

CHAPTER 4 "ONLINE EDUCATION IN CRISIS CONDITIONS: METHODOLOGICAL ASPECTS"

Lyudmila Novitska¹

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Abstract. Against the background of the development of events related to the COVID-19 pandemic and the introduction of martial law in which Ukraine found itself, the use of online education has become even more relevant during the training of specialists by agricultural higher educational institutions. The organization of the educational process during the war is a new challenge of the times, requiring the improvement of distance learning technologies and their integration into pedagogical activity.

The difficult conditions of wartime create a new reality and pose new challenges to which the methodology of teaching mathematical disciplines in higher education must respond. It is necessary for students to study a significant percentage of the educational material on their own, and for teachers to constantly improve and diversify both the methods and means of presenting the material and the methods of knowledge control.

Therefore, today the task of further development of distance learning methods in order to ensure, even in these difficult conditions, a level of mathematical training of a specialist that meets modern educational standards, is gaining the greatest relevance today.

The purpose of the research is to highlight the peculiarities of online learning at the Vinnytsia National Agrarian University, conducting lectures, practical classes and consultations, as well as to identify the reasons for insufficient efficiency of students' independent work and ways to improve the quality of this work.

It is shown that the introduction of remote technologies allows for a continuous educational process at a sufficiently high level and in safe conditions, provides the possibility of constant access to educational resources, and is positively perceived by students. It is noted that online education requires students and teachers of higher education institutions

¹ Candidate of Pedagogical Sciences, Associate Professor,
Vinnytsia National Agrarian University, Ukraine

to possess the skills of information and communication technologies and a flexible approach to the educational process.

It is substantiated that the use of distance learning contributes to the process of professional development of future specialists, encourages them to work independently, forms an information culture, and focuses on mastering innovative means of obtaining and assimilating information. Distance learning requires appropriate training of students. Before it is introduced, students should be taught how to study literary sources, analyze them, highlight the main points, systematize knowledge, and draw conclusions.

Research methodology: systematic literature analysis; study of the conceptual apparatus; modeling; generalization of pedagogical experience; observation, data analysis, conversation, testing, methods of diagnostic control works; qualitative and quantitative analysis of research results.

Practical implications. A pedagogically balanced system of organizational measures is recommended to reduce the negative impact on learning of various challenges associated with critical situations. It is emphasized that the safety of the subjects of the educational process is facilitated by the use of online education, which provides fast communication, operational planning and re-planning, documentation, storage, and ensures students' access to educational materials, a variety of ways to achieve results. It has been studied that Google's digital tools in crisis situations are convenient and simple for carrying out educational activities, which allow easy integration of the educational process into a distance format, and also contribute to the rapid adaptation of students to their use.

Value/originality. The main problems are considered and ways to overcome them are given, in particular when organizing independent work of students during online classes. The importance of teacher control at various stages of students' independent performance of tasks to ensure effectiveness is emphasized. Attention is drawn to the positive and negative aspects of the remote form of conducting classes and the prospects of further research on improving the effectiveness of independent work of students in the conditions of distance learning. *Conclusions.* Online education gives students access to non-traditional sources of information, increases the efficiency of independent work, opens up new opportunities for creativity, consolidation of various professional skills, enables teachers to introduce fundamentally new forms and methods of education.

Introduction

Online education has become a significant part of the educational landscape around the world, especially with the spread of the COVID-19 pandemic. In Ukraine, a full-scale war with Russia was added to this factor. Online education has provided access to learning without the limitations of geography or physical presence, especially in times of war and pandemic. It allowed schoolchildren and students from Ukraine and all over the world to have access to quality education, regardless of their location, social status or other circumstances. Online education provides the opportunity to learn at your own pace and choose courses or materials that meet the specific needs and interests of students. For students and schoolchildren, it provides an opportunity to individualize learning and engage in self-education.

One of the key features of online education in Ukraine is the presence of a relatively developed technical infrastructure, such as fast Internet and access to computers or smartphones. In Ukraine, there are a number of online platforms and resources that provide opportunities for training and distance education. For example, the Ministry of Education and Science of Ukraine has developed the "Action" platform, which contains online courses for schoolchildren and students. In addition, universities and educational institutes are also creating their own platforms for conducting online classes.

Despite the rapid adaptation of the governments of countries and educational institutions of various levels to the online education system, the list of problems faced by participants in the educational space is only expanding. In the process of implementing the concept of online education, the main problem is the availability of this type of education for students and pupils in regions where there is no necessary infrastructure (mobile communication, wired and wireless Internet. The availability of gadgets, which are necessary in the process of online education, is also critical a problem that they are trying to solve at all levels.

The results obtained in the study allow to determine the problems and prospects of the development of online education both in Ukraine and beyond, taking into account such factors of the functioning of the current educational space as the war in Ukraine, the consequences of the pandemic, cooperation with the business environment, comprehensive digitization of science. Determination of practical opportunities for improving the online

education system, with examples of their implementation in real educational institutions, will allow understanding and adapting the experience of the best for further improvement of the educational system.

All this will be able to create conditions for increasing the effectiveness of the implementation of online education in Ukraine and the continuation of the educational process at all levels in the war and post-war periods.

4.1. Challenges of Online Education in Ukraine

Russia's full-scale invasion of Ukraine has continued a series of challenges facing the nation's education system since the start of the COVID-19 pandemic. The most significant of which was the forced mass emigration of participants in the educational process, which prompts us to pay special attention to the issue of the outflow of intellectual capital and the implementation of mechanisms for leveling its prerequisites and consequences.

Considering the requirements of the martial law, one of the tools for the return of educational migrants to the Ukrainian educational process from abroad or their final re-emigration is a well-founded online education, which should provide for the improvement of distance learning methods and at the same time be adaptive to changes in the internal environment and world trends.

First of all, the full-scale war had a negative impact on the mental health of the participants in the educational process: those who emigrated and those who remained, which at the same time affected distance learning. For example, 61% of parents believe that their children have symptoms of stress: poor sleep, anxiety, difficulty concentrating and communication problems. And 85% of respondents believe that the gaps in knowledge and skills that students have as a result of the pandemic and a full-scale invasion will affect their education and their future [1]. Therefore, given the urgency of the problem, the Ministry of Education and Science (MES) began reforming the psychological service by creating an Ecosystem psychological assistance in the field of education [2] within the framework of the All-Ukrainian mental health program at the initiative of the First Lady of Ukraine Olena Zelenska.

The project aims to provide an opportunity for educators, school psychologists, students and their parents to receive free of charge:

- first aid skills;
- methods of working with stress according to the standards of the World Health Organization;
- professional consultations from clinical psychologists for educators and school psychologists;
- training of specialists who will be able to work with clinical cases;
- psychological video trainings from professional psychologists;
- a training course for educators with the participation of experts from Israel and the USA [2].

Along with this, in 2023, a large-scale survey of students, teachers and parents was conducted as part of the international Study of Social and Emotional Skills – "DoSEN", which is carried out by the Organization for Economic Cooperation. The purpose of the study is aimed at determining the level of skills according to five key dimensions and one additional one, namely: performing tasks; regulation of emotions; involvement; breadth of vision; interaction with others; self-efficacy and motivation.

Permanent support of the psychological state of the participants of the educational process is intended to lay the foundation for the smooth implementation and further acceptance of innovative methods of distance learning, which can be a significant step towards the return of forced migrants to the Ukrainian educational environment thanks to the joint processing of collective traumatic experience.

Reimmigration of students, studentship and education reform are priority tasks of the state due to the importance of preserving intellectual capital for long-term planning of economic and socio-cultural development. According to the Ministry of Education and Culture, universities and schools in Ukraine study according to different types of education, which leads to differentiation of acquired knowledge of students and schoolchildren.

In order to minimize the difference in the quality of education between groups of students and learners, online learning must offer effective learning methods. The activities of the scientific and pedagogical community, aimed at minimizing educational losses, should take place comprehensively and systematically at different levels in accordance with the main components of the pedagogical process, namely: motivational and valuable; organizational and procedural; cognitive and meaningful; communication and activity; evaluative and analytical [3].

First of all, it is necessary to promote the greater use of modern approaches in daily online learning, having previously created opportunities to increase the technological awareness and motivation of teachers. It is important to use interactive methods of presenting the material and checking its assimilation, to implement a game approach to conducting classes: simulation and role-playing games, project activities, individual research, which contributes to better assimilation of information and less workload. A special place in the reformation of distance education in modern conditions should be the encouragement of versatile creativity on the part of all participants of the educational process.

In the context of developing ways to return educational migrants, it is necessary to pay attention to the experience of Ukrainians who encountered new education systems in different countries, which can serve as a way to improve the national system and increase its competitiveness.

The example of Great Britain's approach to schooling shows the importance of gaining knowledge not just for assessment, but for progress, career choice and quality of life. It provides tools that are immediately useful: for example, practicals on systematization of material in the form of mental maps, which with the help of associative series help to better understand and remember the learned. In addition, in the schools of the United Kingdom, the skills of public speaking, communication and lack of fear of mistakes are stimulated, making the education process loyal to its acquirers. The experience of Ukrainian migrants with the French education system shows the advantages of a bilingual approach, which opens wider horizons of opportunities for children [4].

Currently, Ukraine is considering the possibility of teaching in two languages – Ukrainian and English – only specialized subjects in senior classes [5]. However, in order to increase the competitiveness of Ukrainian schoolchildren, it is necessary to introduce in-depth daily use of a foreign language from junior high school. Also, an interesting example of the approach to teaching in France can be the complexity of information presentation: for example, it is possible to combine history, geography, art and mathematics in one subject, which minimizes the amount of material for the child, promotes the development of associative thinking and memory, helps to maintain the focus of attention on mastering the main points of this new topic [4].

In order to solve gaps in education due to various reasons, the Ministry of Education and Culture is considering the option of reducing the number of subjects in Ukrainian schools. Also, distance education is planned to be simplified for children who are abroad and study at the same time in two institutions, leaving unique Ukrainian subjects for study, and universal ones will have to be enrolled automatically [6]. In addition, online education should also emphasize the development of soft skills, which are part of psychological stress resistance and help to cope with daily difficulties and large-scale challenges.

It is especially important to implement ways of encouraging educational migrants of higher education to return because of the value of the contribution of young professionals in the post-war period. With this in mind, the reform of distance education in universities should be approached comprehensively: with the creation of a modernized model of teaching information and the application of acquired knowledge, improving indicators of the quality and productivity of the educational process.

First of all, it is necessary to improve the digital competence of teachers as information providers for the development of competitive graduates of educational institutions in the conditions of the Fourth Industrial Revolution. Importantly, digital competence extends to six areas: information literacy and media literacy; ability to work with data; communication and cooperation; creation of digital content; cyber security and cyber security; problem solving and lifelong learning [7].

One of the significant steps towards the realization of the vision of innovative education was the new appointment of the head of the Ministry of Digital Transformation, Mykhailo Fedorov, to the post of Deputy Prime Minister for Innovation, Development of Education, Science and Technology [8]. The key vectors of work in this direction are also determined, which, in particular, contribute to the re-emigration of teachers and those who earn scientific degrees.

Compared to traditional, distance learning has a number of advantages: advanced educational technologies, availability of information sources, individualization of learning, convenient counseling system, democratic relationship between student and teacher, favorable schedule and place of work [9]. Therefore, in order to achieve the set goals, Ukrainian online education should have the goal of transferring the advantages of this type of

Table 1

Key vectors of the work of the Vice Prime Minister for innovation, development of education, science and technology

Vector	Essence
A new approach to management of the education system	Fighting bureaucracy and transforming educational institutions into ones that support and attract talented teachers for decent wages. Training for educational managers and teachers. A separate role for the development of the English language, digital skills, and entrepreneurship. Opening opportunities for talented scientists. Grant and fast financing of projects
Digitization of education	Expansion of Actions in the educational direction: services for schoolchildren, students and parents. For teachers – the development of an online system for working with content, creating a platform for managing educational processes and obtaining data for approval quality management decisions
Development and implementation of the innovation development strategy of Ukraine of the future	A vision of how to develop innovation in the next 3-5-10 years in order to facilitate the creation of billion-dollar companies and compete with technologically developed countries
Military-tech development	The launch of an educational, innovative military technology cluster, the task of which is to support and implement ideas and projects related to military technologies. This will speed up our victory on the battlefield and create the foundation for the economy of the future

education into reality, modernizing the methods of education. For example, for this, it is necessary to reorient the curriculum and methods of teaching the material to those that emphasize the application of acquired knowledge in practice. It is possible to reduce the number of lecture hours with the simultaneous development of information support for the participants of the educational process: filling of repositories, development of interactive courses and the possibility to pass on various platforms, use of multimedia and advanced functions of programs for organizing video conferences, diversification of methods of providing theoretical material. Here it is advisable to refer to the international experience of adapting the educational process to the needs of the time: for example, in the USA and Canada, virtual universities were created as an alternative to traditional education,

where every student can study basic distance courses on the basis of any university. And in Europe, open universities of distance education were formed, which in terms of content is a group of educational institutions that implement distance programs. In order to implement the described principle, it is advisable to provide education seekers with mentors for a qualitative approach to creating an individual learning trajectory.

Thus, the construction of a flexible virtual educational environment, which will be aimed at taking into account personal needs, supporting and developing the individual abilities of students, can be carried out using the example of the practice of tutoring – the technology of individualization of education, which involves the creation of real conditions for the entry of each subject with his aspirations and opportunities in the learning process, how to manage it with your own educational trajectory. Initiating the appearance of tutors in institutions of higher education will have an innovative nature of changes, which will help Ukrainian universities integrate more thoroughly into the European educational space and increase the competitiveness of domestic educational institutions.

It is believed that the history of this position has its origins in the initial stages of the formation of Oxford and Cambridge, but currently tutoring is an official part of the English university system, which defines as its purpose the development of the ability to think through the independent work of a student accompanied by a mentor, who is fixed at the beginning of studies and is retained until its ending. The activity of the tutor includes the selection of the program for his ward, the recommendation of a certain algorithm of classes and the control of the entire educational process. The task of such two-way interaction is to transform learning into a more individual one, taking into account the psychological and social characteristics of the student, which seems to be the optimal solution for improving the quality of distance education in times of instability and constant challenges.

A tutor must have skills that are not expected in the traditional interpretation of the position of a teacher, which is the main difference between these concepts. At the same time, mentoring involves the performance of a number of functions, which are listed in Table 2 [10].

At the same time, mentors should be competent in various sources of educational materials, use the practical experience of other wards, be knowledgeable in computer, chat and web technologies.

Functions of tutors in higher education institutions

Function	Content
Consultative	Conducting group and individual counseling sessions with students. Assistance to the student in organizing the course program and getting an education in general. Monitoring the implementation of the curriculum.
Managerial	Arrangement of the general and individual schedule of the educational process from the educational course, according to which the tutor works with the group. Organization of group classes for students. Recommendations for recruiting and forming groups listeners. Management and motivation of wards.
Facilitative	Establishment and support of information connections and interaction between students and other participants of distance education. Settlement of various problems and conflict resolution. Adaptation of students to a new form of education. Also, the tutor must have training in the field psychology.

Based on the functions and their content, tutoring can improve the connection between the student and the educational institution, which will contribute to increasing the productivity of the educational process with the determination of the individual optimal trajectory of knowledge acquisition for obtaining the maximum result.

In general, the ability to provide quality education at the national level, especially in crisis conditions, depends on the implementation of comprehensive measures to support innovative developments in the field of education, primarily of an organizational, legal and financial nature. At the same time, a thoroughly developed policy in the field of education and training of specialists for new business needs – the basis of the successful development of the country, the key factor of which is the cooperation of state bodies, business and educational institutions. Therefore, creativity as a process of finding and implementing innovative solutions becomes one of the sources of creating competitive advantages of a modern enterprise [11]. In view of this, the modernization of online education should be carried out with the development of the creative economy and the development of programs to support business and encourage its creation, which is one comprehensive mechanism of encouraging educational migrants to return and stay in the country by creating opportunities to apply the acquired knowledge in practice.

Summing up, it is worth noting the important role of distance learning in times of crisis as a means of minimizing losses in the educational process. However, the Ukrainian education system faces a dual task: ensuring high quality during martial law and developing ways for migrants to return. In order to realize the set goals, it is necessary to carry out reforms regarding the modernization of approaches to the presentation of material and to provide knowledge seekers with up-to-date information. In addition, attention was drawn to the importance of interactive methods of conducting classes and independent study – which emphasized the urgent problem of a lack of sufficient digital literacy among a significant percentage of teachers. International experiences of online learning, which would be appropriate to implement in Ukraine, were proposed for consideration, among which tutoring was mentioned in particular. A notable impact of resilience and creativity skills, which are currently among the key requirements for competitiveness, was also highlighted.

4.2. Implementation of Innovative Learning Technologies in Higher Educational Institutions of Ukraine

The relevance of using innovative learning technologies is due to the rapid development of digital technologies and their impact on all spheres of social life, including education. Their introduction into the educational process will improve the quality of education, make it more accessible and effective for students of higher education with different personal needs and learning styles, access to education in limited conditions, etc.

COVID-19 has accelerated the development of innovative learning technologies in higher education, as most higher education institutions have switched to distance learning, which in many cases has made the use of traditional teaching methods impossible or ineffective. In Ukraine, the relevance of this topic is enhanced by the fact that in the conditions of full-scale Russian military aggression, ensuring high-quality distance learning is impossible without the introduction of innovative technologies, especially those that ensure overcoming educational gaps and reduce the negative impact of lack of access to educational infrastructure.

These technologies can help ensure the continuity of education during crisis situations and help maintain the normal functioning of the higher education system.

In addition to the above, the application of innovative learning technologies as such, based on their specific essential characteristics, will also ensure the development of the key competence necessary for work in the modern world and lifelong education – digital competence (skills for interacting with digital technologies).

Based on their advantages, the use of innovative learning technologies can provide a more flexible and adaptive approach to learning, which will provide students of higher education with the formation of an individual educational trajectory and, on this basis, form their effective preparation for professional activities.

Despite the significant attention of scientists and practitioners to the study of this topic, there are a significant number of debatable issues that arouse interest among researchers and educators and require attention. These include the implementation of innovative learning technologies in educational interaction, the impact of the availability of digital technologies on the effectiveness of their use, requirements for teachers' competencies to successfully use innovative learning technologies, ensuring the safety and privacy of participants in the educational process during use.

Taking into account the above, the purpose of the work is to substantiate the theoretical and methodological foundations and develop a conceptual model for the introduction of innovative learning technologies in the study of academic disciplines in higher education institutions of Ukraine.

To achieve the goal of the research, it is necessary to clarify the essence of the concept "innovative learning technologies" (hereinafter – ITN).

We suggest that ITN be considered as a comprehensive approach that combines various methods and tools, primarily digital, for the implementation of the content of learning within one discipline or certain types of educational activity, the application of which is aimed at increasing the effectiveness of the learning process and improving the quality of students' knowledge.

The proposed definition makes it possible to distinguish two key components of ITN: means and methods of ITN. ITN tools are auxiliary components, thanks to which the specified goal and learning results are achieved within the educational process within a certain time, which increase the quality of the educational process and educational support, and include technologies structured by purpose for:

1) technologies for providing access to information and communication (electronic libraries, the Internet, social networks, etc.);

2) computer learning technologies that allow using programs to support learning (electronic textbooks, virtual simulators, simulators, etc.);

3) distance learning technologies that allow you to acquire knowledge and skills remotely, using digital devices, such as video conferences, webinars, etc.

According to the content, it is advisable to divide the means for ITN into:

– hardware (computer classrooms, local and global computer networks, electronic demonstration equipment, computer training laboratories, etc.);

– program-methodical (educational, control, simulation-modeling, instrumental, service programs), program-methodical complexes, etc.;

– educational and methodical (educational and methodical manuals, regulatory and technical documentation, organizational and instructional materials, etc.) [12].

We propose to define methods in the context of IT as ordered methods of interrelated, purposeful activity of the teacher and students, aimed at on the effective achievement of learning goals, based on the use of various digital technologies that provide an interactive and individualized approach to learning, taking into account the needs and capabilities of each student.

They include such methods as: 1) gamification; 2) training using virtual and augmented reality, which allow creating an immersive learning environment (simulators, virtual laboratories, applications with augmented reality, etc.); 3) adaptive training, which allows for individualization of training for each applicant, taking into account his needs, abilities and peculiarities (individual training support systems, data analysis, etc.); 4) mobile learning.

It should be emphasized that when using educational technologies, both traditional and innovative, the integrity of the pedagogical system must be ensured, which requires compliance with the following rules:

– the system of educational technologies should consist of various forms, the choice of which is determined by learning goals (competencies), as well as psychological and pedagogical requirements for the educational process;

– educational technologies must be related thematically, logically, organizationally, emotionally and personally;

– the complexity of the specific educational technologies used should have an incremental nature from the beginning to the end of the implementation of the educational process.

The advantages of ITN in the educational process are due to their diversity and a wide range of goals that can be achieved with the help of their application.

However, it should also be noted that the use of ITNs has limitations and disadvantages, so their introduction should be justified and effective:

– the use of ITN usually depends on the availability of digital devices and software. If such resources are unavailable or unsuitable for use, this may lead to a limitation of the possibilities of their use in the study of academic disciplines;

– depersonalization due to the reduction of opportunities for communication and interaction between students and teachers, which can cause deterioration of social skills;

– depersonalization due to the possibility of distancing the teacher from the student, which can reduce the quality of education, especially for students who need additional support or personal communication with the teacher;

– demotivation due to monotony and low productivity, especially if the system of educational technologies does not take into account the peculiarities of students and their motivation;

– the high cost of ITN both for higher education institutions (to effectively work with some ITN, it is necessary to have high-quality equipment and software, which can increase the costs of equipment and support), and for students, especially those who have limited financial opportunities;

– dependence of acquirers on the use of technologies, technology or software of a certain type to perform specific tasks.

This may limit their ability to work with other tools or methods that may be necessary in the future for their professional development.

Therefore, the use of ITN should be balanced, pedagogically justified and aimed at improving the quality of education and development of students, taking into account all their inherent shortcomings and peculiarities.

The results of the conducted research made it possible to determine that ITNs have a significant number of advantages, especially in the current conditions of the functioning of the educational sector of Ukraine. At the

same time, their introduction requires taking into account a significant number of factors that can affect the quality of education. Considering this, the purpose of the study is to develop a model that can be used by teachers of higher education institutions when introducing ITN in the study of academic disciplines.

After summarizing the research of scientists, we propose to implement ITN in the educational process according to the following sequence of stages, described below.

The first analytical stage involves substantiating the feasibility of introducing ITN, taking into account the interests of all stakeholders.

It determines the technological paradigm (which technologies are used to implement and plan the implementation of the educational program with the determination of prioritization and the ratio of traditional technologies and ITNs). On its basis, the selection of specific ITNs or the decision on their design is made, which must take into account the pedagogical qualifications of teachers; the specifics of the educational discipline Material and technical support of the educational program.

It provides for the initial selection of academic disciplines for which it is appropriate to apply ITN within the educational program. The choice of ITN is largely influenced by the specifics of the academic discipline.

A key characteristic is its openness to ITN, which includes:

- readiness of students and teachers to use digital technologies. They can be willing to use new technologies, or be conservative and avoid them;
- skills and experience in using digital technologies. Students and teachers who have high levels of digital skills may be more open to using them.

In addition to the above, it is advisable to take into account:

- nature of the material (theoretical/practical). For example, if it is about teaching programming, then ITN can include gamification, adaptive and mobile learning with access to online resources for additional study;
- the need to develop practical skills. For example, when studying medicine, ITN can include simulation virtual simulators and interactive models to help students gain practical experience;
- level of difficulty. For example, the use of augmented reality in engineering can help students understand complex technical concepts.

It is also mandatory to check the "adjustment" of ITNs for learning outcomes that require such ITNs that would maximally ensure their

achievement within the allotted time while minimizing the educational load of the applicants.

After the preliminary selection of educational disciplines for which the expediency of using ITN has been determined, the guarantor of the educational program analyzes the interest of students in using ITN during their studies.

To obtain information, it is possible to use:

- a survey, which may include questions about what digital technologies they already use in education, what their needs and expectations are for ICT. You can also ask students what they lack in traditional teaching methods that would help them learn the learning material;

- observing students during classes and studying how they interact with digital technologies. For example, you can observe how students interact with mobile applications or electronic textbooks;

- focus groups where students can freely discuss their opinions and experiences regarding the use of ICT. Focus groups can help identify common trends and needs among students. For example, if students express a desire for more hands-on experience, the use of simulators or virtual learning environments may be considered. If students want more interactivity and involvement in the learning process, you can consider using social networks for collaboration and exchange of ideas.

Based on the results of the above-mentioned procedures, a certain bank of possible INTs is created for educational disciplines and the educational program as a whole. On this basis, the design of the INT system for a certain educational discipline is carried out in the future.

First of all, pre-selected ITNs for the educational program are evaluated from the point of view of the availability of resources for their implementation. Individual technologies such as gamification are not resource-intensive, while immersive digital learning technologies require significant resources that may require significant financial costs. The absence or lack of a certain type of resource makes it impossible to use the appropriate type of ITN within the academic discipline.

Priority should be given to those ITNs that provide:

- interactivity: involving students in active learning and promoting their interaction with the teacher and other students;

- flexibility: the ability to adapt to different pedagogical tasks and learning styles, which will allow teachers to work with different groups of students;
- motivation: ensuring interest in learning and stimulating productive work;
- security for use by students and teachers, ensuring confidentiality and protection of personal data;
- open source: if the ITN is open, it allows the possibility of adding features and supporting development by the community, which provides more flexibility and possibility of development.

The end of the analytical stage is the development of the ITN implementation project, which defines: a brief description of the ITN (disclosure of the idea and essence of the ITN, conditions, technical features, etc.); goals and justification of the need to implement ITN (reasons why ITN should be implemented from the point of view of students and teachers – advantages and disadvantages); result expected from the implementation of ITN.

The second stage is the preliminary examination and approval of the ITN project for the educational discipline by the guarantor of the educational program in accordance with the procedure established by the institution of higher education for approving work programs of educational disciplines.

In the case of a positive decision regarding the implementation of ITN, further development of the ITN project is carried out. At this stage, it is supplemented with the following components (in particular, a list of documents that will need to be developed): basic characteristics of ITN; the strategy of using ICT in the academic discipline; types of educational classes and educational activities for which ITN has been introduced; tasks for which appropriate use of ITN is determined; assessment strategy and methods; specific requirements for technical support, other necessary resources.

In order to study the possibility of implementing ITN, interested persons, in accordance with the internal quality assurance system of the higher education institution, must analyze the documents provided according to their field of activity, provide conclusions regarding the possibility / impossibility of implementing ITN (or the conditions under which implementation is possible) and, if available, their proposals or comments on the project.

For the examination, we suggest using the criteria developed by [13], adapted to the research tasks and the specifics of higher education: methodological (relevance, scientific validity of ITN); procedural (the degree of development of the ITN implementation process, its compliance with the goals and learning outcomes); resource (optimality and sufficiency of personnel, information and communication, technological, material and financial resources); effective (the effectiveness of diagnostic tools for achieving the goals of implementing ITN).

The teacher-developer conducts an analysis of the received conclusions, summarizes comments and suggestions, carries out appropriate revisions of the ITN implementation project and, in case of disputes, identifies unconsidered suggestions / comments for the purpose of discussing them at a meeting of the unit responsible for the development and monitoring of the educational program.

The next stage involves the final approval of the implementation of the ITN project. The ITN project is subject to approval by the unit that ensures the approval of educational programs and programs / syllabi of educational disciplines in accordance with the procedure established by the local regulatory framework of the higher education institution.

In order to prevent possible errors, to check the effectiveness of the ITN, to determine the ability of the ITN to meet the requirements, at the fourth stage, the approbation of the use of the ITN should be carried out and its results analyzed. For example, if mobile learning is used, a trial should be conducted where the technology can be tested on a group of students and the effectiveness of its use evaluated.

During the approbation implementation, it is necessary to get feedback from students and teachers, to evaluate their satisfaction and the level of comprehensibility of the materials that were provided with the help of ITN. It is also necessary to evaluate the impact of ITN on students' success and their level of knowledge. The collected data should be analyzed to determine the advantages and disadvantages of ITN, as well as to form recommendations for its further use. At the same time, it is important to collect not only numerical data, but also feedback and comments to gain an understanding of exactly how students perceive ICT and how it affects their learning and development.

In the process of approbation implementation, changes can be made to the ITN to improve its effectiveness and clarity. After analyzing the results

of the approval and making the necessary changes, ITN can be introduced into the educational process. Monitoring their use is a mandatory stage that increases the effectiveness of the introduction of IT. This makes it possible to evaluate the efficiency of using IT, identify problematic points and find ways to solve them.

In order to conduct it, it is necessary to determine the criteria for evaluating the use of ITN. They can be indicators of the effectiveness of the educational process, changes in the level of knowledge and skills of students (the number of unsatisfactory grades, exam results, general and qualitative success), a decrease in the number of missed classes, an increase in the satisfaction of students according to the results of their survey, etc.

Various tools can be used to collect analytical data, such as questionnaires of students and teachers, focus groups with them, observation of the educational process, analysis of educational achievements, etc.

The obtained results should be used to make changes in the educational process and improve the use of ICT in the study of disciplines.

4.3. Online Education as a Factor for the Formation of Students' Competitive Advantages

Online education in Ukraine and around the world has become an integral part of the educational space. This happened both at the state level and at the level of private educational institutions. A special feature of online education has become practicality, convenience and obtaining new competitive advantages (first of all for students), which can be used in future employment.

Online education offers access to a large number of higher education institutions to a wide range of students. Including those studying face-to-face on campuses, working students. Thus, online education opens up additional opportunities to gain new knowledge or a degree with help of your work experience to be able to change your career path.

Online education is convenient for people who:

- looking for the possibility of flexible time planning;
- decided not to participate in face-to-face education;
- have unusual circumstances, such as war or the COVID-19 pandemic,

which has affected all the world's education systems.

Online learning platforms offer the opportunity to learn anytime, anywhere, regardless of any time schedule constraints. Education, in general, is the process of acquiring skills and knowledge through training or other methods, regardless of any specific goals. In addition, online learning offers a real opportunity for those with diverse lifestyles to learn without limitations in a safe environment.

Pupils and students will also be able to improve the management and organization of their course content with the help of e-learning tools. In addition, online learning offers individual "classrooms" to share information that may be useful for students to gain a more complete understanding of the curriculum.

Online learning tools can improve students' social cooperation and help them connect with peers and discover people with similar interests in a safe and socially open environment.

However, the actual implementation of online learning contains certain obstacles and difficulties. Despite the fact that e-Learning (online learning) has additional functions, for example: issuing grades, discussing in the chat, electronic correspondence, quite often the elements of online education are duplicated in various messengers, blogs, social networks. There is some doubt about the effectiveness of eLearning collaboration tools compared to other collaborative software available.

Technologies in education have improved the learning process – education is becoming essential for modern learning. Technologies must be used as an educational tool; thus, attention should be paid to how students form goals for adopting advanced technologies. Technology-driven learning systems are easy to implement among students because of the convenience it provides; moreover, the process of this modern way of learning is not limited to instructors or facilitators; moreover, physical distance is no longer an issue.

Computers in education are used as a tool in the online learning process. Students can use different devices such as smartphones and laptops, giving them more freedom to access e-learning at their own pace. This gives them a sense of self-regulation (autonomy) regarding education as a whole.

Today, many university students use various versions of online learning tools and learning methods. However, as far as the courses are concerned elements of online learning, how effective are they for both teachers and students?

Many students can be easily distracted and confused if they lack the basic knowledge of how to properly use online learning tools. The degree to which online learning meets the needs and characteristics of university students needs to be examined.

An important factor in the increased competitiveness of online higher education graduates is that e-learning provides students with access to new levels of education that were previously unavailable. Such an example can include systems of parallel education, when a student receives two diplomas from different specialties. In this case, online education greatly facilitates and speeds up the process of obtaining additional education.

In addition, online education plays a key role for educational institutions that want to address the resource barriers needed to increase their physical structure (premises, equipment and personnel). Thanks to this, they can increase the number of students, receiving the additional benefit of reaching students in the educational process outside their campus.

Within the studied factors of online education that affect the growth of students' competitiveness, it is worth emphasizing the process of obtaining online education, which can include:

- the very structure of the course;
- online course design;
- skills needed by both teachers and students;
- course monitoring and management.

Online learning platforms provide their list of factors related to the success of future graduates, such as:

- a smaller volume of structured experience for students, since there are few or no face-to-face meetings in the online process;
- instructions for teaching in the course and what technologies should be used and implemented (this is an extremely important issue for both teachers and students);
- selection of original methods and strategies for discussion of issues and exchange of course materials, which could be easily provided in the online environment and face-to-face (in the online education environment, there should be a single theoretical method that would allow unifying the process of information transfer without losing its content).

Although the success of a student in any learning environment, and in our case in an online environment, depends on a large number of aspects,

not all of these aspects are controlled by the teacher. It is the responsibility of university faculty to mitigate and anticipate obstacles during the online learning process. Similarly, instructors with a thorough knowledge of online learning methods and strategies, as well as the ability and skill to implement them, will be able to deliver an excellent online course to meet the course objectives and ensure that their students not only enjoy the experience, but and such necessary competitive advantages as additional soft-skills [14].

The development of online education involves a gradual increase in student autonomy, since the online learning process itself is based on the principles of self-management. Students understand what is expected of them and gain the extra confidence they need to succeed. It is this necessary quality of a future specialist (regardless of the profession), such as self-organization, that is in the greatest demand among employers. Teachers and leaders can accelerate the development of this quality.

Among the skills required by the employer, the following can be distinguished, which can be easily obtained in the process of online education at universities and schools:

1. Responsibility is a key skill of candidates in modern conditions. She ranks first in the ranking of the most desirable qualities of a potential employee.

In 2023, 80% of all jobs that mention soft skills require candidates to be responsible. Employers want to work with people who will complete the assigned tasks within the specified time. In the case of the benefit of online education for the development of responsibility, it can be noted that the basis of all online courses is a clear schedule and specific deadlines for the completion of certain tasks. The Bologna system of higher education encourages students to responsible attitude, and the online format provides the necessary time and target restrictions.

2. Tactfulness is a quality that implies compliance with the rules of conduct, the ability to understand the current situation, minimization of possible conflicts, and the availability of business communication skills.

The online format of education and work involves large volumes of communication in messengers, e-mail, work chats, and video communication. By mastering communication skills in the "online" mode, students learn tactful correspondence and tactfulness in video conferences,

because the online format allows for preliminary preparation for dialogue, in "online" you have more time to formulate your thoughts.

3. Analytical skills are quite a necessary trait, the ability to analyze and critically assess the situation is currently necessary in our dynamic environment. Online education allows you to use additional software and methodological tools for data analysis and work with a large amount of data.

4. Self-organization is "...the ability of a person to organize his activities in such a way as to fully realize his potential and fulfill the tasks" [15]. In today's realities, potential employees need to adapt to the situation and organize their work in such a way as to perform the assigned tasks with maximum productivity. Online education, with the help of self-management principles, stimulates the development of this skill and aims at its further improvement.

5. Multitasking is one of the TOP-10 most desirable skills for employers. They are looking for candidates who can do several tasks at the same time or be a multidisciplinary employee. Online education, in turn, helps to multitask and get several specialties at the same time. Among the new qualities that are valued in vacancies are the following: flexibility, mobility and adaptability. The development of these characteristics can be accelerated through the use of online learning tools.

However, there are some skills that have been "suffered" by distance learning and online education.

1. Teamwork skills. The coordinated work of the team is, first of all, the key to the successful performance of the tasks set by the team. The presence of good relations in the team is a guarantee of high efficiency and flexibility of all team members.

2. Sociability – it is manifested in the candidate due to the ease of finding a common language with other people, openness.

In the case of distance education and work format, students and potential candidates lose this skill, the lack of live communication makes a person less communicative and socialized.

In addition to the qualities that online education develops or minimizes, it is worth considering in more detail the advantages and disadvantages of online learning tools and methods.

Small and medium-sized colleges and universities provide great value with classrooms of about twenty students or less. Open discussion promotes learning.

Providing that same dynamic online and creating a curriculum to support it is incredibly difficult. This is complicated by systematic traditions and routines. Educators integrate a variety of tools – multiple whiteboards, electronic media, and demonstration materials – that maximize the teaching and learning experience in a physical space [14].

The pandemic led to the sudden closure of universities in the spring of 2020, educational institutions in Ukraine combined existing synchronous and asynchronous platforms (e.g. Zoom, Google Classroom, Canvas) to find a way out of this situation. The bar for success was quite low, with many schools noting that they managed the transition quite easily. Students, pupils and their parents were mostly unhappy, but agreed given the circumstances. However, as online learning takes on an increasingly prominent role, it is unclear how current technologies will keep up with the growing expectations.

Internet access and connection reliability remain a huge challenge. In a synchronous online learning environment, a momentary loss of a teacher's Wi-Fi connection results in the loss of an entire class. Wi-Fi in dorms is now even more important as the dorm room becomes a classroom.

Technology and infrastructure upgrades for educational institutions are a must. As well as investing in new curriculum and ensuring that pupils and students are properly equipped to participate in the online education process. However, all this is not simple. Many schools and universities operate exclusively from the state budget, therefore, during the war, their funding was cut or completely eliminated.

For small and medium-sized institutions, developing a strategy to address the cultural, operational, technological, and financial challenges of online learning begins with thinking about how it can be used to enhance the in-person educational experience, not replace it. Exploring creative ways to approach face-to-face online dynamics makes sense in the short term. The potential is already visible for startups created by students who survived the first days of the pandemic in the spring and think: "The online experience was not very good. Here is a better offer" [16].

In the future, you can expect a lot of smart, incremental ideas from students about how to improve their own online learning experience.

Summarizing the above, we can say that stakeholders and management of higher education institutions are primarily concerned about the effectiveness

of online education. Negative reviews of online learning, physical isolation and lack of experience are just some of the disadvantages that both teachers and students themselves pay attention to [14].

On the other hand, there is growing evidence to the contrary and a growing focus on online education, both at the university and school level, as well as within specialized online courses. Employers are already used to the idea that the vast majority of young professionals studied online, so they will focus on additional skills and mobility of applicants. Those job seekers are realizing that they can acquire additional soft skills through online education to be more competitive in the job market.

4.4. Distance Education:

the Case of Vynats National Agricultural University

The full-scale invasion of the Russian Federation on the territory of Ukraine affected all aspects of life in the country, including education. The special role and significance of higher education as a key factor in the development of society is manifested precisely in the conditions of war. After all, it allows you to train highly qualified specialists for the development of the economy, science, ensuring national security, military defense and other segments of the country's economy and life.

Today in Ukraine, most institutions of higher education conduct educational activities in a mixed or exclusively distance format. During the COVID-19 pandemic, distance higher education has become relevant in many countries of the world. It allows students to study from anywhere with internet access, which makes it attractive. In times of war, the distance learning format is a safety requirement for students and teachers.

The purpose of the study: to determine the specific problems of the implementation of distance learning during the martial law at the Vynnytsia National Agrarian University (VNAU) and to propose ways to solve them.

Objectives of the study:

- to assess the level of organization of the educational process in the conditions of distance learning during martial law, the work of the university administration in ensuring the safety of the educational process;
- to study the level of satisfaction with the quality of education and the quality of remote classes during martial law;
- determine the level of stress due to martial law;

- to find out the change in educational priorities of higher education seekers in the conditions of martial law;
- to study the impact of martial law on the academic performance of students of higher education;
- to find out the volume of classes attended by students of higher education and what difficulties they faced in the distance learning process;
- to determine the ways and tools for solving the problems of distance learning in the conditions of martial law.

Research methodology: the research is based on an anonymous survey of higher education applicants, which was conducted from May 10 to May 15, 2023 using the Google Form online resource. The questionnaire contained 16 questions, a third of which were open-ended.

The total number of respondents was 1,070 people, of which 710 people (72%) obtained the first level of higher education, 360 people (31%) – the second, full-time and part-time forms of education. The number of respondents is a fourth part of the total number of higher education graduates of VNAU.

Analysis of respondents' answers to the question "How do you assess the level of organization of the educational process in the 2022/2023 academic year under martial law?" shows that students of higher education rated it as quite satisfactory.

The survey shows that the majority of respondents – 56% – are completely satisfied with the level of organization of the educational process in the 2022/23 academic year during the full-scale aggression of the Russian Federation. 35% and 8% rated the organization of the educational process as satisfactory and average, respectively. Only 1,5% of respondents answered that they were not satisfied and 0,25% were not completely satisfied with the organization of the educational process. Dissatisfaction of a small share of higher education applicants is explained by their desire to study in an offline format.

It is worth noting that an important task for university management during martial law is to ensure the safety of the educational process. Yes, more than half of respondents – 55% of respondents consider it quite satisfactory, 38% – satisfactory, 7% – average. Only 1% of respondents consider the safety of the educational process to be unsatisfactory and categorically unsatisfactory.

A large part of the surveyed higher education seekers (90%) are satisfied/completely satisfied with the quality of education during martial law. 10% of respondents are somewhat satisfied or dissatisfied with the quality of education. Only 0,5% of respondents are categorically dissatisfied.

Along with this, answers to the question "What difficulties did you encounter in the process of distance learning under martial law?" (with the possibility of choosing several options) were distributed as follows: problems of a technical nature (access to the Internet, power outages, lack of necessary equipment) – 71%; did not think about this issue – 29%; the difficulty of performing practical tasks by profession without access to workshops and laboratories – 22%; insufficient knowledge of computer technologies – 11%; insufficiently formed skills of organizing independent work – 8%; insufficient level of feedback from teachers – 6%; untimely delivery by teachers educational materials for distance learning – 3.6%; untimely informing by teachers about the deadline for tasks – 3,5 %, 3,3% of respondents chose their answer option.

In our opinion, an essential lever for ensuring the quality of distance learning during martial law is the discipline of teachers, which is manifested in compliance with the class schedule, the timeliness of uploading educational materials to the Moodle online educational platform, checking the tasks completed by students and justifying the assigned grades.

Thus, the responses of the respondents showed that teachers follow the schedule of classes (91%), the schedule of classes is partially followed (7%), only 1,5% of respondents noted that teachers do not always follow the established schedule of classes. At the same time, less than one percent (0,6%) have their own answer to this question, for example, omissions by teachers due to objective conditions.

The distribution of the answers of higher education applicants regarding their actual academic discipline is interesting. Yes, the analysis of the answers to the question "What amount of classes do you have the opportunity to attend in the current conditions?" showed that almost half of respondents (47 %) had the opportunity to attend 71-100% of classes; a third of respondents (30%) attended 51-70% of classes; 14,5% of respondents visited from 26 up to 50% of classes and only 8% of respondents attended less than 25% of classes.

It should be noted that these results are slightly different from the data obtained a year ago. Compared to last year, VNAU higher education students prefer distance learning in synchronous mode, while in June 2022 – distance learning in asynchronous mode. On the plus side, students want to be directly involved in online learning. The share of respondents who attend less than 25% of classes explains this by the lack of access to a stable Internet or by being busy at work or volunteering.

At the same time, it is worth noting that a significant part of respondents (61%) are convinced that martial law did not affect their academic performance, 8,5% of respondents believe that martial law improved their academic performance, but a third (31%) believe that their academic performance has become worse.

We believe that a very difficult task for university management and teachers during martial law is to ensure a favorable psycho-emotional atmosphere in the online audience. After all, all participants in the educational process are victims of war: someone is under occupation and suffers from it, someone is in a zone of active hostilities or a front-line zone and constantly experiences stress from massive shelling, someone is abroad in a foreign language and cultural environment and has difficulties in adaptation. The life circumstances of each participant in the educational process significantly affect learning and teaching.

Therefore, when answering the question "Do you feel an increased level of stress due to the effect of martial law?", the majority of respondents indicated that they had an increased level of stress due to the effect of martial law. Of them, 42% state that the level of stress has definitely increased, and 47% believe that stress affects them partially. At the same time, 11% of respondents do not feel an increase in the level of stress due to a full-scale invasion, and 3 people (0,3%) have a different answer, including the use of antidepressants.

The results of the survey showed that in connection with the implementation of martial law, almost 45% of respondents changed their educational priorities, and almost 55% of respondents noted that they remained the same as before the war, 0,3% of respondents have their own opinion (for example, volunteering during wartime takes precedence over studying).

It is worth noting that along with the general positive indicators of the organization of the educational process during the martial law and a number

of positive reviews and words of gratitude to the teachers and management for the organization of work in difficult conditions, there are separate comments and remarks of students of higher education. Among them are the issues of the need to visualize (present) the lecture material of individual topics of the educational components, fill the educational online platform Moodle with methodical materials for processing the educational material, reduce the amount of independent work, timely feedback to the teacher regarding the performance of practical tasks, etc.

So, the results of an online survey of higher education applicants revealed the main problems of distance learning in the conditions of martial law at VNAU:

- partial lack of visualization of educational material for educational components;
- partially absent or untimely feedback in the asynchronous learning mode (awareness of students regarding the quality of independent tasks and the points awarded to them);
- untimely updating of methodical materials on the online educational platform Moodle (lists of literature, current tasks);
- technical points (lack of communication, electricity, security situation, finding higher education applicants and scientific and pedagogical staff in different time zones).

We believe that motivational problems prevail against the background of these organizational problems. Despite the undoubted advantages of online learning (access to educational resources for training sessions and materials from anywhere in the world; use of state-of-the-art IT technologies and online tools; provision of safe learning conditions during martial law, etc.), there are significant disadvantages, including the lack of direct offline communication between all participants in the educational process, which leads to a gradual decrease in the motivation of higher education seekers to distance learning.

In view of the results of the survey, we consider the following to be the optimal ways to solve the identified problems in order to provide quality educational services:

- unconditional compliance with safety rules in the online educational space by all participants of the educational process (through constant explanations and systematic briefings);

- creating a backup copy of all educational materials and placing them in a cloud environment;
- constant monitoring of the psychological state of employees and students of the university, special attention to stress and risks of depression, provision of appropriate support and assistance;
- application of a flexible approach to drawing up a schedule of educational classes;
- increasing the motivation for distance learning by visualizing and diversifying the presentation of the material through the use of various applications and programs for creating presentations (adding video materials and interactive elements, etc.); use of the resource of online laboratories;
- recording of mini-lectures on individual topics of the educational component and placing them on the Moodle online educational platform for visual study of the topic in asynchronous mode;
- mandatory announcement at the first lesson of the number of tasks, deadlines and points that will be awarded; regular information students about their results and reminders about the deadlines for submitting assignments (it is recommended to set a deadline for submitting work on the Moodle educational platform);
- providing mandatory feedback to students in an asynchronous learning mode, for example, using e-mail, communities in messengers, forums or online consultations;
- regular updating of methodological materials on the Moodle online educational platform, including current lists of literature and assignments (recommended involvement of higher education applicants in updating materials by collecting proposals and feedback from them);
- entrance and exit survey of higher education applicants to determine the relevance and necessity of the lecture material, tasks proposed for practical and laboratory work;
- diversifying online education of higher education students with cultural and leisure activities, actively involving representatives of student self-government.

More than 90% of respondents are satisfied with the quality of education and the quality of distance learning. Those seeking higher education will demonstrate a fairly high attendance rate for distance learning. Along with this, a high level of stress is observed in a significant number of respondents

due to the effect of martial law and a decrease in motivation for online learning. Despite this, it was found that the educational priorities of higher education students allow them to receive quality educational services. The obtained results of the study indicate that, in general, higher education graduates of VNAU have adapted to the challenges of martial law. On the basis of an anonymous online survey, it was established that about 60% of respondents are quite satisfied with the level of organization of the educational process in the conditions of distance learning during the war. Almost all respondents positively evaluate the work of the university administration in ensuring the safety of the educational process.

We believe that the proposed ways and tools will allow to minimize or solve the problems of distance learning in the conditions of martial law.

The case of VNAU regarding the organization of the educational process in a remote format during martial law may be useful to other higher education institutions of Ukraine.

4.5. Teaching Mathematics of Future Bachelors of Computer Sciences in the Agricultural University

In the context of globalization, informatization and digitalization of society, the system of higher education in Ukraine faces new requirements for the training of IT specialists, in particular, bachelors of computer science. The information technology industry has already changed the world and continues to play a key role in its further rapid development. Thus, professionals in this field are among the most in demand in the labor market of developed countries. However, at the present stage it is a question of training such a specialist who is able to find the necessary information at the right time, analyze it, correlate the obtained information with the tasks to be solved, and on this basis develop adequate ways to solve the problem. As practice shows, the requirements for the level of mathematical training of computer scientists are growing over time. And now it is impossible to train such specialists without thorough mathematical training.

The importance of mathematical disciplines, which are a system-forming element of educational and professional activities of students of the Agricultural University, in particular, the specialty "Computer Science" is growing.

The effective activity of specialists in the modern information space involves high-quality mathematical training, which is characterized not only by the accumulation of a certain amount of knowledge, but also the development of logical thinking, spatial representations; formation of skills to establish causal relationships, substantiate statements, model situations, affects the development of personal and professionally significant qualities of future professionals, allowing them to self-realize in the field of future professional activity. The driving force of the development of mathematical training of students, agreeing with G. Dutka, we see in the dual principle of fundamentalization and professionalization of education, which reveals in the education system contradictions between needs and available means of meeting them, which can give science and practice due to the discovery of new facts and connections, and the emergence of new requests for practice that require the development of new theoretical knowledge. Fundamentalization of mathematics education makes it possible to consider it in conjunction with the training of future professionals. It is a means of transition of a certain set of mathematical knowledge into a new quality – professional and mathematical knowledge, which includes as an important component of intellectual activity, responsibility, independent thinking and principle [17, p. 241].

The study of publications on the problem of mathematical training at the Agricultural University and our own teaching experience revealed a contradiction between the objective need to implement and apply mathematical methods in the teaching of professional disciplines and insufficient development of methods for implementing these methods in the educational environment. Graduation departments require the expansion of some sections of classical mathematics and the introduction of new ones, and departments of mathematical disciplines are not able to provide a satisfactory level of knowledge and skills of students, because, first, study groups include students who do not have sufficient cognitive development (attention, memory, thinking), so unable to master the material of the disciplines, secondly, reduces the amount of classroom workload, which is not desirable to make reductions in the first year. There is a need to restructure and rethink the goals, content, methods and organizational forms of teaching mathematics at the Agricultural University, which will adapt future computer scientists to modern requirements of the

information society and allow them to use the mathematical apparatus in their future careers.

The history of the development of mathematical science is about three millennia and can be divided into several periods. The first period is the formation and development of the concept of number, solving the simplest practical problems in geometry. The second period is associated with the emergence of Euclidean geometry and the substantiation of the method of proving mathematical judgments using logical inferences. The next stage begins with the development of differential and integral calculus. The last period is also accompanied by the emergence and spread of concepts and methods of set theory and mathematical logic, on the basis of which all modern mathematics is built. The entry of society into the information phase of its development at the beginning of the XXI opened new opportunities in the application of information and communication technologies. In turn, the development of these technologies stimulates the emergence of new and improvement of "old" classical sections of mathematics. The next stage of its development begins.

For many centuries, mathematics has been and is an integral part of the system of higher and general education in all countries of the world. This is because the role of mathematics in shaping personality is special. Its developing, educational potential is huge, because mathematics shapes logic – a universal element of thinking. Students carry out mental activity through mathematics, as it is characterized by: the ability to correctly analyze a process or phenomenon and draw conclusions through logical reasoning; the ability to distinguish the proven from the unproven, the known from the unknown; ability to classify, generalize, express assumptions, refute them or confirm a system of logical reasoning, use analogies.

The second important feature of mathematics is its language of symbols as a specific means of communication. Literate mathematical language testifies to organized and clear thinking and mastering it, understanding the content, logical connections and influences the development of ordinary speech, thus making a significant contribution to the formation and development of analytical thinking.

It is necessary to pay attention to one more extremely important feature of mathematics: its influence on development of volitional qualities of the person: persistence, stubbornness, stability, purposefulness, confidence,

creativity, character formation, moral traits. To solve a mathematical problem (not only to find the correct answer, but also the optimal solution) it is necessary to go through a thorny path. In mathematics, the mistake cannot be hidden – there are objective criteria to determine whether the solution is complete and reasonable, and the result is correct. Thus, mathematics contributes to the formation of not only the intellectual sphere, but also the moral traits of the individual.

In addition, mathematical disciplines contain a practical, utilitarian component, which has a completely independent meaning. To navigate in the modern world, everyone must have at least a minimum stock of knowledge and skills of mathematical nature (computational skills, elements of practical geometry, the concept of function and graph, addition and solution of elementary equations, inequalities, systems, proportions, etc.).

Mathematical disciplines at the Agricultural University in the specialty "Computer Science" are usually studied in the first, second, third year of study and are for students one of the most difficult to master the disciplines. The main reason is the abstractness of mathematical theory. Mathematical concepts are more or less successful models of certain real phenomena and processes. Another reason is that a huge amount of theoretical material needs to be studied in a short time. For example, the invention and assimilation of sections of the derivative function and integral has been studied by mankind for several centuries, and students must master these sections in one semester. In addition, mathematical disciplines are full of various ideas and methods, a large number of concepts, so students, including freshmen, are not able to study them in such a short period of time. Due to this, the methodical system of teaching mathematics is forced to intensify its capabilities. Thus, the question of the content, methods and means of improving the quality of mathematical training at the present stage remains quite relevant.

In our opinion, higher mathematics occupies an important place in the system of mathematical training of future specialists-engineers and in the structural-logical scheme of the specialty "Computer Science". The difficulty in constructing mathematics education at the Agricultural University is that higher mathematics in it occupies a dual position. On the one hand, it acts as a special general education discipline, as knowledge of higher mathematics is the foundation for the study of other related and professional disciplines. On the other hand, for most specialties of higher agricultural institutions,

higher mathematics is not a profile discipline. Thus, most students are convinced that mathematics at the Agricultural University does not bring them closer, but distances them from acquiring professionally important knowledge, skills and abilities.

We are convinced that in the first lecture during the acquaintance with students the teacher is obliged to reveal the role and importance of mathematics in further educational activities, the relationship of mathematics with other disciplines, the study of which they consider most important for their future profession.

As an example, we analyzed the educational and professional training program for bachelors in the field of knowledge 12 "Information Technology" specialty 122 "Computer Science" 2022. According to this program, the discipline "Higher Mathematics" provides the study of the following disciplines: physics, information technology, probability theory and mathematical statistics, econometrics, discrete mathematics, numerical methods, algorithm theory, object-oriented programming, systems modeling and others.

Thus, in the structural and logical scheme of the educational process, the discipline "Higher Mathematics" is the starting point. It precedes the study of physics, probability theory and mathematical statistics and virtually all related and vocational disciplines.

In particular, the analysis of work programs and educational literature on physics showed that the concepts and methods of linear and vector algebra, mathematical analysis are systematically used in the introduction of many theoretical provisions of the physics course and in solving specific physical problems. The study of the physical foundations of the theory of electric current and electromagnetism is based on the concepts of vector analysis and vector algebra (linear operations on vectors, types of products of vectors, gradient, divergence, flux, etc.). The study of oscillatory motions and waves is based on the knowledge of concepts and methods for solving ordinary second-order differential equations, concepts that are related to partial differential equations. If you analyze the programs of disciplines of professional training, you can also see a number of mathematical concepts used in the study of these disciplines.

Thus, it is obvious that the content of teaching mathematics at the Agricultural University is the basis for studying the disciplines of

fundamental and professional training of bachelors in computer science, so the mathematics course should be more dynamic, subject to constant correction, improvement in modern science and technology.

In addition, the problem of the ratio of classical and applied mathematics in agricultural institutions has acquired new aspects.

There are different views on the content of mathematical disciplines in the Agricultural University. We see ways to improve the quality of mathematical training by strengthening the internal logical connection of the discipline on the basis of scientific knowledge. This is due to the fact that in contrast to applied knowledge, fundamental, theoretical aging is slower, the methodological effectiveness of the latter is much higher.

Thus, the value of the methodology of theoretical knowledge is beyond doubt. However, it would not be enough to limit the teaching of mathematical disciplines to a fragmentary illustration of professional problems. There must be a systematic, deeper and multifaceted connection. Based on the above, we have the opposite point of view, which provides for a broader inclusion in the content of mathematical disciplines of an applied nature. This is due to the fact that in the study of such disciplines, students do not acquire the skills to apply mathematical knowledge in further educational and professional activities. In particular, the implementation of interdisciplinary links of fundamental and professional disciplines, the implementation of educational material of professional orientation should not violate the interdisciplinary links of mathematics, the logic of the discipline, turn it into a cycle of separate, unrelated issues.

Thus, mathematical disciplines in agricultural universities must meet the requirements of fundamentality and professional orientation.

An in-depth analysis of the state of mathematical training of students of higher technical educational institutions was presented in the works of T. Krylova [18]. The results of her research and her own practical experience show that the times of "abstract" mathematics courses, designed equally for "pure" mathematicians, applicators and high school teachers, have passed irrevocably. Requirements for mathematical education of a modern specialist, in particular bachelors in the field of "Information Technology" have changed significantly recently. There were courses in special sections of mathematics. However, before studying these sections and applying them in research and practice, the student must understand the basic concepts,

ideas and methods of mathematical science. And this cannot be achieved without mastering the classical sections of mathematics.

Unlike the study of mathematics at the mathematical faculties of classical universities, in agrarian higher educational institutions the teaching of mathematics does not aim at the detailed disclosure to students of the sections of mathematics, their logical structure. Mathematics is practically not studied for applied, practical purposes and is not considered as a means to solve professional problems. The main focus is on mastering the general techniques and tools, rather than on the development of skills of strictly logical processes of reasoning and proof. In the first place is the habit of using ready-made answers and various aids without proof.

It is obvious that the course of higher mathematics for bachelors of computer science should be continued by the course of applied mathematics, but not narrowly utilitarian and prescription, but one that contains the necessary theoretical provisions. Applied mathematics is not a simplified version of pure mathematics, the latter is not a higher degree than the former.

Thus, studying the process of teaching mathematics, in particular higher, in agricultural universities, based on the research of scientists, methodologists, we believe that the teaching of mathematics in such educational institutions should be subject to the following goals:

- to report the basic theoretical provisions necessary for the study of related and professional disciplines, to teach the appropriate mathematical apparatus, based on the principles of fundamentality and professional orientation and based on the rationale of the empirical material;

- to develop skills and abilities to solve applied problems: to translate a real situation into mathematical language, to choose the optimal research method, to interpret the research result and to evaluate its accuracy;

- to form skills of bringing the solution of the problem to the final result – the exact correct conclusion, numbers, graphs, using computing tools, reference books, tables;

- combine traditional and information and communication technologies in educational activities;

- to form the ability to use the available scientific and methodological literature, to independently understand the mathematical apparatus used in other disciplines;

– to develop analytical and logical thinking, to educate students in applied mathematical culture, the necessary intuition and erudition in the application of mathematics.

Note that the formation of mathematical knowledge, skills, abilities of students of agricultural higher education institutions must satisfy the following principles:

– the principle of purposefulness (connection of mathematics with the relevant field of study);

– the principle of continuity (study of mathematical methods throughout the period of study and their use in courses of professional disciplines, as well as in writing master's theses);

– the principle of continuity (improvement of mathematical preparation for admission to higher education, during training in it and after its completion);

– the principle of modeling (the formation of mathematical thinking, through which the subject reveals the causal links not only in mathematics but also in professional and other social activities);

– the principle of universality (the introduction of professional-applied component that forms the idea of universality of mathematical formulas and methods);

– the principle of motivation (determination of the content of the course of mathematics, forms and methods of the educational process, providing increased interest of students in the study of mathematics, the introduction of clarity through information and communication technologies);

– the principle of self-study and self-education (development of the student's ability to self-study and self-education during professional activity).

Based on the above, the need to modernize the teaching of mathematics at the Agricultural University is obvious.

In the course of our research, some components of the methodological system of teaching mathematical disciplines at the Agar University of bachelors of computer science were developed and clarified, namely: the definition of principles, methods, tools and conditions of implementation.

The purpose of the methodical system of teaching mathematics:

– organic combination of higher mathematics with disciplines, in the process of teaching which mathematical concepts and methods are used;

- ensuring the level of mathematical knowledge, skills and abilities, which guarantees mastery of the foundation of professional disciplines studied at the Agricultural University;

- formation of ideas about the role and importance of mathematics in the development of intellectual abilities of the individual, the relationship of mathematics with other disciplines of the chosen specialty;

- education of interest in mathematics as the main tool for the analysis of production phenomena and processes, the construction of theoretical models that allow to reflect existing relationships in the professional environment, to predict the behavior of objects and their dynamics.

The components of the methodological system are motivational, semantic, activity and effective. The semantic component includes a system of subject knowledge, including concepts, categories, theories, laws; operations of mental activity, the degree of formation of which provides the ability to conduct analytical reasoning, to make the right inferences, to establish causal links between events, facts, processes. The activity component is characterized by systematic, efficient knowledge; ability to learn mathematical positions. The effective component contains information about the ability to apply the acquired mathematical knowledge in the tasks of other professional disciplines and in future professional activities. The motivational component of the system is determined by the attitude of the individual to the teaching of mathematics, promotes the development of such positive personality traits as self-determination, self-esteem, self-regulation of independent learning activities.

The methodological system of teaching mathematics, like any other, is based on the principles of construction, which are based on the didactic principles of higher education, namely: the optimal combination of fundamentality and professional orientation, science, connection of theory with practice, system and perspective, accessibility, priority of independent learning; productive interaction of teaching aids in independent learning activities. The implementation of the principles of this methodical system of teaching mathematics involves the use of a set of methods that are combined with general didactic methods. Based on research in the scientific and pedagogical literature, we distinguish the following methods: information-receptive; reproductive; methods of problem-based learning.

Forms of education perform an organizational function in educational activities and are a means of continuous management of independent educational activities of students. To ensure the quality of mathematics education, we provide the following forms of educational activities: lectures (lecture-presentation, lecture with planned mistakes, problem lectures, video lecture); practical and laboratory classes, where most of the independent work; individual and group consultations; extracurricular independent learning activities; participation of students in conferences, writing projects. The purpose of lectures is the assimilation of theoretical material by students, the formation of mathematical culture, the development of analytical and logical thinking. The purpose of practical and laboratory classes is to consolidate theoretical knowledge, transfer them to the plane of practical application, the formation of information culture, the development of skills to apply information and communication technologies.

At the present stage, it is impossible to imagine educational activities without the use of modern information and communication technologies. Indeed, the computer has become an integral part of everyone's learning. At the present stage, it is impossible to imagine learning activities without the use of modern information and communication technologies. Indeed, the computer has become an integral part of every student's learning, and the use of such technologies is an integral part of the student's learning process, and the use of such technologies is an integral part of the learning process.

In our study, depending on the tasks we set ourselves, we use computer technology as a tool: information, demonstration, modeling, computing, control.

Information and communication technologies contain educational and methodological support of mathematical disciplines. For this purpose, an electronic management system of the higher educational institution "Socrates" is used [19]. Demonstration computer technologies provide an opportunity to make a presentation of a part of a lecture material, a speech at a conference; serve as a means of visualization. Modeling computer technologies (GRAN1, MathCAD,) are of great importance for the intellectual development of the individual. With their help the skills of independent research activity are developed, without which the effective work of the future specialist is not possible.

For example, in the preparation of a lecture-visualization, implementing the principle of clarity, the use of the MathCAD system not only increases the perception of educational material, but also allows you to get deeper into its essence. Visualized educational information, being perceived and understood, serves as a good support for practical application [20, p. 82].

Computing computer technologies (MathCAD, MatLab, Excel) allow you to quickly perform calculations, which allows you to spend more time looking for other ways to solve the problem or to analyze the result.

Controlling computer technology is designed to test knowledge, to determine the level of skills and abilities. Test tasks in academic disciplines are developed according to the "Test Master" program. A successful combination of different types, forms of organization and methods of control is an indicator of the level of the educational process in higher education, proof of pedagogical skills of teachers [21].

It should be noted that only an organic combination of traditional and computer technology contributes to the successful learning activities of students. According to scientific research, when working with a computer, mental capacity is reduced inversely proportional to the studied amount of educational material, in particular, perception by 6%, memory by 10%; local fatigue of the visual analyzer in the process of only automated learning occurs 2-3 times more intensely.

Teachers of the Department of Mathematics, Physics and Computer Technologies of Vinnytsia National Agrarian University developed the content and detailed the semesters of higher mathematics. Since the course of higher mathematics is the same for almost all specialties, in the first year we propose to study the following sections: "Linear and vector algebra", "Analytical geometry", "Introduction to mathematical analysis", "Differential calculus of one and many variables", "Integration functions of one variable", "Differential equations", (in each semester of classroom hours – 90, of which lectures – 30 hours, practical classes – 28 hours, independent work – 32 hours). In the second year it is offered to study other sections of mathematics which are coordinated with final departments according to a direction of a specialty.

Educational and methodical support of teaching mathematics is an educational and methodical complex of the discipline "Higher Mathematics". Such a complex contains the program and work program of the discipline,

lecture notes and presentations, textbooks, guidelines for practical classes and independent work, options for individual tasks and examples of their solution, typical tests, tests, questions for the exam, test tasks.

High-quality bachelor's degree in computer science is based primarily on mathematics. On the other hand, attention to improving the quality of mathematical education of students of the Agricultural University in the field of "Information Technology" contributed to the development of mathematical methods and mathematical modeling, which are used in the professional activities of future professionals. It is not possible to teach a person for life, but the teacher must form and develop a culture of thinking, which will allow future professionals to self-learn and self-realize in the modern world of science and technology.

4.6. Problems and Prospects of the Development of Online Education During the Training of Bachelors in Computer Sciences in Crisis Conditions

With the development of Internet technologies, new opportunities for the educational process are opening up, because the Internet provides unlimited opportunities for everyone, and students in particular, to obtain the necessary information using innovative forms, methods and technologies of education. Interactive learning technologies and various distance learning systems are one of the most effective learning technologies in modern conditions. At the same time, the fact that in modern conditions the distance form of education best corresponds to the peculiarities of the training of students of the specialty is also undeniable "Computer Science". After all, most graduates, and often students, of this specialty choose a remote work format in modern conditions. In addition, students of this specialty have wide opportunities to choose work in international companies and in different countries. At the same time, the distance learning system is more independent and individualized, which, in turn, accustoms students from the first years of study in higher education institutions to constant development, and, as a result, to the expansion of career opportunities in the future.

The problem of innovative development of education is urgent. Innovations in the educational process have a positive effect on the perception of information and allow more active study of disciplines, forming needs for self-education, self-development. Innovative educational

activities help higher education students to increase their motivation and develop creativity.

External factors (coronavirus, martial law) and internal prerequisites are the impetus for improving methods and forms of education. Modern students of education differ significantly from previous generations in the ways of obtaining and perceiving information, which is why it is necessary to look for and use new approaches that can interest them in working hard to achieve results.

The distance learning system is based on the Moodle platform and includes a sufficient number of distance courses that are available to students of all areas of training and educational programs.

The distance course of an optional educational discipline has a standard structure and includes all the necessary information for mastering this educational component. It also provides two-way communication between the teacher and students (via video conference and messenger). Educational simulators in such courses are the uniqueness of the educational components of the "Computer Science" educational program.

Equally important is the fact that distance learning requires students to put more effort into their own learning, but at the same time significantly more efficient and comfortable in terms of time, money and convenience than other forms and technologies of learning. After all, distance learning is available to all consumers of educational services at a convenient time, which is an important component of virtual socialization of the individual.

At the same time, all distance learning systems must meet certain requirements in order to meet all the needs of consumers of educational services. It should be noted that the Vinnytsia National Agrarian University introduced a distance learning system more than 10 years ago. At the same time, today's world is increasingly moving to a digital format, so it is important to develop effective and simple web applications. In addition, the modern distance learning system should provide more opportunities for teachers and students to work in an interactive online environment.

The purpose of the research is to analyze the content of innovative educational technologies and their effectiveness during distance learning, to point out the problems and prospects of online education.

The features of online education at VNAU include the following:

- lifelong education (there is no age limit for admission);

- student-centeredness, which includes an individual educational schedule for everyone;
- use of new achievements of information technologies;
- social equality – receiving education regardless of place of residence, age, social status;
- distance learning through interactivity ensures the relevance of the acquired knowledge.

The advantages of distance learning at VNAU include the following:

- relevance and innovation in the content of distance learning courses;
- availability of scientific and educational information sources throughout the entire period of study;
- the study of academic disciplines within the framework of the academic semester is determined by the independent choice of pace and order;
- communication of students and teachers in the virtual space is unimpeded;
- the educational process is organized transparently;
- ensuring student-teacher communication online;
- transparent, accessible and objective assessment of knowledge;
- obtaining a modern profession in accordance with the requirements of employers;
- adaptability in the professional sphere due to a high rate of practical training.

One of the ways to develop the educational process is the development of innovative technologies. Innovation in education is based on the development of various forms of thinking, creative abilities, high social adaptation capabilities of the individual.

One of the effective methods used to increase the assimilation of theoretical material and practical skills is the use of simulator programs during the educational process.

As part of the preparation of bachelor's and master's qualification papers by students under the guidance of teachers of the Department of Computer Science and Economic Cybernetics of VNAU, many simulators from various educational components for students of the specialty "Computer Science" were developed and implemented in the educational process. Training simulators have proven themselves quite positively. Approaches to their design and implementation depend on the specifics of educational

components and the amount of material being studied. Distance courses continue to be filled with new software.

Educational simulators are programs in the form of tests, solving typical problems using various methods, which are created in order to repeat the material, practice and do self-analysis.

The use of exercise programs in the modern educational environment is no longer a whim, but an urgent necessity for teachers who are trying to optimize the educational process, make it more interesting, understandable, and, therefore, more effective for the formation of special competencies and program learning outcomes of education seekers, as well as is the purpose of their work. Thanks to these innovative technologies, the student acquires knowledge more efficiently while studying the topic, because he performs self-examination and self-analysis. It also increases the motivation and interest of the learners.

While working with the exercise program, every student of higher education falls under the watchful "eye" of the computer, which patiently corrects errors, gives advice, recommendations on improving knowledge.

Trainer programs provide:

- Instant reaction to wrong actions;
- Sequential display of tasks of a given complexity on the selected topic;
- Sequential analysis of a certain type of problem;
- Output of the result and summary message with or without recommendations.

Online education is an important direction in the development of modern education, which allows to provide access to education for a wide range of students, and also provides an opportunity to develop computer skills and skills of independent work. However, when training computer science professionals, online education faces the following challenges:

- Lack of access to necessary equipment and software. Teaching computer science requires the use of specialized hardware and software, which can be quite expensive and inaccessible to students;
- Lack of opportunity for practical work. To train specialists in computer science, it is necessary to perform practical tasks that require special conditions and equipment. In the remote mode, the performance of practical tasks may be limited, which negatively affects the quality of specialist training;

– Insufficient interaction between teachers and students. Distance learning can lead to a feeling of isolation and insufficient interaction between teachers and students, which in turn can negatively affect the quality of learning;

– Insufficient motivation of students. Distance learning requires greater self-discipline and independence from students, which not everyone can do. Insufficient motivation can lead to a decrease in interest in learning and negatively affect students' academic performance;

– Problems with evaluation. Online education can face problems with objective assessment of students. For example, the impossibility of checking the level of learning of the material by students in real time or the possibility of falsifying the results of tests and other assessment tasks;

– Lack of international accreditation. Many online courses and online programs do not have international accreditation, which can be an obstacle for students who want to continue their education abroad or get a job in international companies;

– Lack of interactivity and socialization. Learning in an online format can be less interactive and less social, which can affect the formation of communication and communication skills of students.

Overall, online education is an important tool in the training of computer science professionals, but it also has its limitations and challenges that need to be addressed to ensure quality student training and the development of this field.

The advantages of online education in the field of computer science include the availability of training, a flexible schedule and the ability to track student progress. Online courses allow students to study from anywhere with Internet access and complete assignments at a time convenient for them. In addition, progress monitoring allows teachers to quickly identify learning problems and adjust teaching methods.

However, it is important to remember that online education has its own challenges and issues. These include the lack of direct communication between students and teachers, the possibility of falsifying the results, as well as the lack of the opportunity to demonstrate practical skills in real conditions.

Therefore, for the successful development of online education in the field of computer science, it is necessary to solve these problems and ensure the

quality of education. Innovative technologies such as virtual laboratories, video conferencing and other tools for communication and interaction can be used for this. It is also important to create practical tasks and projects that will allow students to apply the acquired knowledge in real conditions and increase their motivation to study.

In general, online education is an important direction in the development of computer science and has great potential for achieving success in the education and professional development of students. But for this you need to solve the problems of online education in the field of computer science can be solved by using innovative approaches to learning and interaction between students and teachers. For example, virtual labs can be used to allow students to complete hands-on computer science tasks in a virtual environment. This makes it possible to ensure the availability of practical classes and exclude the possibility of damage to equipment and living organisms.

In addition, video conferencing and other communication and interaction tools can be used between students and teachers to enable direct communication and discussion of class materials. To improve the quality of learning, you can also create interactive courses with video lessons and practical tasks that will allow students to independently study the material and engage in active interaction.

The potential of online education in the field of computer science lies not only in providing the possibility of learning from any place and at any time, but also in providing accessibility for different categories of students. For example, it can be useful for students who work or have children and cannot come to class at the scheduled time. In addition, online education allows students to learn at their own pace and at a pace that is convenient for them.

Thus, online education in the field of computer science has great potential for development, and ensuring the quality of online education can be a challenge for teachers and educational institutions, as it is necessary to ensure the availability of the necessary resources and ensure the support of students in the online environment. This can be done using a variety of tools such as chatbots, forums, and other resources to provide student interaction and support.

In addition, online education may require changes in approaches to assessment and quality control of learning. For example, automated systems can be used to check tests and other tasks, which allows to reduce time

consumption and ensure the objectivity of evaluation. However, at the same time, it can lead to a decrease in the individual approach to students and a decrease in the quality of education.

It is also important to consider the technical and financial limitations that can be an obstacle to the development of online education in the field of computer science. To ensure high-quality online education, it is necessary to have a sufficiently powerful and stable Internet connection that will not interfere with the normal functioning of online courses and other resources.

The prospects for the development of online education in the field of computer science are quite strong, since this field depends on technological progress and is necessary for many fields, such as programming, software development, artificial intelligence, web development, etc.

One of the advantages of online education is the accessibility of learning to a wide range of people from different regions and countries, which can provide a large number of talented students from all over the world. Also, online education can provide a flexible schedule for students who have jobs or other commitments.

Online education can help develop new learning methods and course formats that allow students to enrich their knowledge and skills, as well as use new technologies and tools not available in traditional education.

Online education can also help ensure world-class learning as it allows students to access the best courses and lecturers from around the world.

However, for the successful development of online education in the field of computer science, it is necessary to solve a number of problems, such as the lack of interactivity and socialization, difficulties with objective evaluation, lack of international accreditation, and others.

The success of online education in the field of computer science depends on the combination of different methods and approaches, such as interactivity, socialization, assessment, accreditation and other aspects, which can ensure high quality of education and provide graduates with the necessary knowledge and skills to solve modern challenges in the field of computer sciences.

Another factor that can affect the development of online education in the field of computer science is the development of technology. New technologies can provide more effective methods of learning and developing skills, such as the use of virtual reality and artificial intelligence.

Cooperation between universities, companies and other organizations is quite important in this direction, which can help ensure the relevance of educational programs and training in practice. Companies within the framework of signed memorandums or contracts provide access to their tools and technologies, and can also offer internships and jobs for students.

The development of interactive platforms for online learning that can enable interaction between students and teachers, help ensure rigorous assessment and ensure the quality of learning is essential.

So, it can be argued that the prospects for the development of online education in the field of computer science are promising. Online education can provide accessibility and flexibility of learning, allowing students from all over the world to obtain a quality education at the level of global standards. However, challenges such as lack of interactivity and socialization, insufficient quality of instruction, technical issues, availability of necessary hardware and software, and lack of opportunity to provide students with access to real-world experience working with computers and software must be addressed for success.

To solve these problems, it is important to develop new learning methods, such as the use of interactive platforms, cooperation with ordinary universities and companies, which can provide access to real projects and internships for students, as well as the introduction of new technologies into educational processes.

In addition, for the successful development of online education in the field of computer science, the development of professional orientation is important. Modern computer technologies are changing rapidly, and professionals must have the skills and knowledge to work with new technologies and ensure their effective use.

Therefore, the use of exercise programs during various forms of the educational process contributes to better learning, understanding and assimilation of educational material, and also motivates students to self-development.

Non-standard and interactive methods used during classes motivate students to better study disciplines and self-education, which ultimately is the main task of a modern teacher.

All this is a component of high-quality training of qualified specialists, scientists, educators, that is, the flower of our nation in the future – which, ultimately, is the goal of the educational process.

Based on the results of the analysis, it can also be concluded that online education is an important direction for the training of computer science specialists. However, there are a number of issues that need to be addressed in order to ensure high quality training and process efficiency.

For the successful development of online education in the field of computer science, it is necessary to develop new learning methods and technologies, ensure availability of the necessary equipment and software, cooperate with universities and companies that can provide students with access to real projects and internships. It is also important to develop the professional orientation and skills of specialists so that they can work with new technologies and ensure their effective use.

So, taking into account all the advantages and disadvantages, it can be concluded that online education in the field of computer science has great potential for development and accessibility for various categories of students.

4.7. Choice of Learning Technologies for the Development of Soft Skills in Students During Martial Status

The functioning of the education system in the conditions of martial law is characterized by an intensive search for new approaches to learning, innovative forms of organization of the educational process, effective pedagogical and information technologies. Therefore, it is relevant to research new approaches that ensure the necessary level of development of soft skills among students during martial law. An important role in solving this problem lies in the choice of learning technologies that allow performing various types of activities in war conditions.

A modern requirement for the professional training of a future specialist is the formation of a flexibly thinking person who is able to navigate in many directions of human activity and quickly self-learn in its individual areas. As soon as Russia launched a full-scale war in Ukraine on February 24, 2023, many students left their desks and started volunteering or joined the ranks of the Armed Forces of Ukraine. So the soft skills they developed at university came in handy.

Soft skills, which are also called key skills, basic skills, key competencies or employment skills, are those desirable qualities that are used in different workplaces and in different life situations – such traits as integrity,

communication, politeness, responsibility, professionalism, flexibility and teamwork [22, p. 163]. In our opinion, soft skills during the war are a complex of non-specialized, important in force majeure circumstances, professional skills that are responsible for the successful completion of the task, high productivity and are end-to-end, that is, not related to a specific subject area.

Flexible skills, unlike professional skills in the traditional sense, do not depend on the specifics of a specific job, are closely related to personal qualities and attitudes (responsibility, discipline, ability to make quick decisions), as well as social skills (communication, in particular, listening) in a team, emotional intelligence) and organizational skills (time management, leadership (in volunteer activities, in the Armed Forces of Ukraine), solving military problems, critical thinking, etc.). Therefore, the development of soft skills among students of higher education institutions during martial law is an urgent issue today. Learning technology is a system of scientifically based actions of active elements (participants) of the learning process, the implementation of which with a high degree of guarantee leads to the achievement of the set learning goals. We define learning technology as a set of means and methods of reproduction of theoretically grounded learning and upbringing processes, which allow to successfully implement the set educational goals. Thus, the learning technology, in fact, means the organization of the learning process, which involves a certain system of actions and interaction of all, but first of all, active elements of the learning process. When organizing the learning process, from a technological point of view, its active participants (students and teachers) perform certain operations. When performing technical actions in the process of carrying out one or another operation, students and teachers perform certain roles or functions. Functions characterize the main goals and features of the actions of active participants in the learning process. Thus, the structure of learning technology is a system of certain operations, technical actions and functions of students and teachers.

So, when talking about learning technology, it is appropriate to have in mind such an organization of the learning process, in which students and teachers perform clearly defined actions and functions to perform certain operations. With the correct execution of the defined actions of the learning goal (formation of the subject of learning the ability to carry out the mastered activity or its elements, the totality of which constitutes the

ability to carry out the mastered activity. So, when talking about learning technology, it is appropriate to have in mind such an organization of the learning process, in which students and teachers perform clearly defined actions and functions to perform certain operations. If the specified actions are performed correctly, the learning goal will be achieved.

Having analyzed the available modern pedagogical literature and programs [23, p. 140], it can be noted that in the conditions of martial law, the most relevant pedagogical technologies in the educational and extracurricular activities of a higher educational institution for the development of soft skills in students: the ability to work in a team, leadership qualities, creativity, organizational abilities, communication, emotional intelligence, work with information, systems thinking, motivation Table 3.

Table 3

List of basic "soft skills"	Characteristic
The ability to work in a team	The ability to listen, perceive a common goal and find ways to achieve it, combine personal ambitions with a collective cause; willingness to support, convince and find compromises
Leadership qualities	The ability to unite people around a socially significant goal, the ability to take responsibility for the entire team
Creativity	Ability to find non-standard and new solutions for familiar situations, generate and implement new ideas
Organizational abilities	The ability to unite people, clearly distribute responsibilities according to their capabilities, initiative and demand for themselves and others
Communication	The ability to communicate according to the situation, take into account facial expressions and gestures, negotiate, effectively start and end a conversation, summarize the results
Emotional intelligence	The ability to recognize other people's emotions and express their own, to establish emotional contact for joint work
Work with information	Ability to collect, analyze and evaluate new information. This means that the learner must have the skills to effectively gather relevant information from various sources, such as documents, research, the Internet, communication with experts
Systems thinking	Ability to plan, set current and final goals and implement them, analyze complex situations and find optimal solutions
Motivation	Covers the ability to motivate oneself, understand other people's motives and intentions, overcome problems and crises and motivate clients to achieve goals

Technology for the development of critical thinking. This technology is directed on the formation of students of higher education in the ability to analyze and evaluate information, think logically, draw conclusions and solve problems. The main idea is to teach learners more than just memorization facts, but also analyze information from different sources, understand different views and approaches to the problem and develop the ability to find solutions independently.

Technology of project activity (the technology of project activity means a set of educational and cognitive methods that allow solving one or another problem as a result of independent actions according to a certain plan for solving search, research, practical tasks with a mandatory presentation of these results). When applying the technology of project activity, participating in the development and implementation of various events, students acquire organizational skills: the ability to manage their own activities and the activities of the student team, the ability to plan their time, hold an event according to plan, change the event plan in case of unforeseen circumstances.

Health technology is a targeted learning approach to ensure the preservation of personal health and the formation of knowledge and skills and healthy lifestyle skills. This technology covers various aspects the influence of the teacher on the health of the students of education at different levels. Health care technology is designed not only to provide education seekers with knowledge about a healthy lifestyle, but also to actively influence on their physical and mental health and psychological state.

Problem-based learning technology involves the creation of problem-based learning situations in the course of educational activities and the organization of active independent students' work on their solution. This technology promotes development creative abilities, critical thinking, analytical skills and problematic thinking in students of education. Problem-based learning technology at VNAU is actively used in summarizing the activities of student organizations at meetings, reporting and election conferences. Students demonstrate the ability for professional reflection and self-analysis, analytical and diagnostic skills, the ability to evaluate the results of their work and the activities of colleagues.

Game technology uses a variety of methods and techniques that are based on the organization of the pedagogical process in the form of games.

This is the game in the context it is considered as a type of activity that makes it possible to reproduce and learn social experience and develop self-governance in the team participants.

Case technology. This technology is an interactive learning method, aimed at forming the knowledge, skills and personal qualities of the applicants education through the analysis and solution of a real or simulated problem situations in the context of professional activity. Case in this case is a document that describes a particular situation, problem, or task in need a certain decision or analysis.

The technology of creating a subject-developmental environment that ensures the full development of human activity and personality. It includes – the environment, objects and materials of various functional significance, allows the teacher to solve specific educational tasks, involving participants in the process of learning and assimilation of skills and abilities, ensuring maximum psychological comfort for everyone). Technologies for creating a subject-development environment for students are always present in teamwork.

A collaborative learning technology based on community ideas development activities of the teacher and student education It is designed to provide an effective individual approach to training taking into account the personal qualities of each student. The main idea of this technology is to build activity based not on the educational subject, but on the needs and characteristics of a person, using at the same time psychological and pedagogical diagnostic methods for revealing the student's potential.

Research technology is a method of organization of the educational process, aimed at active encouragement of education seekers to own research and discovery of new knowledge. This technology stimulates sa bridge creative activity of students in the course of research work, which can be carried out both individually and in the form of team or group work.

Information and communication technologies (ICT). This is a general term for designation of a group of various technologies and tools for processing, transmission, storage and exchange of information. Technology covers use of computers, telecommunication networks, software provision, audiovisual systems, Internet, multimedia materials, electronic learning tools, video conferences and other tools that provide enable people to access information, create, store, transfer and change it.

ICT is used in various spheres of life, in particular in education, business, science, communication, entertainment, etc. ICT is used in the educational context to improve the learning process and promote the assimilation of knowledge and skills education seekers. ICT makes it possible to create new opportunities for access to information, communication, cooperation and creativity. They contribute to the development of digital literacy, critical thinking, help in the organization of problematic and project training. ICT can also improve efficiency and productivity of the educational process, promoting interactivity, individualization and adaptation to the needs of education seekers.

It is worth noting that these technologies are able to effectively develop soft skills of future specialists during the period of study at an educational institution such as educational, as well as in extracurricular activities, during face-to-face and distance learning teaching.

Among the practical aspects of the development of soft skills in universities In Ukraine, innovative methods and technologies attract special attention are used in the educational process. Let's consider them in more detail.

Integration of soft skills into curricula. Yes, universities can include the study of soft skills in their educational programs. It may be a separate discipline or the integration of soft skills into other educational disciplines. For example, communication skills can be developed through role-playing games or projects that promote cooperation and group work.

Using the latest technologies to promote active learning Virtual reality, simulations, web conferencing and more interactive technologies can help learners develop communication skills, critical thinking, creativity and cooperation. During such classes have the opportunity to create situations in which students can interact, make decisions and solve problems.

Projects and workshops. Implementation of project and practical tasks in the educational process helps students to develop communication skills, critical thinking, leadership qualities and cooperation. It it can be solving real problems or creating projects that require communication with other people, teamwork, time management and resources. Such tasks can contribute to the development of leadership qualities, creativity, critical thinking and analytical skills.

Development of emotional intelligence. Emotional intelligence is important component of soft skills. Educational institutions can use

innovative techniques such as emotional intelligence training, meditation, to help learners understand and manage their emotions, develop compassion and empathy.

Intercultural communication. Nowadays, skill becomes an important achievement communicate effectively with representatives of different cultures. Educational institutions can implement innovative techniques such as virtual exchanges, projects that involve participants from different countries, and cultural events that will help students expand their intercultural knowledge and skills communicate and perceive other cultures.

Evaluation of soft skills. For the effective development of soft skills in education it is important for institutions to have a system for evaluating these skills. Innovative evaluation methods such as portfolio, self-evaluation, mutual assessment and involvement of various interested parties (stakeholders, employers, experts, etc.), can be used to assess the soft skills of applicants education.

In general, the introduction of innovative methods and technologies for development soft skills in Ukrainian universities require planning, resources and support from the administration and scientific and pedagogical staff [24, p. 158].

It is also important to maintain ongoing professional learning and development teachers They must have access to up-to-date, methodical information materials and trainings to implement for education seekers various innovative approaches to teaching soft skills. Achieving these goals requires support from the state and educational institutions organizations and the business sector. Cooperation between all stakeholders – by students, teachers, employers and the state – is key for the successful development of soft skills in educational institutions of Ukraine.

4.8. Features of the Teaching of Higher Mathematics in an Agricultural University under Modern Conditions

It is difficult to overestimate the importance of high-quality mathematical training of a specialist in any field of science and technology, production and economics. In addition to factual knowledge that provides the possibility of mastering a complex of professional disciplines, higher mathematics plays an important role in the formation of a specialist's worldview, the development of logical and abstract thinking. Therefore, an important task

in the process of reforming the higher education system is to improve the methodology of teaching higher mathematics in an agricultural university, which includes the following aspects:

- rethinking the content of mathematical training of specialists taking into account its professional focus;
- development of the latest pedagogical technologies for teaching mathematics;
- active implementation of digital technologies in the learning process;
- provision of an individual approach to students, taking into account both the peculiarities of their thinking and the basic psychological and pedagogical patterns of learning.

The difficult conditions of wartime create a new reality and pose new challenges to which the methodology of teaching mathematics in higher education must respond. It is necessary for students to study a significant percentage of the educational material independently, and for teachers to constantly improve and diversify both the methods and means of presenting the material and the methods of knowledge control. Therefore, today the task of further development of distance learning methods in order to ensure, even in these difficult conditions, a level of mathematical training of a specialist that meets modern educational standards, is gaining the greatest relevance today.

In the process of reforming the higher education system, the task of high-quality mathematical training of agricultural university students acquires great importance, which means not only providing students with fundamental knowledge and improving their logical-mathematical thinking, but also the formation of skills and abilities to use higher mathematics in professional activities. After all, the final result and goal of education is the readiness of the agrarian university graduate for effective professional activity.

Unfortunately, our country has to go through the path of reforming higher education in the extremely difficult conditions of war. Studying higher mathematics has always been quite a difficult task, especially for first-year students. Now this task is complicated by the insufficient level of basic secondary education of the entrants. This is clearly demonstrated by the analysis of the results of the national multi-subject test, which entrants take for the second time in the conditions of a full-scale Russian

invasion. According to official statistics, they did not pass the NMT in mathematics this year (scored no more than 3 test points out of 32) more than 10,000 applicants, despite the fact that the level of difficulty of the test is very, very low. However, for higher education teachers, teaching mathematics will be a serious problem for the large enough part of the students who received 4-10 test points, and given the low requirements of universities for students, most of them will become university students. To a large extent, the low level of mathematical preparation of entrants is caused by insufficiently effective distance learning, which students of general educational institutions have been receiving for several years.

Therefore, the problem of improving the methodology of teaching higher mathematics, in particular distance learning, is extremely urgent. The second major problem of agrarian universities is the reduction of time allocated to classroom classes in higher mathematics. Instead, the volume of topics and tasks for independent study is increasing, despite the insufficient level of skills in this activity in most of the entrants. Thus, in these difficult conditions, the teacher should make the study of higher mathematics interesting and accessible to the majority of students, increasing their motivation by including it in the course of higher mathematics (initially simple enough and increasingly more complex and weighty for practice) tasks of a professional direction.

In an agricultural university, higher mathematics is studied not for the sake of deep penetration into its theoretical foundations, but with the aim of building, first of all, the professional competencies of a future specialist: an agricultural engineer, an economist, a manager. Therefore, when choosing tasks, the teacher of higher mathematics should remember their connection with the future profession, creating a foundation for studying special disciplines. Work programs in higher mathematics for students of different specialties should differ significantly in content.

When creating them, the guarantors of specialties must be involved, because no one better than them is aware of interdisciplinary connections and the real needs of training a qualified specialist. Attempts to give a student of an agricultural university a "classical" mathematical education will encounter, on the one hand, opposition from the student himself, who usually has neither the desire nor sufficient basic education for this. On the other hand, such an approach simply does not fit into the time

frame of a higher mathematics course for non-mathematical majors. The teacher should motivate the student to study higher mathematics, actively involving him in solving problems of professional direction by mathematical methods. This not only contributes to the study of higher mathematics, but also forms a creative attitude to the future specialist professional activity, when he is determined to independently acquire knowledge and further development. Therefore, a teacher of mathematics in a higher school should systematically use specific engineering problems, problems of economics, logistics, and management that illustrate the theoretical material that is presented [25].

Since the course of higher mathematics for students of non-mathematical specialties cannot be burdened with excessive "theorizing", a large number of complex proofs, there is a danger of its formalization, turning it into a series of recipes. To avoid this, the lecture course should be structured so that the student is not a passive listener, so that immediately after a certain number of definitions and theorems are presented, he can answer questions aimed at clarifying the content of what he has learned.

Such an approach becomes especially important in the conditions of distance learning, when the student sometimes does not have the opportunity to immediately receive the teacher's answer to the questions that have arisen. Then, solving the proposed theoretical tasks on time and learning the correct answers, he will independently acquire the necessary knowledge.

Let's pay attention to the tasks from the manual [26], which can be used when creating a distance course as part of a course of lectures or as control questions. They are easily included in a distance course, as they can be formulated as tests with the choice of one correct answer.

An important aspect of training under wartime is the psychological state of the participants in educational process. The stress they are under all residents of Ukraine, may negatively affect ability to learn new material and motivation to study in general. Therefore, it is more relevant than ever it is the issue of optimizing educational and psychological logical load for both education seekers, as well as for teachers. In particular, it is important to to evaluate students in such a way that minimize possible stress for them due to grandfather problems with the execution of tasks, problems with connecting access to the Internet, etc., as well as reduce physical no burden on teachers during the examination works.

The main purpose of assessment in the conditions of dis dance training is not only the control of knowledge, as well as provision of teaching feedback with students of education, which involves the provision of support, adjustment of means and methods of learning changes in the event of their inefficiency. Assessment can be done orally and written forms, using the following types: testing, practical and control works, oral interviews and surveys etc.

Recently at the agricultural university, we use tests to control knowledge, because they are quite a convenient kind of evaluation as for teachers and students.

It is important in the competition of test technologies to determine the number, how and for what purpose to monitor the quality of knowledge of first-year students. We are deeply convinced that the level of knowledge of students who have entered a higher educational institution (who came?) is successfully assessed during the entrance examination based on the results of a competitive selection based on an external independent assessment. To test the knowledge of first-year students, teachers perform so-called "zero" test papers for the school mathematics course at all faculties.

Preliminary control provides an opportunity to get acquainted with the general level of mathematical preparation of first-year students and to plan the further organization of their educational and cognitive activities.

The results of this control significantly influence the specification, optimization and more targeted definition of the content component of the educational discipline, the main methods, forms, means, methods of its implementation, substantiating the sequence of processing certain sections of the educational material. The advantages of closed-form test tasks include speed of testing and ease of scoring. Among the shortcomings, we note the effect of guessing, which is inherent in poorly prepared students.

Current control is carried out by us in the course of students' daily educational activities through systematic observations of educational activities in all types of classroom classes in order to ensure feedback between the teacher and students in the learning process, to identify the degree of understanding of the learned educational material by them and the ability to apply it in practical activities. The results of the current control obtained by us are used to adjust the methods and means of teaching students, organize their independent work, and in the final control and

assessment of knowledge. In particular, we carry out such control in the form of conducting express tests, mathematical dictations.

Current control stimulates students' desire to systematically independently work on educational material, develops learning motivation, forms skills and abilities of self-control and self-evaluation, and also pushes the teacher to improve the quality of didactic tools and improve his pedagogical skills.

Border control is planned, predetermined. It consists in determining the level and volume of students' acquisition of knowledge, skills, and abilities for a certain period, as a rule, after studying a logically completed part of the curriculum of a discipline (a certain topic, section). The purpose of border control is intermediate attestation of students, therefore it is conducted simultaneously for all students. Border control provides students with an appropriate idea of the level of their training in the discipline, as well as improves the operational management of the educational process, contributes to the planned work of students.

In the process of forming final control tests, we use a combination of open and closed-type tasks, which allows us to some extent eliminate the possibility of hints and write-offs, and increase the objectivity of the assessment.

The control of the level of residual knowledge (slices of knowledge), conducted by the higher education administration, is also carried out in the form of tests using test technologies as a control of the stability of students' knowledge, abilities and skills. Such control sections are conducted according to the topics of the discipline that were studied in the previous semester, or according to the curriculum of the entire discipline. To achieve this goal, tests can be designed that focus on what a student knows and can do, rather than how he looks (in terms of academic achievement) against others.

The obvious advantages of using tests that ensure the successful implementation of the goal and all control functions are:

- high efficiency, objectivity, fairness of knowledge assessment;
- absence of stress and overload for students;
- possibility of saving time of teachers and students;
- speed of processing of received results;
- test tasks are clear, understandable and well structured: open tests are

an effective training tool in the educational process, and closed tests are best used when checking the level of residual knowledge.

At the same time, along with the positive, the negative sides of using tests should be noted. Compiling high-quality tests takes a lot of time. It is quite difficult to find distractors that do not contain false information. Test results are often guesswork. A student can answer a difficult question and not answer a simple one. It may depend on the quality of the test, the level of motivation of the student. The test does not allow you to check knowledge related to creativity. In particular, it is impossible to follow the logic of the student's reasoning in the process of solving mathematical problems.

Under martial law it is important to organize the testing so that the student could pass it at a time convenient for him during for a period of time determined by the teacher, but, along with the duration of testing and the number attempts should be limited for objectivity evaluations. The teacher can also organize self-appreciation by students of their success by providing them the correct answers and solutions for self-help revisions after the work is done.

The issue of improving the quality of control tests becomes special relevance in the conditions of distance learning. Tests constantly improve, their variability increases. In particular, in the tests created in the Moodle distance learning web system, there is the possibility of generating numerical data for the test options randomly from some interval. There are also "step-by-step tests" in which the main stages of problem solving are checked by combining several test tasks into one test. But all this does not relieve distance learning tests of one of their main drawbacks. When creating test questions in the form of typical problems, the teacher must understand that when solving them, the student can resort to unscrupulous methods and use online services to formally obtain answers.

We have given examples of "open" tasks and "closed" type [21], in our opinion, deprive the student of such an opportunity and stimulate his cognitive activity. At the same time, the tests should be sufficiently simple and accessible to the majority of students and meet the learning or control tasks we assign to them. Thus, despite all the disadvantages of distance learning (too much independent work, difficulty in communicating with the teacher, the impossibility of monitoring students' compliance with the principles of integrity, etc.), it is also possible to teach mathematics

effectively under extreme conditions. But this requires great efforts from both sides of the educational process.

In the process of teaching higher mathematics at an agricultural university, even with very limited classroom time, it is important to systematically include tasks of a professional direction. We formulate the main requirements for applied problems: they should reflect the real professional situation; numerical data in them must be relevant; each of these tasks should be offered to students precisely at the moment when it will meet both the cognitive capabilities and the needs of the student himself.

From the very beginning, the future specialist should learn to make mathematical models of applied problems in his field of activity. Under this condition, he will later be able to develop successfully, acquiring knowledge on his own. In addition, the misconception about the lack of connection between higher mathematics and the field of his professional interests does not contribute to sufficient motivation in its study. Without strong motivation, it will be impossible to overcome the difficulties in studying mathematics that a student faces, especially in the conditions of distance learning.

On the one hand, distance learning gives the student the opportunity to receive educational materials in a convenient form, and he will be able to independently choose the time to study them at a pace convenient for him. But this is a positive point only if the student is sufficiently motivated, interested and organized. Additional motivation to conscientious study of higher mathematics provides the use of high-quality materials for knowledge control. The main requirements for these materials: availability and compliance with the program; maximum individualization; impossibility of using online calculators when solving them.

4.9. Independent Work in the Conditions of Distance Learning

The difficult conditions of wartime create a new reality and pose new challenges that must be answered by the methodology of teaching mathematical disciplines in higher education. It is necessary for students to study a significant percentage of the educational material independently, and for teachers to constantly improve and diversify both the methods and means of presenting the material and the methods of knowledge control.

In general, independent work of students contributes to deepening and expansion knowledge, increasing interest in cognitive activity, forming creative personality of the future specialist, capable of permanent self-improvement and self-education throughout life. In a more general aspect independent work is one of the ways to adapt to professional activity and today's challenges in the conditions of the modern world. To have independent work effective, the acquirer must deeply understand its necessity, purpose and further usefulness to oneself.

In order for independent work to be effective, the acquirer must to deeply understand its need, but also its further usefulness for oneself. One of the important criteria is the presence of motivation. To students studying in a mixed form of education using distance methods, strong motivation is required, most of the materials are proven learn independently. It requires sufficient willpower, self-discipline, self-organization, responsibility and self-control.

The essence of independent work is independent educational activity students, and its didactic purpose is to prepare them for self-education throughout their entire life professional activity and during life.

For effective organization, support and support of students' independent work, the forms and methods of the teacher's work, which stimulate and activate students' independence and creativity.

In this regard, it is appropriate to talk about educational, methodical and information support for students' independent work, which is available a didactically substantiated set of methods and teaching tools, educational and methodical recommendations on the organization, planning and control of independent work students. Relevance of educational, methodical and information support independent work of university students is confirmed by the fact that in modern society is growing the role of professional readiness of specialists. Information is of particular importance ensuring the independent work of university students in informational and educational conditions an environment that involves the use of information and communication technologies.

At present, we have a wide selection of forms of organizing students' independent work. For effective support for the organization of this type of student work is necessary organization of distance learning in relevant academic disciplines. One of ways to solve the problem of organizing distance learning is to create electronic ones training courses in the Moodle system.

Organization of independent work of students of agricultural universities with the use of technologies we will consider e-learning using the example of e-learning courses "Higher Mathematics" and "Discrete Mathematics", developed on the Moodle distance learning system platform.

Included in the electronic educational courses "Higher Mathematics", "Discrete mathematics" includes the following structural ones elements:

1. General information about the course: work program; thematic plan; evaluation criteria; schedules of individual classes and consultations; bulletin board; glossary; course guide.
2. Individual research task.
3. Group project-research work.
4. Module I, Module II,...: guide to the module; theoretical material for the module; laboratory works; tests for laboratory works; tasks for independent work; modular control.
5. Final certification.

E-learning courses (ELCs) provide tremendous opportunities for inclusion students in active work with various visualization and computer tools models, on the organization of interactive learning and intensification of mental activity students The organization of the educational process with the use of developed ENCs is not focuses only on discussing theoretical issues and performing practical and laboratory tasks works in the computer class, and maximally activates the independent work of students. It allows rational use of classroom time allocated for study relevant disciplines, focusing on the key and problematic issues of the courses.

Independent work with the use of ENK forms in students the ability to creativity, stimulates mental activity, activates independent activity, develops personal qualities. It allows: individualization of training in the conditions collective assimilation of knowledge (the possibility of choosing an individual rhythm of work, the possibility of working at different levels of complexity); during the independent work of students in constant interaction between participants and the teacher and control is carried out within ENK on the part of the teacher according to the educational activity of the students.

The independent work management system within ENK includes the following stages: planning, organization, coordination and control (which includes evaluation, analysis and correction).

Students' independent work while studying the courses "Higher Mathematics", "Discrete Mathematics" includes:

1. Acquaintance with methodological maps of the course and educational modules.
2. Development of theoretical material.
3. Preparation for practical classes and laboratory works.
4. Solving creative tasks using adjacent or alternative ones ICT.
5. Participation in project-research work.
6. Performance of an individual research task.
7. Testing and testing for the purpose of preparing for modular tests works.

Independent work of students during preparation for each laboratory work in within the limits of the developed ENC includes:

1. Acquaintance with methodological recommendations for the implementation of the relevant laboratory work.
2. Development of theoretical material for the corresponding laboratory work.
3. Preliminary familiarization with the program interface, examples of results, which can be obtained using the ICT being studied.
4. Acquaintance with evaluation criteria.

Methodological recommendations for performing laboratory work contain all the necessary stages of their implementation. Each laboratory work has its own criteria assessment Theoretical material includes separate paragraphs of electronic the study guide of the corresponding course, which is presented in its entirety in the main theoretical material of the course. Each laboratory work is referred to examples of creative results that can be obtained with the use of appropriate ICT.

It is of great importance for solving the problems of forming students' skills work in a team, build effective communications, be ready for continuous education and self-development has the use of the project method. There is a project method an effective technology that will significantly increase the level of independence of students, their cognitive activity, develops communication skills, motivation to study, gives experience working in a team, experience in setting and solving problems, forms skills work with various types of information, that is, it forms the qualities necessary in the conditions of construction information society.

Therefore, one of the tasks of the created ENCs is the implementation of a project-research task by students. Independent work of students in project-research work includes:

1. Familiarization with methodical recommendations for project-research works.
2. Acquaintance with the general criteria for evaluating students' design and research activities.
3. Selection of the topic of the future project.
4. Planning of project and research activities.
5. Information search and analysis.
6. Formation of the business card of the project using visualization tools.
7. Organization of joint work on the project.
8. Selection and use of network services for development and presentation project results.
9. Evaluation of one's own work and products of project-research activities other students according to previously formed criteria.

Achieving the desired level of efficiency from project and research activities of students also depends on the teacher's participation in it. In particular, the teacher's actions regarding organizing and ensuring effective independent work of students in project-research work should include: clear organization of students' work on the project; adjustment of the chosen topic and project goals; correction of business card and project plan; a preliminary review of the results of students' project-research activities; involvement of students in evaluating the works of their colleagues.

Individual work of students, unlike project-research work, involves creation of conditions for revealing individual creative abilities of students. One among the forms of individual work of students is the implementation of an individual research task (INDZ), which is used in the process of deepening the software course material based on acquired knowledge, skills and abilities. INDZ are performed by everyone by the student individually and covers the content of the entire course as a whole.

The teacher checks the students' performance of the INDZ using services for checking texts for borrowing from other sources (internal or Internet), with in order to detect various forms of plagiarism. Tasks for independent work of students within the framework of the created ENK are offered at the end of studying each module and aim to deepen, generalize

and consolidate the knowledge that students have acquired during the study of the corresponding module course, as well as apply this knowledge in practice.

Using distance learning technologies during the organization of independent work in within the limits of the created ENK, we get new opportunities for:

- creation of quality content;
- clear structuring, transparency and convenient access to a large volume educational material;
- clear structuring, transparency and convenient access to a large volume introductory and explanatory material;
- ensuring continuous access of students to educational material;
- conducting testing, questionnaires, surveys;
- inspections of laboratory and other types of works, in particular, detection of plagiarism;
- determination of time limits for the submission of laboratory and other types of work, passing tests;
- implementation of training monitoring, knowledge and skills assessment rating, students' skills;
- monitoring of student activity.

In order for the independent work of students during distance learning to be effective, the following conditions are necessary:

- optimal volume of classroom and independent work;
- uniform distribution of educational work by modules;
- methodically and correctly organized work of students in the classroom and outside it;
- students' awareness of the need for independent work;
- provision of students with the necessary educational and visual materials from purpose of transforming independent work into a creative process;
- ensuring interactive interaction between all participants of the training process;
- control over the progress of independent work and availability of encouraging measures students to its quality performance.

So, effective organization of students' independent work in conditions of distance learning is designed to stimulate cognitive processes of students

and increase their motivation in mastering mathematical knowledge. However, more are still needed research on the issue of electronic information overload educational resources, the need to create and resource provision of informational and educational space of higher education institutions education Constant quality control requires special attention initial information, methodical and didactic aspects distance education.

4.10. Google Digital Tools for Organizing the Educational Process of an Agricultural University in Crisis Situations

At the Vinnytsia National Agrarian University, for students of almost all majors, the discipline "Information Technologies" (IT) is mandatory for study, the study of which falls mainly on 1-2 semesters and is aimed at first-year students. The content of the educational discipline is focused on knowledge of the current state, prospects for the development of information and communication technologies and the ability to effectively work with them, apply basic methods, methods and means of obtaining, storing, searching, systematizing, processing and transmitting data.

The study of the "IT" discipline involves the formation of ICT competence and the acquisition of ICT literacy for the implementation of educational activities and interpersonal communication, information security, information culture. In particular, the prerequisites for understanding the subjects of the discipline are the acquired knowledge of informatics provided by the school curriculum, which serves as a transition from school to the future profession and brings all students to the same level. During laboratory work, students should acquire skills that they will need when studying other disciplines, as well as in further professional activities.

In accordance with the educational and methodological support of the "IT" discipline, the content remains largely unchanged, methods, approaches, tools and teaching aids are constantly updated. This applies both to traditional training in classrooms and computer classes, and to online collaboration of participants in remote mode.

In addition, the educational process during the study of the discipline "IT" in crisis periods also faces challenges, due to which the teacher should determine priorities and plan of action, clearly understand expectations, create opportunities for students and ensure the process of dissemination of educational information for decision-making and regular communication.

Educational resources, which are transferred to students remotely, should be characterized by accessibility, flexibility and simplicity. The teacher had to take this into account when choosing tasks for laboratory work. That is, the student simultaneously studies a certain tool for acquiring ICT competence, and learns to apply it in practice, performing specific tasks. Therefore, the selected digital tools during laboratory work are not only a subject of research, but also a means of application.

Digital ones are quite convenient and simple for carrying out educational activities Google tools that make it easy to provide education in a distance format, and also contribute to the rapid adaptation of students to their use. Digital tools Google circulates in the educational process, supplementing one service with another, having powerful functionality for use, in particular for creating sites, for collaborative work with the possibility of editing documents in real time, for cloud data storage and access only if connected to the Internet with any technical means at any time and in any place, for means of control with full compatibility with other services.

The following main reasons for use can be identified for the educational process Google digital tools: free, one account for all services, intuitive clear interface, cloud data storage, minimum requirements for access to services, joint creation of projects, delineation of access rights, preservation of history of all changes, support and development, user community. The practical application of at least one of Google's digital tools makes it possible to evaluate their advantages, to form the information culture of the participants of the educational process, to acquire the necessary digital competence in the modern world, in particular, the creation of an account and profile in social networks, participation in communities, the culture and ethics of network interaction, the ability to collaborate in one project, create announcements of publications, explore the details of working with calendars, sites, blogs and survey forms, etc.

Since modern students actively use these tools in everyday life, their main advantages for the educational process are simplicity, speed of work, which does not require special knowledge. These advantages are of great importance for both face-to-face and distance learning both in stable periods of social development and in times of crisis. Google's digital tools make it possible to diversify the forms and methods of organizing training and communication between users, optimize methodical work, make training

effective and interesting, to reduce the costs of organizing and managing the educational process, to form a vision of the prospects for the development of one's own educational institution through implementation of digital technologies, which is especially important in times of crisis development of society.

In laboratory classes in the "IT" discipline, students were offered educational tasks using Google's digital tools, which were demonstrated to students as a means and subject of research. Each subsequent assignment to laboratory works complemented the previous one, revealing more and more new possibilities of using Google's digital tools in the educational process, thereby forming the ICT competences of the future specialist.

During the laboratory work "Developing a website using Google Site", students had the opportunity to see for themselves that creating a website does not require extraordinary abilities of a professional programmer. It is necessary to approach this task creatively and creatively, to clearly think through all the stages of creating a site and ensuring proper functioning, as well as to determine the target audience for which certain information will be published on the site. It was emphasized to students that Google, which owns the Site application, can provide a powerful arsenal of tools for creating a site, in which the average user, using ready-made designer templates, will be able to ensure the publication of various materials on the pages of his own site. By creating sites using Google services, they can be used in various areas of the information society in the future, as the students learned before completing the task.

The students' attention was drawn to the fact that when switching to the application Site from the company Google opens a powerful environment of site builder tools with possibilities of stylistic design, adding various objects (Maps, video files from YouTube, files from Drive, Calendar, etc.) to fill the site and ensuring its proper functioning.

The laboratory work "Creating an author's blog using Google Blogger" corresponds to the current preferences of student youth regarding the blogosphere, namely the use of blogs for educational purposes. It was emphasized to the students that now young people follow bloggers, their stories and posts, therefore it is fashionable and relevant for a modern specialist to have an author's blog in which he can publish a wide variety of information and make it available to a certain circle of readers. Information

in the blog is united by a certain topic, presented in a structured manner in a logical sequence. The author's blog attracts attention with its appearance, proper design, which makes educational information attractive and interesting to learn. Comparing the possibilities of a book, a website, a forum and a blog, it is worth highlighting some features. The site has no means of feedback to the target audience, the book has no means of visualizing the presented information, and the forum is a means of communication, not educational activity. Therefore, the use of a blog increases the motivation to learn new knowledge and acquire skills, creates attractive conditions for their implementation, diversifies and improves the educational process.

Together with the students, it was analyzed that blogs can be created with the help of various platforms, in particular, using the well-known social networks Facebook, Instagram, Telegram, Twitter, YouTube, TikTok, etc. This lab focuses students on Google Blogger, which has powerful tools for creating and maintaining a blog. The training instructions provide a step-by-step algorithm for the author's blog, which begins with setting up your own account in the Google system and switching to the Blogger platform.

It was also emphasized that an interesting stage of creating a blog is its appearance, in particular, its layout and design. Publishing blog posts with the possibility of attaching photos and video materials, processing information in it is the most important stage of creating an author's blog, because the information provided must be interesting and properly designed. Students' attention was drawn to the target audience of their own personal blog, namely adding readers to view the blog and comment on individual posts. On their own experience, students had the opportunity to make sure that when creating a blog, you can use various gadgets, that is, small software applications that will perform certain functions, in particular, display the current date, count the number of visitors to the blog, etc.

Tasks for laboratory work in the discipline "IT" indicate that students had the opportunity not only to familiarize themselves with Google's digital tools as a subject of research, but also to test their use on their own experience, but as a means of learning. In addition, the tasks for the laboratory work were thought out in such a way that the student accumulated, supplemented and diversified his knowledge of Google's digital tools.

Special attention of students was also paid to the issues related to setting up the organization of collective work with Google digital tools, in particular,

the ability to jointly define an indicative plan of action, to clearly distinguish responsibilities, without understating or exaggerating the participation of the students involved. This is special relevant in the educational process during various crisis situations that contribute establishment of mutual assistance, mutual benefit and quality cooperation not only between teacher and students, but also between classmates or students of a certain stream.

The analysis of the main aspects of the use of Google digital tools as means of distance learning in crisis social processes in the context of the formation of IR competence of teachers, organizational and methodological support of the educational process, technical support of distance education made it possible to focus the attention of students on acquiring knowledge, skills, and abilities in the educational discipline "IT" during the war and not lose the desire of most students to study and ensure physical and psychological safety. In particular, when studying this discipline, attention is focused on acquiring practical skills in using Google's digital tools as a subject of research and a means of learning.

Google's digital tools have specific usage and functionality for educational purposes, which allows them to be at the forefront positions in the organization of the educational process, in particular during crisis periods of development society. Thanks to the ease of use with Google's digital tools, intuitively clear interface of its applications, dynamic synchronization of data on different technical devices, opportunities for collective work, etc., the authority of the company constantly confirmed by a fairly large group of users.

Distance education gives the student the opportunity to develop such qualities as independence, mobility, the ability to self-educate, the ability to make independent decisions, which is highly valued today in the labor market. However, among the disadvantages of distance education in the period of instability in society, the following are identified: insufficient technical support for communication, lack of Internet, low self-organization of individual students, separation from the group, team, etc.

The conducted studies of the developed system of activities for the organization of the educational process using digital tools in crisis social processes led to the following conclusions:

– the primary condition of distance learning is the safety of the subjects of the educational process, which required a mode of asynchronous work;

- the participants of the educational process were oriented to the plan of maximum educational determination, the use of tools for interpersonal communication, selection criteria and plan "B", if the main one cannot be implemented;
- the recommended pedagogically balanced system of organizational measures led to a reduction in the negative impact on learning of various challenges associated with critical situations;
- support of the emotional state of the participants of the educational process took place through the functioning of the relevant services and measures of psychological support in order to focus students' thoughts on important elements and promote internal harmony;
- the communication of teachers and students required paying attention to the peculiarities of virtual communication, in particular the influence of unreliable, low-quality information on the personality, manipulation of human consciousness, removal of prohibitions and moral restrictions.

Conclusions

Research into the problem of organizing the educational process under conditions of force majeure, in particular a full-scale war, led to the conclusion that online education is a forced measure that is directly related to the introduction of security restrictions. However, a detailed analysis of the positive and negative aspects of the introduction of distance learning enables the following conclusions:

- the most effective format for the provision of educational services in the existing conditions turned out to be a mixed format, as it combines classic (traditional) forms of work with the use of virtual platforms;
- it is advisable to link the prospects of further scientific research with the preparation of the teaching staff to work in a mixed format and the use of innovative methods and teaching tools;
- a meaningful role in the process of such educational activity is also played by the aspect of mentoring, when the teacher ensures clear and effective communication with students and provides the necessary support; educators should stimulate student dialogue, discussion and collaboration using appropriate online tools and platforms;
- the system of adequate evaluation methods, taking into account all possible aspects of work and training conditions, remains a painful problem, unfortunately.

Blended learning has great potential to improve the quality of education and ensure flexibility of learning. However, it requires planning, preparation and improvement of educators themselves. Innovative approaches and constant readiness for change are important success factors in the organization of blended learning.

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