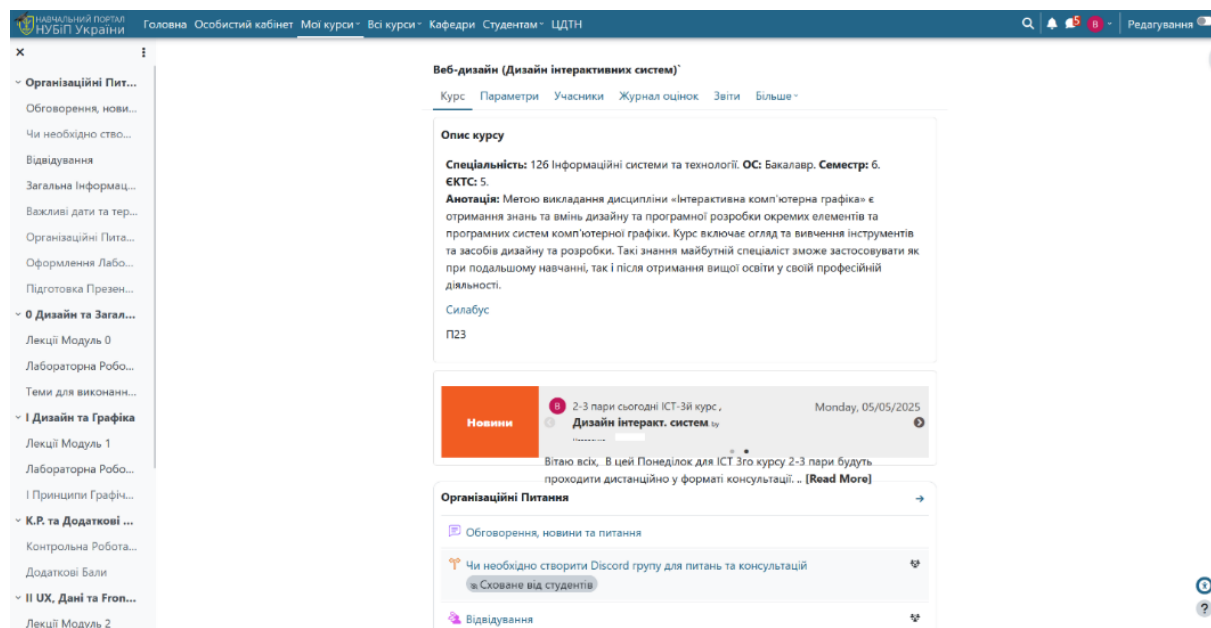
#### 4.3. Improving the quality of the organisation of the educational process

An essential role in improving the quality of the organisation of the educational process is the provision of a high level of digitalisation and the availability of several modern digital services for students and scientific and pedagogical workers. As part of implementing the university's digital transformation program, significant results have been achieved quickly in modernising the educational process, resource management, and improving information security. Thanks to implementing these initiatives, the university has made significant progress in introducing modern digital technologies, improving the quality of education, and management efficiency.

Figure 5 illustrates a sample of how e-learning courses are structured and populated on the university's MOOC eLearn platform during mixed-format instruction. It highlights the integration of multimedia content, interactive assignments, and real-time progress tracking tools. The platform's comprehensive design ensures that students have consistent access to updated course materials and assessments, thereby enhancing the effectiveness of blended learning and supporting continuous academic engagement even during disruptions.

An important component was also supporting the participants' psychological state in the educational process, which included expanding the forms of service provision by psychological centres and providing a wide range of opportunities for organised recreation, including sports competitions, art events, seminars for NCE to increase emotional and psychological stability, etc.

Over the past three and a half years, the organisation of the educational process at the University has undergone significant changes related to the challenges faced by the higher education system, the military aggression of the Russian Federation, quarantine restrictions, and other threats. The university widely uses the possibilities of a mixed learning format, which gives fundamentally better learning outcomes for students, in contrast to distance learning. The mixed format at NULES is a flexible combination of distance lectures, consultations, separate practical classes, and face-



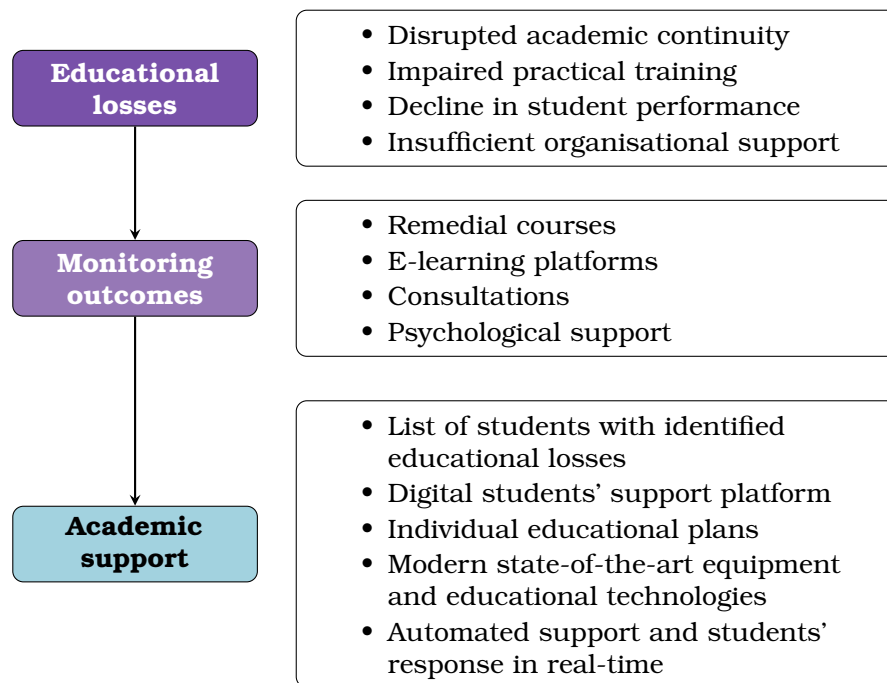
**Figure 5:** Example of filling out e-learning courses on the MOOC eLearn platform during a mixed-format education.

to-face contacts of teachers and students at the laboratory, practical and seminar courses, educational and industrial practices, examination sessions, and defence of graduation papers. Depending on the speciality, faculty, SRI can choose from two algorithms for organising the training of full-time students during each semester.

Figure 6 presents a comprehensive framework for overcoming educational losses in higher technological education through a structured, multi-stage intervention model. The diagram begins by identifying four primary dimensions of educational losses – disrupted academic continuity, impaired practical training, decline in student performance, and insufficient organisational support – all of which have intensified due to recent crises. In response, the model emphasises a critical monitoring outcomes phase, incorporating tools such as remedial courses, e-learning platforms, personalised consultations, and psychological support to stabilise the academic trajectory of affected students. Building on this foundation, the academic support phase involves identifying specific students experiencing setbacks through data-driven monitoring and integrating them into a robust support ecosystem. Key components of this system include a centralised digital support platform, individualised educational plans that tailor learning paths to student needs, and access to modern educational technologies and state-of-the-art lab equipment, especially vital for technical disciplines. Furthermore, automated support systems ensure real-time feedback and timely interventions, fostering a responsive academic environment. This integrative model enables institutions to mitigate current educational deficits and institutionalise resilient support mechanisms that safeguard long-term educational quality and continuity.

For applicants for higher education of all educational degrees who study in technological specialties, including engineering, zooveterinary, agrobiological educational programs, it is advisable to rotate full-time and distance learning formats more often during the semester, which is associated with the presence in the curricula of a significant number of laboratory and practical classes, for which the university has a powerful material and technical base with the most modern devices and equipment.

For applicants for higher education of all educational degrees who study in economic, managerial, humanitarian, and pedagogical educational programs, you can use the



**Figure 6:** Overcoming educational losses diagram.

algorithm already developed at the University with one rotation of full-time and distance learning formats in the middle of the semester.

Both algorithms allow you to maintain parity in the ratio of full-time and distance learning formats for each applicant in the educational process. Their use will enable you to reduce the gap between theory and practice in the study of disciplines, increase students' attendance rates, bring students as close as possible to university life, and contribute to forming a comfortable socio-psychological climate in academic groups.

These research results provide compelling evidence that the decline in academic performance and the rise in student expulsions are not isolated anomalies. Still, they indicate a broader, systemic crisis in the organisation of higher technological education under crisis conditions. The quantitative data on GPA trends, academic debts, and expulsion rates reflect the compounded impact of external disruptions (such as the war and pandemic) and internal structural challenges (like outdated pedagogical approaches and insufficient support systems). This multifaceted deterioration underscores the urgent need for educational institutions to adopt flexible, adaptive, and evidence-based strategies beyond temporary solutions. In particular, the effectiveness of blended learning models and targeted academic support programs should be further evaluated and scaled where successful. These findings form the empirical backbone for the subsequent recommendations on restoring educational quality and resilience in higher technological education.

As a result of the work carried out on collecting and analysing a large amount of empirical data, a basis has been formed for further analysis and planning of actions to reduce educational losses and improve the quality of educational services under challenging conditions of uncertainty of many factors. The authors used a holistic approach to analysing educational losses for technical and technological specialities, covering pedagogy, psychology, and digitalisation. The most important stage in further work in this direction is the development of a set of practical recommendations based on today's real limitations: external and internal factors influencing educational losses (tables 1 and 2). It is also planned to conduct numerical modelling to predict long-term

results and plan current reforms to improve the quality of the educational process and trends in reducing educational losses.

## **5. Conclusions**

The study identified key ways to overcome educational losses in higher technological education. The proposed mechanism for organising the university's educational activities not only successfully levels educational losses at the moment but also guarantees the continuous provision of quality educational services to applicants, demonstrating flexibility in responding to current challenges of the academic environment.

To effectively and systematically overcome educational losses, it is necessary to ensure regular annual monitoring of the program learning outcomes of higher education applicants in each speciality by the requirements of the Higher Education Standards of Ukraine. This process should be carried out with the active use of modern computer equipment, specialised software, and validated diagnostic tools, which will allow obtaining objective and timely data on assimilating knowledge and skills.

An important place should be given to the introduction of adaptive and flexible planning of the educational process, which will provide for the possibility of prompt adjustment of the schedule of classes, redistribution of study time between disciplines and topics within the framework of the developed educational programs. The content of education and the academic programs themselves must be flexibly adapted to the identified educational losses, thus ensuring their relevance and compliance with the needs of applicants.

It is also necessary to actively develop and improve the methodological system of supporting the individual educational trajectories of each higher education applicant. This includes conducting individual lessons, organising independent work under the guidance of a teacher according to the curriculum and personal requests of students, providing regular consultations to eliminate gaps in knowledge in disciplines, as well as developing differentiated tasks of different levels of complexity, taking into account individual needs and the pace of learning.

It is also urgent to strengthen systematic work to support scientific and pedagogical workers in improving their qualifications, undergoing internships at specialised enterprises and leading scientific institutions, and promoting continuous professional improvement. Ensuring teachers have high professional competence is key to effectively overcoming educational losses.

In summary, the research demonstrates that a convergence of global and national crises has significantly undermined the quality of higher technological education in Ukraine. The findings emphasise that addressing educational losses requires more than reactive measures, necessitating a systemic transformation of the educational environment. This includes sustained investment in digital infrastructure, ongoing support for the psychological well-being of students and educators, modernisation of curricula, and the development of individualised learning pathways. The study highlights the importance of institutional adaptability and strategic planning in managing educational disruptions. By leveraging blended learning, enhancing faculty qualifications, and fostering a student-centred approach, universities can compensate for current educational deficits and build a more resilient and future-ready academic ecosystem. The proposed framework is relevant to the current wartime context and offers a blueprint for long-term reform in technological higher education.

## References

- [1] Donnelly, R., Patrinos, H.A. and Gresham, J., 2021. The Impact of COVID-19 on Education – Recommendations and Opportunities for Ukraine. Available from: <https://tinyurl.com/4akzndha>.
- [2] Eurydice Unit Ukraine, 2025. Ukraine: Digital transformation of education as a strategic path to resilience and innovation. Available from: <https://tinyurl.com/hs6kfu98>.
- [3] Fidanian, O.H., 2023. Overcoming educational losses and ruptures schools in today's conditions as a problem of educational management. *Innovate Pedagogy*, 1(65), p.228–233. Available from: <https://doi.org/10.32782/2663-6085/2023/65.1.47>.
- [4] Korinchuk, N., Narykhnyuk, N., Korinchuk, V. and Poplavska, A., 2024. Educational losses of mathematics students in war conditions: risks, diagnostic sociological research and ways of overcoming. *New pedagogical thought*, 118(2), pp.52–57. Available from: <https://doi.org/10.37026/2520-6427-2024-118-2-52-57>.
- [5] Kotun, K., 2024. Implementation of blended learning in the pedagogical HEIs of Ukraine. *UNESCO Chair Journal Lifelong Professional Education in the XXI Century*, 2(10), pp.21–33. Available from: [https://doi.org/10.35387/ucj.2\(10\).2024.0002](https://doi.org/10.35387/ucj.2(10).2024.0002).
- [6] Kotun, K., Banit, O. and Radomskyi, I., 2023. Educational challenges and innovations in higher pedagogical education in UKRAINE: from the destructive consequences of war to effective blended learning. *UNESCO Chair Journal Lifelong Professional Education in the XXI Century*, 2(8), pp.71–84. Available from: [https://doi.org/10.35387/ucj.2\(8\).2023.71-84](https://doi.org/10.35387/ucj.2(8).2023.71-84).
- [7] Kripak, T.P., 2024. From losses to opportunities: joint work of education authorities and teachers for quality education. Available from: [https://doi.org/10.52058/2786-6165-2024-12\(30\)-809-824](https://doi.org/10.52058/2786-6165-2024-12(30)-809-824).
- [8] Moroz, P., 2023. Educational losses in Ukraine: analysis of challenges and ways of their compensation. *Pedahohichna komparatyvistyka i mizhnarodna osvita — 2023: horyzonty innovatsii : zb. materialiv VII Mizhnarodnoi naukovoï konferentsii (Kyiv, 25 travnia 2023 r.)*. Kyiv, Ternopil: Krok, pp.174–177. Available from: <https://lib.iitta.gov.ua/id/eprint/736452/>.
- [9] Overchenko, M., 2024. The Role of International and Public Organizations in Overcoming Educational Losses in Ukraine. *Ukrainian Educational Journal*, (1), p.65–73. Available from: <https://doi.org/10.32405/2411-1317-2024-1-65-73>.
- [10] Pasichnyi, R., Serhieiev, V., Shevchenko, S., Petrukha, N. and Hryvna, B., 2024. Digital transformation of higher education as a driver of Ukraine's integration into the European educational space. *Cadernos de Educação Tecnologia e Sociedade*, 17(se4), p.232–245. Available from: <https://doi.org/10.14571/brajets.v17.nse4.232-245>.
- [11] Sedochenko, A. and Shyyan, O., 2024. Crisis in Higher Education—Ukrainian Realities. In: J. Rudolph, J. Crawford, C.Y. Sam and S. Tan, eds. *The Palgrave Handbook of Crisis Leadership in Higher Education*. Cham: Springer Nature Switzerland, pp.155–174. Available from: [https://doi.org/10.1007/978-3-031-54509-2\\_9](https://doi.org/10.1007/978-3-031-54509-2_9).
- [12] Topuzov, O., Holovko, M. and Lokshyna, O., 2023. Educational Losses During Martial Law: Problems of Diagnosis and Compensation. *Ukrainian Educational Journal*, (1), pp.5–13. Available from: <https://doi.org/10.32405/2411-1317-2023-1-5-13>.
- [13] Trubacheva, S., Mushka, O. and Zamaskina, P., 2023. Features of Designing an Educational Environment in the Conditions of Digitalization of Society During the Time of Marital State in Ukraine. *Ukrainian Educational Journal*, (4), p.46–52. Available from: <https://doi.org/10.32405/2411-1317-2023-4-46-52>.

- [14] World Bank, 2022. *Education: Impact of the War in Ukraine*. (Ukraine Sectoral Briefs). World Bank Group. Available from: <https://documents1.worldbank.org/curated/en/099945306202211104/pdf/P1775870809f1d04d0844c0e7042abf0eb5.pdf>.