MODERN EDUCATIONAL TECHNOLOGIES IN THE TRAINING OF SPECIALISTS IN THE AGRICULTURAL SECTOR DURING THE CRISIS

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Scientific monograph

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The research is devoted to the urgent problem of formation of professional and innovative competence of future agronomists in the crisis conditions of the higher education system of Ukraine due to the consequences of the pandemic and the war. Modern approaches to the design of the content of education under martial law are highlighted. The structure, main trends and features of forms and methods of training specialists with a focus on new problems and challenges are revealed.

The publication is addressed to heads of higher educational institutions, pedagogical and research workers.

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DISTANCE LEARNING OF MATHEMATICS FOR AGRICULTURAL HIGHER EDUCATION INSTITUTIONS STUDENTS DURING MARTIAL LAW

Lyudmila Novitska[1]

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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 recently found itself, the use of blended learning has become even more relevant during the training of specialists by agricultural institutions of higher education. The forced and necessary transition caused transformations in the educational process, to which teachers and students of higher education institutions must adapt. The article is devoted to the importance of using distance education as a component of professional training, in particular mathematical training, of first (bachelor's) level specialists at the Vinnytsia National Agrarian University. The role and state of mathematics education in crisis conditions is analyzed. 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 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. *The purpose of the article* is to highlight the experience of implementing distance learning at the Vinnytsia National

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Agrarian University, in particular, mathematical disciplines. *Research methods.* To achieve the goal, theoretical and empirical research methods were used: the study of scientific works, the analysis of educational and methodical literature, pedagogical observations of the students' learning process. The article presents the experience of teaching a higher mathematics course at an agricultural university during distance education. The key requirements, principles, elements and technologies for the development, construction and support of a distance learning course are provided. A distance course in higher mathematics is offered for the specialty 208 Agricultural Engineering. 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. It is noted that when organizing distance learning, the problem of the teacher's readiness for distance learning is often not taken into account. It is believed that he easily adapts to new working conditions. Practice shows that this is far from the case. There is a significant need for training of teachers of the organization and methods of distance learning. *Conclusions*. Distance learning gives students access to non-traditional sources of information, increases the efficiency of independent work, provides new opportunities for creativity, consolidation of various professional skills, and allows teachers to implement fundamentally new forms and methods of learning.

1. Introduction

The 2022/2023 academic period will go down in the history of higher schools of Ukraine with the following challenges: firstly, the state of war in Ukraine [1]; secondly, the coronavirus epidemic; third, this year’s difficult admissions campaign; fourthly, reduction of sustainable expenses for education; fifth, significant social and psychological tension.

Currently, the entire higher education is faced with a choice, how to preserve the integrity of the student and scientific-pedagogical teams in the conditions of martial law and the pandemic and provide high-quality

knowledge to students of higher education? Educators have a great responsibility for actions before all stakeholders of the educational process, including students, parents, employers, the state, society.

During the wartime, qualified personnel are needed more than ever to prevent a food crisis in Ukraine and the world, as well as to rebuild our state. A special need is already felt for qualified personnel for the restoration of all branches of the economy, in particular agro-industrial, nature protection, processing, food, etc.

Therefore, the first task of all institutions of higher education, including agricultural ones, is to in no case stop the educational process and the training of qualified personnel, to ensure the quality of the educational process in the new academic year and to preserve the life and health of students and teachers in the difficult conditions of war state [2].

2. The role of mathematics and the state of mathematics education before and during the war

Even before the war, there were discussions in our country about what mathematics education should be. And how many good words have been said about quality education, which, they say, is our future. And now society can clearly see why it is important. Because modern wars are primarily wars of technology. State-of-the-art equipment can turn into ordinary binoculars if you do not understand how it works and how to use it. A gunner cannot calculate the trajectory of a projectile without mathematics.

Qualified workers with knowledge of the basics of natural and mathematical sciences will be desperately needed by the country even after the war. In industry, construction, technology development. Journalists and humanitarians, who will probably have to join the ranks of the Armed Forces, cannot do without mathematical knowledge. Or write about events, analyzing numerical data or technology. And here the incompetence, which some journalists and translators were even proud of before, is no longer acceptable.

We have not only seen how important mathematical education is. And we have problems with it in our country. Even before the war, society was shocked by the results of the international PISA study, which showed that most of our teenagers do not know mathematics. And in elementary school, not everything was fine – national monitoring data clearly show this. The

results of the external examination, when future students could not solve elementary problems, are also disappointing. The current national multi-subject test in view of the war in mathematics is primitive, so the unsolved problem will move to high school.

Perhaps someone will say that it is not the right time to talk about the quality of education. The main thing now is the war. But in fact, war is just a chance to see problems and radically eradicate their causes. Now we are protecting the future of Ukraine, and it is impossible without a change in the quality of education.

Even before the war, Ukrainian education, in particular higher education, had tendencies towards easy, mainly game-based learning with little inclusion of actually educational elements, a tolerant attitude towards pupils and students, and this term concealed turning a blind eye to cheating, ignoring homework and the educational process in general and making good grades for about zero knowledge. Accusations of reluctance to learn are solely due to the fact that children are not interested. The value of any knowledge and skills was downplayed, the main thing was psychological comfort, sensitivity to reluctance to make even the slightest effort, the cult of ease and problem-free life. In fact, such a situation created an illusion in children that their life will continue to be easy, comfortable, someone will solve all their problems, no effort is needed, and in general, everyone owes them something.

It is necessary to think about the country's need for engineers and qualified specialists, who must have basic mathematical knowledge (calculation skills, elements of practical geometry, concepts of functions and graphs, composition and solution of elementary equations, inequalities, systems, proportions, etc.). The meager number of graduates who know mathematics is not enough even for the needs of the information technology sector, postgraduate programs of the best world universities have been opened for physics and mathematics stars.

3. Peculiarities of distance learning

The intensive development of computer and information technologies in the modern world determines the creation and implementation of the latest learning technologies. One of the main trends of this process is the relegation of traditional technologies (face to face learning) and the gradual

development of electronic (e-learning), mobile (m-learning) components of the educational process. Thus, a new direction of educational technologies appeared – blended learning [3].

Vinnytsia National Agrarian University (VNAU) has been successfully conducting mixed education for several years using a wide range of modern tools and technologies, which allows it to adapt to today's requirements.

Blended learning is a relatively new approach in the field of higher education in our country, provides flexibility in relation to traditional learning, provides an opportunity for educational institutions to offer learning in different conditions of delivery of educational material. This is a successful combination of traditional education with elements of online education. Usually with such training: materials are submitted in electronic form; there is a possibility to submit work in electronic form; there is regular evaluation with comments; the possibility of group work is provided; there are means of electronic tracking of success (electronic logs); face-to-face learning is based on the principles of interactivity.

Blended learning means a combination of traditional teaching methods with modern information technology tools that allow you to continue learning in any convenient place and time. It involves not just teaching materials in electronic form, but mandatory feedback from students to the teacher, either electronically or face-to-face. Note that the simple use of electronic resources in class without further work with them by students cannot be called blended learning: for example, conducting a class using a multimedia presentation, which is at the sole disposal of the teacher, or using computer testing using a system installed in a computer laboratory. The mixed learning model is a model of using distributed informational and educational resources in stationary training with the use of elements of asynchronous and synchronous distance learning.

Distance learning is an opportunity to learn and obtain the necessary knowledge remotely from an educational institution at any convenient time. It should be noted right away that there is no one-size-fits-all distance learning scenario. There may be similar methods and forms, however, the overall learning will always be different. This is characteristic of any educational institution, where even with uniform standards and general requirements, the actual training is slightly different. These differences arise from the natural needs of educational institutions, where different teachers

actually work, different academic schools operate, different emphasis is placed on the direction of study. Distance education has gone even further. Education of each student in this system is an individual and flexible process. There is an opportunity for each student to build his own curriculum, learn the material at his own pace, and focus on those areas that are interesting.

It should be noted that distance learning has always looked like a rather attractive alternative to traditional education. In many scientific works, its advantages such as cheapness due to savings on the provision of a workplace and the possibility for subjects of training to work remotely from home are indicated, while the software and technical support of educational activities is transferred to the teacher and students. In addition, the costs of training one student in the distance learning system are considered to be the lowest. The dependence of distance learning effectiveness on students' age, previous education, professional training, educational experience, their ability to self-organize, self-study, and level of motivation is significant. Also, the transition to distance learning for certain specialties with a large volume of practical training is impossible at the current stage of the development of educational and computer technologies (veterinary workers, food engineers, agricultural engineers, etc.), since the transition to the training of such specialists requires the creation of and timely updating of expensive simulators with the involvement of artificial intelligence.

The experience of many higher educational institutions shows that for the successful implementation of distance learning, it is necessary to take into account many aspects that arise in accordance with the requirements of today, current legislation, regulatory documentation regarding the educational process and all its participants, both from the Ministry of Education of Ukraine and from the leadership of higher educational institutions.

Also, the educational institution must take into account the modern labor market, the state and development of the latest information technologies, the provision of accompanying technical support and a number of small factors that may arise in connection with the local location of a specific user (teacher, student, manager, etc.).

The first steps are especially important and difficult. First of all, it is necessary to choose the type and technology of distance learning that would meet the above requirements and easily adapt to the changes that will occur during the introduction of distance learning into the educational process.

It is the mixed form that can provide this. It has a number of advantages over other forms of distance learning.

The next stage is the creation of a regulatory framework, according to which control and regulation of all aspects of distance learning of higher education institutions are carried out (Admission Rules, relevant Regulations, etc.).

During the quarantine caused by the COVID-19 pandemic, students already studied remotely to the full extent, and the volume of distance electronic learning courses (ELCs) available remotely for full-time and part-time students of the Bachelor and Master programs was about 60% of total number of courses.

On January 24, 2022, the Russian Federation launched a large-scale invasion of the territory of Ukraine, as a result of which training again switched to a distance format. By this time, the teachers already had some experience in organizing distance learning. But such training during the war has its own characteristics, which, of course, complicates its organization.

During the war, several groups of students were formed: those who are at home (in unoccupied or occupied territories) and those who left their homes (internally displaced or externally displaced).

Of course, each student's situation is unique, but these groups of students share certain similarities. Students who are at home, in their native walls, have certain means of learning, although they are forced to constantly move to a bomb shelter and be in a terrible emotional state, which, of course, affects cognitive processes. Students who are not at home, but in Ukraine, do not have the usual conditions and circumstances for studying, but they communicate quite actively with others, are in a somewhat calmer emotional state.

The number of students who do not have access to the Internet is greater than during distance learning due to COVID-19.

At the same time, student groups are dynamic. That is, 10 people are present at the class today, 20 tomorrow, 5 the day after tomorrow. Also, during a synchronous online class, students can both join and disconnect, for example, due to the need to go down to a bomb shelter, where there may be no Internet.

In the context of the military operations currently taking place on the territory of Ukraine, we observe significant differences in the capabilities of

all participants in the educational process, which leads to certain specifics of the organization of distance learning of mathematics during the war:

– lack of distance learning in certain territories;

– periodic or permanent absence of some participants of the educational process;

– a significantly larger number of participants in the educational process have technical problems (lack of light, absence or insufficient availability of gadgets or the Internet);

– poor health of the participants of the educational process (not enough food, water, fresh air, movement, sun, difficult emotional state, etc.);

– significantly reduced motivation, self-organization and self-efficacy of all participants in the educational process;

– limited time opportunities for teachers to create content for classes and for students to complete homework;

– different conditions in which students are (staying at home, internally displaced, externally displaced), which leads to a different sense of security and opportunities for learning;

– the stress experienced by students has a negative effect on cognitive processes, and therefore complicates the learning process;

– groups are not static, but dynamic groups, students often miss classes or their parts;

– there is a request for synchronous online classes from part of the students, because such classes help to distract from the events taking place on the territory of Ukraine, and also allow to communicate with classmates and teachers.

Much research on distance learning emphasizes changing the role of the teacher to that of a consultant or tutor. However, the work experience of recent months did not reveal such a change of roles, the teacher did not become a tutor. Although the students gained more independence in their studies, they needed help, advice and assessment from the teacher in his usual role. The means of communication and communication with students have changed, but not the role of the teacher.

It should also be noted that the students did not turn into highly motivated subjects of educational activity and needed the teacher's guidance, not the tutor's advisory activity. A big problem was the lack of motivation of individual students, their perception of distance learning as an opportunity

to relax, additional vacations, their inability to self-organize and self-study, dependence on traditional learning under the guidance of a teacher. Students with strong internal motivation and desire for knowledge were able to adapt to the transition to distance learning and organize their educational process in a new time-space dimension. Students with predominantly external or situational motivation and dependence on direct communication with the teacher and his evaluation judgments, more oriented to rating evaluation than to the achievement of educational and cognitive goals, turned out to be less adapted to new challenges and needed controlled distance learning and the creation of additional incentives for learning. Difficulties also arose with access to technical means of learning, if there are several users of one computer in the family, or the use of a smartphone as the main technical means of learning, lack of reliable access to the Internet, problems with turning off the electrical networks during classes and credit tests or credit/ examination papers, lack of quality microphones and cameras for video communication.

But there are also positive points. With the transition to distance learning, students initially felt some confusion and anxiety, and sometimes took online learning lightly. Over time, most of them adapted and even began to enjoy certain advantages of such training, such as:

– the opportunity to be present at the class without leaving home, in a convenient and comfortable atmosphere;

– the ability to perform tasks at any time: “owls” and “larks” were able to work according to their biorhythms;

– the ability to be “partially” present when the teacher and other students cannot see each other’s faces, not to answer questions, explaining it by a non-working microphone or poor communication;

– participation in the selection of web resources and video materials for creating tasks that are interesting to perform and relevant to the future specialization of students.

It should be noted that the success of distance learning depended on students' ability to self-organize, their level of consciousness and motivation. Therefore, there was a decrease in the effectiveness of distance learning according to age. In particular, work with high school students who were students of university preparatory courses showed little effectiveness of such training. Often their parents were more interested in the results than the students.

Therefore, it is necessary to develop new approaches to creating tasks, conducting individual classes and learning in general, to look for more effective methods of motivating school-age students, one of which is gamification (especially for high school students and juniors), since the motivational component is weak at school age, understanding of general learning goals is usually absent, self-organization is rather weakly developed, and distance learning is needed more by parents and teachers (external motivation) than by students whose internal motivation is not sufficiently formed.

Overall, feedback from university students about online learning was positive. The virtual classroom not only helped systematize learning, but also simplified and made the evaluation system understandable. Students regularly received automatically generated letters with their scores. If necessary, the teacher could quickly and conveniently provide comments to each work or to a group of works, provide clarification to an individual student or the entire group. The system also sent a reminder to the student about the time of handing in each task, which made it difficult not to complete the task on time.

During the transition to distance learning, the process of coordinating the actions of teachers and students turned out to be quite difficult, as a number of teachers increased the number of tasks, motivating it by the fact that they, being in self-isolation at home, have more time and therefore can do 1,5-2 times more work from their subject. Some teachers perceived the challenges of distance learning as conducting traditional classes in real time based on a certain online platform in the form of video classes. Sometimes teachers, considering their subject to be unique and the most important, and themselves the only teacher who works with students, did not take into account the need for students to complete tasks from other subjects, scheduled online classes and consultations at a time convenient for them and did not take into account the existence of a general schedule, thereby creating disorder and chaos in the educational process and nervous exhaustion in conscientious students who tried to adapt to all the requirements. In addition, there was a general tendency to hold classes later, as some students, feeling generally relaxed, did not want to start work earlier than 10 o'clock in the morning. The similar lack of general coordination of the teaching staff and imbalance in the organization of the distance learning

system and uniform requirements for students gave rise to dissatisfaction of the latter and complaints of total overload.

The process of involving students in distance learning unexpectedly turned out to be the next difficult moment. Since all students, as a rule, have a fairly decent command of a computer and have access to high- speed Internet, their joining the virtual class and working in it should not cause any difficulties. However, as it turned out, with the launch of the virtual classroom, there was an urgent need to conduct a lot of explanations and trainings on social networks, instant messaging services and mobile applications (messengers), through e-mails, in chats, which took a lot of time. During the day, I had to answer many questions from students regarding the organization of work in the virtual classroom. Below are the main difficulties that arose at the beginning of the work.

Individual students took the involvement in online work not seriously and used pseudonyms, i.e., not their real names when asked to register. nicknames, which created confusion and took a lot of time to identify them.

The form of work, close to a traditional class, turned out to be ineffective in the online class and boring for students. Independent performance of exercises from the textbook was not interesting, and therefore teachers had to urgently create interactive tasks using multimedia tools (video tasks, text exercises in the form of Google forms, etc.).

Art of the teachers understood the transition to distance learning as the need to conduct online classes, similar to the traditional ones in Zoom, Google Meet, Skype, etc. environments. In addition to the additional burden on teachers and students, this caused a number of technical difficulties (for example, the inability to hold long classes in Zoom, problems with joining the classroom in Google Meet without an additional invitation from the teacher, etc.).

The ability to communicate with the camera and microphone turned off was also unusual for many. I had to adjust to the class without being able to see each other's faces, get used to the need to overcome periodic communication problems. The students have a new one “reasonable reason for absence from class” – poor Internet connection or breakdown of electrical networks; since students are well-versed and widely use various virtual environments, for example, Viber, Telegram, e-mail, etc., at the beginning of distance learning, they began to send completed tasks to places where it

seemed more convenient or usual for them to attach them. This created an additional burden on the teacher – it was practically impossible to track and systematize all student works.

Some of them were lost, which caused dissatisfaction among students and created chaos at work. Only after creating a number of step-by-step detailed instruction sheets for each group did the students generally understand the principles of working in the virtual classroom and the procedure for completing and attaching assignments. This reduced the teacher's workload and reduced the number of daily question letters.

Assessment of students also became more difficult, since the main points were presented in the virtual classroom. Then they had to be duplicated in the electronic office, as well as keep paper reporting journals, which caused additional difficulties.

Online learning and the need to stay in forced self-isolation reduced the self-discipline of individual students. During online meetings, they allowed themselves to behave or speak inappropriately, to insult other group mates. Here, the function of removing such students from the virtual class, which, unfortunately, was rarely used, turned out to be very convenient.

Some teachers, who did not have time to remember the faces of all students at the beginning of the semester, had a problem with their identification during the assessment or exam. Students had to be asked to show their grade book or other document with a photo to the camera.

It became difficult to carry out simultaneous test tasks for all students, since it is practically impossible to understand who is on the other side of the monitor, whether the student is doing the work independently, or copying the answers from some resource. Some teachers, in order to avoid copying and eavesdropping, created creative, creative tasks that cannot be found ready-made answers on the Internet or asked students to answer questions with their eyes closed to prevent the process of reading information from the other half of the screen.

The transfer of work to remote form made it difficult and increased the number of reporting documentation, in which teachers had to prove the effectiveness of their work with students. Reports on the completed work had to be submitted every week, and their preparation took 2 or more hours.

An increase in the time spent at the computer led to the deterioration of vision, physical fatigue and motor limitation of all distance learning subjects.

It should be noted that the work in the virtual classroom was difficult, unusual and took a huge amount of time for preliminary preparation. However, it stimulated creativity, forced to look at education from a different angle, forced to look for new effective means of education and new methods for involving students in studying the subject and the process of systematic education.

The main tools used by university teachers for distance learning were: – virtual classes for systematization of groups such as Moodle, Google Classroom;

– special platforms for conducting regular classes in real time close to work in a real audience (Zoom, Google Meet, Skype);

– online resources for creating tests, various surveys, tasks and materials for students;

– available textbooks in digital formats;

– multimedia video and audio materials, other resources compatible with the selected virtual class.

Such experience led, in particular, to the following results: a well-prepared initially student with a high level of motivation manages to overcome the difficulties of remote learning and demonstrate good answers on the exam. Of course, you have to work yourself, the importance of independent work increases many times.

With skillful organization and use of opportunities to communicate with the teacher, a high level of mastery of the material can be achieved; student qualities such as the ability and desire to independently process and assimilate the offered information come to the fore during preparation. There are pleasant "surprises" when on the exam you want to tell the student about his answer: "This is better than expected". By the way, among such "average" students there are many who were sick for a long time, were in quarantine and at the same time did not lose, but only gained the desire to learn. The desire for self-development, learning "for yourself" is sometimes a much more motivating factor than others. If the student has a very weak initial preparation, and also a weak level of communication with other students of the group, then the remote form of learning is too much for him and most often leads to "failure" in the exam. Such a student cannot move forward during preparation and generally loses motivation. If such a problem is detected in advance, the teacher can try (of course, if the student

takes the initiative) to help him organize his independent work, conduct several consultations in the usual format.

Whenever possible, such consultations should be held, and intermediate control in classrooms is, of course, very informative. Many students are active during remote classes, trying to show their presence, but later it turns out that this is only a visible side. In fact, the level of these students is so weak that the material is not learned at all, and the result on the exam turns out to be unsatisfactory.

What has the use of distance learning shown? It once again confirmed the fact that the learning outcome depends not only and not so much on the form of presentation of the material by the teacher, but on the student's desire and ability to assimilate this information. As long as it is possible to conduct classes in the usual "live" format, it is necessary to instill self-education skills in students in advance, to teach them to organize their work, their time, the ability to take initiative and make independent decisions, and to nurture students' desire for self-development.

If online training is necessary, the teacher should use all opportunities to help the student in the learning process, providing him with the necessary support in acquiring knowledge. Such a cooperation strategy should be aimed at preserving and improving the quality of education in a difficult period.

4. Online services during distance learning of mathematical disciplines

The Moodle platform (https://moodle.org/) is a free open distance learning management system. Allows you to use a wide range of tools for educational interaction between the teacher, students and the administration of the educational institution. In particular, it provides an opportunity to submit educational material in various formats (text, presentation, video material, web page; classes as a set of web pages with possible intermediate performance of test tasks); to test and survey students using questions of closed (multiple choice of the correct answer and matching) and open types; students can complete tasks with the possibility to forward the corresponding files. In addition, the system has a wide range of tools for monitoring students' educational activities, for example: regarding the total time a student works with a specific educational subject, relevant topics

or components of educational material, the overall success of a student or group in the process of performing test tasks, etc. [4].

The positive aspects of using Moodle are: distance course resources are always available; saving time during testing compared to oral interviews; reports from laboratory and practical work can be received and corrected electronically; answers to questions during the student's independent work can be provided remotely; in the event of a student's absence from classes for valid reasons, the possibility of counseling and assessment of his assimilation of the educational material; it is possible to download presentations, images, video, audio and text files; you can view how much time students devote to studying the course, how often they visit the platform, what mistakes they make in tests.

Along with this, there are disadvantages: the impossibility of remote identification of the student's identity by the teacher (there is no 100% certainty that, for example, the test was passed by the student whose last name is in the grade book); the possibility of biased assessment of students' knowledge by the teacher in connection with the written reporting of task performance, as some students find it easier to give an answer orally; low quality of video communication; insufficient self-discipline of students regarding successful work in the distance learning system.

Video conferences are one of the main elements of distance learning. The Zoom application – a cloud platform for online video conferences and webinars – has gained incredible popularity during the quarantine.

Advantages: high quality video and audio communication; screencast capability: Any participant can share their screencast. The teacher can select several students to show the screens at the same time; commenting is available. the presence of the "Discussion Rooms" function, which makes it possible to discuss the problem by manually dividing the conference participants into small groups. You can set a time limit for them. The teacher can visit groups to participate or observe; the presence of the "Hall of expectations" function provides an opportunity to conduct an individual survey of an individual conference participant; online blackboard with the possibility to draw on it or write; broadcast from mobile phones; password protection of the conference; collective chat between participants; calendar and reminder to participants about the start of the conference; webinar recording; integration with calendar, mail.

Disadvantages: inconvenience of using the online board when writing formulas, performing geometric drawings.

An example of means that provide the possibility of synchronous communication using chat and voice communication is Skype.

Advantages: you can give explanations and ask questions face-to-face, send files, correspond in chat, show presentations; surveys available; audio and video playback in screen display mode; the system allows you to call ordinary landline or mobile phones all over the world; support for video calls, creating a conference of 10 subscribers.

Disadvantages: there is no built-in virtual whiteboard – and without it, online learning will not be effective enough; there is no possibility to automatically record the lesson so that it can be reviewed later; the ability to create a conference call, creating a group consisting of a maximum of 25 interlocutors; if 5 participants can still actively interact in the connection, then the work of 10 will be complicated, the program hangs, the voice lags behind the image, and the image itself often loses clarity.

Today, the Google Meet service is also gaining popularity for conducting high-quality virtual classes, parent meetings, parent-teacher conferences, tutoring and even school social events.

Google Meet allows: integration into various calendar planning systems, in particular Google, thanks to which it is easier for the teacher and students to coordinate the time of the meeting; conduct audio and video broadcasting with high quality; demonstration of your screen by any of the meeting participants; the teacher, as the organizer of online communication, can choose several students to show screens at the same time; chat option is available; there are no time limits for video meetings; all you need is a link to go to a video meeting.

Some inconvenience in using Google Meet is the lack of ability to record an online lesson and the fact that to create a video meeting you need to log in to a G Suite account, given that most people use a Gmail account. However, despite the fact that in some versions a slightly more advanced functionality is possible than in Google Meet, for most of them you need to download additional software and there are time limits for video communication in the free versions.

In order to successfully choose a service, you need to formulate clear tasks that are expected to be performed with students during a video meeting, and to be aware of the expected results after using them.

In our practice, we use the Zoom application to conduct lectures and practical classes in mathematical disciplines. Downloaded to the phone, Zoom allows both the teacher and the students to show their own recordings, which are performed directly during the teacher's explanations or students' answers. Thus, the built-in screen display function serves as a substitute for a regular whiteboard. But there is one drawback. By pointing the phone's camera at a piece of paper, we are forced to hold the phone with one hand and make the necessary notes with the other, which is physically inconvenient. Yes, the available online board allows you to write and draw, but it will take a lot of time to develop such skills as they say, "hand typing". And for that it is simply not enough now. Someone will say that there is special equipment for fixing the phone. But not everything can be obtained instantly in the current conditions. But, despite these inconveniences, the Zoom application turned out to be the most useful.

The above-mentioned online services make it possible to diversify the educational process, strengthen learning motivation, and develop communication skills. All psychological barriers are also removed. The use of the programs discussed above increases their competitiveness, creates conditions for building individual educational trajectories, maximum individualization of the educational process, combining the independent cognitive activity of the participants of the educational process with various sources of information, group work, prompt and systematic interaction with teachers. Zoom, with all its positive characteristics, has significant security problems, so you should definitely take this into account when installing it. With the help of Skype, it is impossible to fully use it in the video training format.

5. A distance course as a means of forming motivation during education

A number of psychological-pedagogical, organizational and technical problems should be solved for a successful transition from traditional to distance education. First of all, it is necessary to design and develop a distance course in accordance with the curriculum in higher mathematics, the level of knowledge of students, their previous general and mathematical training, taking into account individual characteristics.

A distance course is a complex of educational and methodological materials and educational services created in a virtual educational

environment for the organization of distance learning based on information and communication technologies, aimed at organizing the educational activities of students to develop structured informational, didactic and educational and methodological materials with the support of available information technologies, in particular, multimedia (audio, video, animation, modeling, etc.) [5, p. 53, 115].

Planning and creating a distance course is a long process, which, as a rule, takes several months and requires coordinated actions of all teaching staff, consultants and technical staff. The distance course should be based on the following pedagogical principles [4]:

– from learning to self-learning;
– the student is the main person;
– creation of a convenient and understandable learning space;
– determination of learning strategies;
– prediction of methods of self-organization, self-control and self-management of students;
– formation of relevant competencies;
– interactivity of training and cooperation of all subjects of the educational process.

In the process of planning and developing a distance course, information and communication technologies should be used as a source of creation, accumulation, storage and access to electronic resources of the educational discipline and ensuring the organization and support of the educational process with the help of specialized software and means of telecommunications and psychological and pedagogical technologies distance learning as a system of methods, tools, techniques, actions, the planned implementation of which ensures training and guarantees its quality using information and communication technologies and taking into account the characteristics of participants in the distance learning process [5, p. 54].

The first steps in the transition to general distance learning during martial law were the selection of an educational platform, the creation of new and the adaptation and systematization of existing materials for virtual classrooms and meeting the needs of each individual group of students in accordance with the curriculum and individual characteristics of each. It is clear that in such a short time it was impossible to create a full distance course that would cover all the educational material of the subject. Therefore, the

main part was made up of the materials of the current classes, which were previously planned as face-to-face. It was necessary to quickly turn them into a distance course.

The next step in the creation of a distance course was to familiarize students with the features of working in a virtual classroom, the organization of electronic communication tools in synchronous and asynchronous modes, and access to educational resources and materials.

In general, preparation for classes and their conduct, analysis and control of students' work took from 6-8 to 18 hours every day, the concept of weekends and working days disappeared. As some teachers noted, the teacher's irregular working day became endless. It took about 2 weeks to create, organize and properly design the remote classes for all groups.

All the preparatory and organizational work was entrusted to the teachers, although the following structural divisions of distance education, which should provide distance education, are described in theoretical sources regarding the system of distance learning functioning: administrative unit for general organization and monitoring of distance education; the customer service unit that provides the arrangement contracts with educational institutions and individuals for the provision of distance learning services; the unit that ensures the organization of the educational process and carries out the formation of the content of education and scientific-methodical, personnel support; a unit that provides organizational, technological and informational and communication support for distance learning; other divisions that take a direct part in the educational process, in the development and use of web resources necessary for the implementation of distance learning [5, p. 54].

In reality, the main specialists for providing distance learning were the pedagogical workers of the university, who performed the functions of teachers, consultants, curators of study groups, authors of didactic and methodical content of distance courses. Although the organization of the distance learning process also required methodologists for the organization of the learning process, assistance in established interactions between teachers and students in synchronous and asynchronous modes, providing methodical assistance in developing the curriculum; administrative and managerial staff to perform the function of heads of units and heads of individual directions and types of distance learning provision; engineering

and technical staff or specialists in information and communication technologies to provide the function of programmers, web designers, system administrators.

In fact, teachers were left alone with the problem of the general transition from traditional to distance learning and only a small part of them were ready for the challenges of distance learning. Therefore, the attempt of individual teachers to transfer the means of traditional learning to a distance platform with practically no changes and modifications to the requirements of online learning becomes understandable.

The need to quickly create new materials and search for new pedagogical techniques for a successful transition to distance learning turned out to be quite stressful for many teachers.

In general, the main components of the functional duties of teachers in the process of distance learning have become:

– planning of the educational process;

– development, adaptation and timely updating of didactic and methodical materials;

– conducting educational events, including various forms of classes (lectures, seminars, practical classes), consultations, discussions, role-playing games in synchronous and asynchronous modes using various means of information and technical support;

– individualization of educational tasks in order to increase the motivation and involvement of each student in the educational process;

– conducting control measures, organizing the process of evaluation, mutual evaluation and self-evaluation of students;

– advising students during study and preparation of graduation, project, assessment and examination papers;

– provision of various reports on the results of students' implementation of educational programs.

At the beginning of the organization of the distance course, the teacher had to predict the quantitative and qualitative composition of students, their level of education and previous learning experience, the availability of relevant knowledge from the course and work experience, level requirements for completing tasks, motivation to study, physical and mental characteristics of students. The next step was to predict the necessary number of hours for teachers to work (which turned out to be impossible

during the quarantine period, since no one knew what time to expect), prepare external and internal materials, provide technical support, create or purchase appropriate software, plan time for studying the course.

In the process of creating a distance course, it was necessary to clearly formulate its purpose in accordance with standardized educational and pedagogical requirements, duration, target audience, types of tasks, methods and terms of their implementation, types of reporting, plan all types of educational activities and indicate its methodological and didactic support. The next step was to compile or revise the curriculum in accordance with the course, predict the number and types of classes, think through appropriate educational methods and techniques for conducting a distance course, develop individual exercises, and plan the control system.

Also, before the introduction of the course, it was desirable to create a presentation of the course for general familiarization and interest of students in its study.

The distance course planning process should include the following stages:

– creating a course program;

– thinking through the structure and sequence of the course;

– provision of a system of adaptation of students to work in a distance course and in the system of distance education in general;

– determination of the delivery system of educational materials;

– creation of conditions for students' interest in the distance course and strengthening of their general motivation to study;

– development of a system of assessment, self-assessment and control of knowledge;

– writing a preface;

– prediction of time spent on course preparation;

– prediction of students' time spent on individual tasks and the course as a whole;

– organization of students' independent work;

– prediction of the system of technical support of the course.

Course tasks should be logically formulated and interconnected. The duration of the course should be clearly defined. A distance learning course must always be accessible to the student studying it. That is, the student can participate in the performance of tasks asynchronously at any time, when it

is convenient for him. It is important to adhere to the accuracy of wording, simplicity and comprehensibility when creating course tasks, to personalize them according to the individual needs of each student.

To adapt the course materials, it is necessary to adapt the existing internal materials for use in distance learning. As for external materials, to use them you need to buy a license if they are paid, or indicate their original sources if they are public resources.

Distance learning tools make it possible to implement an individualized approach to each student and to develop tasks in the distance course in accordance with the peculiarities of his perception.

The distance course should include the following parts:

– preface;
– content and organization of the course;
– information about the authors;
– information about the teachers of the course, consultant and their contacts;
– main goals and objectives;
– detailed description of the course;
– menu and course map;
– information about students as the target audience, their contacts;
– course news;
– course program;
– tasks;
– tests for testing and self-testing of knowledge;
– links to used materials;
– conclusions and questions for reflection.

The structure of a separate lesson within the distance course depends on its purpose, educational tasks, functional component, etc. However, as a rule, each lesson contains an introduction, definition of the goal and formulation of the task, the task itself and means of its implementation, visual materials, multimedia tools, organizational issues, means of control or self-control, conclusions and comments, and reflection.

The development of educational materials should be a cyclical process, because, firstly, it is impossible to develop all materials at once. Development is an interactive process that requires constant consultations and discussions with all subjects of educational activity and evaluation of

the results of the implementation of materials in practical use. During the quarantine, the development and introduction of new materials took place in a fast mode, and their publication in the distance course was carried out, as a rule, 1-2 times a week.

In the process of creating a course, you should plan and think about the types of interaction between the teacher and students, which should include clarification (for example, a lecture, webinar), interactive (practical class), adaptive (individual consultation). Communication can be synchronous (in real time – video conferences, chats) or asynchronous (for example, forum, blog, e-mail, social networks, instant messaging services and mobile applications) [4].

In distance education, conducting classes, consultations, control activities with students in real time using appropriate technical means of communication is a rather difficult and responsible task. In addition to overcoming possible technical difficulties and ensuring a reliable Internet connection, the teacher should carefully consider and prepare such a meeting in advance, since distance communication is different from a traditional class. Therefore, the following requirements for conducting video meetings, forums, web conferences and chats should be taken into account beforehand:

– determine the purpose of the meeting;

– formulate a topic;

– write down the main tasks/problems that need to be solved;

– think over the course of the meeting;

– determine the optimal number of students (4-5, but no more than 10);

– plan the form of the meeting (role or business game, round table, seminar, practical session, defense of works, etc.);

– to determine the main types of activities (speech, discussion of the problem, “brainstorming”, question-answer, game tasks, etc.);

– think over the stages and time limits of the meeting and inform the students about them;

– prepare written fragments in advance, such as greetings, introductory words, activation phrases and encouragements, problematic questions, which can be quickly inserted into the chat during the meeting;

– think through organizational issues;

– predict possible technical problems and ways to solve them;

– think through reflection and expected results;

– make recommendations for students to participate in the chat, video meeting.

The practical experience of conducting remote classes has proven that the following conditions must be observed for their effectiveness and obtaining positive educational results:

– meet weekly on a specific virtual platform in real time so that distance learning subjects can see and hear each other (the use of various video and audio functions such as Zoom, Google Meet or Skype allows you to see and hear each other while keeping continuity of face-to-face interaction);

– adhere to the agreed schedule, which ensures the normality and predictability of the teacher's actions and accustoms students to regular studies;

– be available so that the teacher can promptly provide students with professional, personal and emotional support, even when he himself sometimes does not know what to expect ahead [6].

The presence of feedback is an important component of the distance course, which helps to carry out psychological and pedagogical adaptation of all distance learning subjects, take into account their personal characteristics, eliminate psychological barriers, prevent and correct complications, and plan further actions. The close interaction of the teacher and students in the conditions of quarantine measures and the need for quick and effective coordination of remote and traditional learning methods is particularly significant.

To create a system for monitoring the quality of distance learning, common standards and comprehensive evaluation criteria are needed, the definition of tools for collecting statistical data and evaluation criteria for intermediate and general results, and the development of effective means of reflection.

The new form of education made it necessary for teachers to be in touch almost 24/7, especially when organizing a distance course, adapting students to a new way of learning and establishing communication. Those teachers who previously used various types of communication with students (e-mail, various messengers, teacher websites, etc.) established contacts more easily and quickly and involved students in distance learning, but suffered from a greater psychological burden due to the need to be constantly in touch and respond to the numerous requests of students.

Direct contacts between subjects of distance education helped to quickly solve urgent issues, but did not always provide a real picture of the general situation. Therefore, they had to be supplemented with other forms of communication for general monitoring of the internal dynamics of students' activities, quality control of educational materials, their timely replacement and correction in the process of working with a distance course. Various questionnaires, surveys, tests, individual and group interviews, analysis of student works, results of video meetings, forums, chats, collection of task performance statistics, etc. were used for such control.

In general, monitoring can be carried out by the course teacher, an independent observer, another teacher, one of the students, the student himself or as part of a working subgroup. The following criteria should be followed when developing monitoring tools for the effective implementation of the distance course and establishing interaction with students:

– brevity and brevity;
– clarity and comprehensibility;
– correctness of the questions asked;
– clearly defined time limits;
– differentiation of complexity according to the psychological and age characteristics of the listeners.

In the course of distance learning, the following types of control should be provided:

– current (tests, open questions, control and diagnostic tasks, work with information sources, etc.);
– frontier (quantity and quality of mastered and passed tasks, control test, solving a problem situation, project activity, RGZ, etc.);
– final (general statistics of completion of course tasks, final test, rating evaluation, project implementation, etc.).

As an example of the organization of an educational discipline, we present a distance course in higher mathematics for the specialty 208 Agricultural Engineering. This course contains resources (theoretical materials in the form of files with information presented by the teacher, in the form of links to external sites); active elements (forums, chats, exchange of messages, tests to check knowledge, etc.), which allow to organize communication between students and the teacher; tasks-tasks; workbook (written control work in which the student can change information during a certain period in

accordance with the teacher's advice); database (a resource for accumulating and storing content (files, books, resource data) and presentation (posters, tables, photos) information created by students; online seminars, lectures, conferences, etc.

Distance course "Higher mathematics" is presented in the form of modules containing the entire list of information (from class to control). Each module is divided into separate topics. The first module of the course covers the following topics: "Linear and vector algebra", "Complex numbers", "Analytic geometry", "Introduction to mathematical analysis". The second module includes the topics "Differential calculus of functions of one and many variables", "Integral calculus", "Differential equations", "Series". The course allows you to study topics in your free time and at your own pace.

The developed course has a block structure: content, control and monitoring, and information and communication blocks. The information and communication unit performs two functions: organizational and communicative. It contains the following components: course presentation (abstract and purpose of the course, information about those for whom the course is intended, information about the authors, control forms); the curriculum, with the help of which you can familiarize yourself with the content, methodical structure, sequence of studying the discipline; methodological instructions for working with the course, schedule of consultations, announcements. The content block performs the function of training and is represented by educational material divided into modules. In the control and monitoring block of the use of resources of the Moodle tool environment, it is possible to monitor the educational process, quickly assess the success of learning the material and, if necessary, adjust the educational process. This block contains individual tasks and methodological instructions for their implementation with a detailed solution of typical tasks, a package of test tasks to determine the degree of mastery of individual modules and the entire course as a whole. The package consists of test tasks of current, modular and final control. As one of the necessary components of the distance learning system, testing provides a fairly objective assessment of the level of student preparation. In addition, the method of computer diagnostics of knowledge implements such basic didactic principles of control as systematicity, individual approach, coverage of all material by test control.

The course poster contains the following information: course name, purpose, summary. Also, from the poster page, you can enter the question and answer forum, the teachers' forum, the news forum, go to the pages on which the program and work program of the academic discipline are posted, the list of recommended literature, electronic materials on higher mathematics, tables on elementary mathematics, the main course glossary.

The quality of assimilation of the educational material of the distance learning course in higher mathematics implemented by us is largely determined by the reality of its computer visualization. Audio and video informational materials, accompanying independent work with explanations, presentations of lecture material implemented in a distance course using Moodle, contribute to the deepening and consolidation of knowledge, the development of intuition and imaginative thinking, which are necessary for a future agricultural engineer. The means of this distance learning system enabled the implementation of various pedagogical technologies, provided a multi-level model for studying each topic of the course. So, for example, hyperlinks in the distance course text to a paragraph, terminological dictionary, sites, to additional information resources implement both a linear and branched learning algorithm. They ensure the convenience of presentation of educational material, contribute to its systematization, reflect the interrelationship of various aspects of the discipline, bring the process of knowledge transfer closer to direct communication. The use of a color palette focuses attention on key issues. The Moodle tool environment also made it possible to build animated images on the basis of mathematical models, to explain difficult points of the educational material.

6. Student preparation for distance education

In the conditions of socio-economic transformations in Ukraine, the requirements for the quality of education, specialists of the highest category, the development of their intellectual and creative abilities, which allow them to successfully and actively participate in public life and the development of the economy, are significantly increasing. As a result, the system of higher education is qualitatively changing: new educational standards and programs are being created, methods of training specialists are being improved based on the choice of directions, which will ensure the

development of cognitive and special abilities of students to independently acquire knowledge and solve new problems in professional activity.

Analysis of modern pedagogical research and practical experience testify to the growing interest in the problems of forming the readiness of future specialists for professional activity, independent work, modern remote learning technologies, the analysis of which makes it possible to determine the degree of study of the specified problem. Thus, the works of E. Gapon, N. Gelashvili, L. Zhuravska, V. Kozakov and others are devoted to the issue of pedagogical foundations and conditions for organizing students' independent work. Various aspects of the use of distance learning technologies in the educational work of higher school students are given due attention in the pedagogical theory, in particular, the following aspects: T. Poyasok, S. Sysoeva, E. Polat, V. Bykov studied the scientific support of distance professional education; the organizational and pedagogical foundations of distance learning were studied by V. Oliynyk, N. Korsunska, P. Talanchuk and others.

The peculiarity of distance learning is that during the learning process, students work independently with electronic and printed learning tools in the absence of direct involvement of the teacher. The process of organizing distance learning can be implemented in the presence of certain psychological and pedagogical conditions, the creation of which ensures an increase in the effectiveness and efficiency of this process.

The analysis of the psychological and pedagogical literature showed that scientists define the conditions for the effective organization of distance learning in different ways and ambiguously assess their impact on the success of the educational process. This can be explained by the fact that various aspects of distance learning, external or internal, were analyzed in the course of research. In some cases, they were based on external aspects (organization and management, system of educational tasks, didactic tools), in others – on internal ones (motivation, creative character, content and methods of activity), as well as certain differences are introduced by the specifics of the disciplines being studied. However, most scientists note that one of the main conditions for the organization of distance learning is the readiness of students for independent cognitive activity.

Analysis of scientific literature [7; 8; 9; 10] testified that the formation of an individual's readiness for a specific type of work is carried out in accordance with the following stages:

1) positive attitude to activity, profession;

2) assimilation of theoretical knowledge;

3) mastering practical skills and professional skills;

4) improvement of knowledge and skills directly in the process of professional activity.

In the context of our study, the readiness of students for distance learning characterizes the state of formation of motivational, cognitive and subject-practical (activity) components in the structure of the personality, which reflect the ability to learn and apply the system of knowledge, skills and skills of using information sources during distance learning.

The motivational component captures a positive attitude to work with information support in the process of independent work. It includes students' awareness of the importance and role of information and communication technologies in their own activity, the need to ensure the conditions for its use, a persistent desire for thorough and detailed preparation for the use of information and communication technologies in the course of independent work.

The cognitive component is represented by a system of knowledge about the essence, meaning, types of information sources and ways of applying information support in the process of distance learning. This component provides for the necessary amount of psychological-pedagogical and special knowledge on the use of information support by students in the course of independent activities.

The subject-practical (activity) component is formed from the list of abilities and skills for using information support in the distance learning process. These skills include general and special skills and the ability to use different types of information sources depending on the type of activity, the ability to plan and organize one's work with information sources, predict and analyze the results of independent work with the help of information support.

Analysis of psychological and pedagogical literature [8; 11; 12] and the study of pedagogical experience made it possible to highlight the following skills:

– plan independent activities (determine the sequence of actions when performing tasks for independent work, allocate time budget, etc.);

– control the correctness of one’s actions, as well as evaluate the quality of work performance through self-reflection;

– find sources of information, selection of necessary information using several sources;

– process information (analyze and classify educational material, draw conclusions from what has been learned);

– use information and communication technologies in independent activities in the process of distance learning.

7. Independent work in the conditions of distance learning

The works of psychologists P. Anokhin, N. Bernstein, L. Vygotsky, V. Davydov, A. Leontiev, S. Rubinstein and others have made a significant contribution to the development of modern didactics in the field of work.

The problems of substantiation of theoretical foundations, methods of organizing independent work, as well as the development of creative abilities of students are given considerable attention in the works of foreign scientists (A. Tom, J. Liner, J. Litt, etc.).

Various aspects of the problem of organizing students' independent work have been reflected in the scientific works of recent years.

Dissertation studies have also appeared, which consider the issue of organizing students' independent work when studying individual subjects: pedagogy (V. Khrypun), philosophical and political science disciplines O. Popovych), foreign language (M. Smirnova), mathematics (N. Vanzha), legal disciplines (N. Shishkina), social disciplines (A. Tsyuprik).

Today, these studies are widely used in higher education and contribute to the development of educational and cognitive abilities and cognitive independence of students. However, despite the many-year history of consideration of the concept of "independent work of students", there is still no generally accepted definition. It is used by scientists in various contexts:

– the student performs the work independently, without the participation of the teacher;

– the student thinks independently and orients himself in the educational material;

– extracurricular work of students.

The concept of independent work in the first sense was used by M. Kashin, K. Gomoyunov, V. Bogdanov, B. Esypov, N. Dairy, R. Mikkelson.

K. Gomoyunov considers independent work to be the planned work of students, which is carried out under the guidance and at the request of the teacher, but without his direct participation.

R. Mickelson understands independent work as "a student's performance of tasks without help, but under the supervision of a teacher".

M. Gelashvili claims that independent work is a special form of organization of learning, which is carried out according to the task of the teacher and the implementation of which requires active mental activity from the student.

Independent work of students, as a separate form of the educational process in the traditional organization of education, was also interpreted as extracurricular work of students (L. Golovko, S. Zinoviev, V. Lyaudis).

Thus, L. Golovko understands independent work as one that is performed on one's own, without outside help or guidance during extracurricular activities.

The essence of independent work was also considered in these works V. Buryak, B. Yesipov, I. Unt, I. Lerner, O. Nilson, P. Pidkasysty, M. Skatkin, B. Korotyaev, and others.

B. Yesipov and O. Nickelson considered the external, organizational side of independent work to be decisive. V. Buryak and I. Unt emphasized the unity of the internal and external aspects of independent work. There are different views on organizational aspects: the method of learning, the means of learning and the form of organization of educational activities.

V. Buryak, B. Yesipov, L. Zharova, A. Usova and others define independent work as a method of learning in their research. Independent work was understood by M. Gelashvili, T. Shamova, and Ya. Kamensky as a form of organization of educational activities.

Some scientists, in particular M. Garunov, G. Gaponov, P. Pidkasisty, consider independent work a means of engaging students in independent cognitive activity.

P. Pidkasisty [13] claims that "independent work is not a form of organization of educational activities and not a method of learning. It should be legitimately considered rather as a means of engaging in independent cognitive activity".

V. Kozakov considers independent work as an independent learning activity outside the classroom, the main goal of which is the formation of the student's independence.

The approach to the independent work of students as an independent learning activity allows to represent it not as a didactic means of learning,

but as a system of his (as a subject) independent actions with subjects-tasks in appropriate conditions. It is the various conditions and subjects that make it possible to create a dynamic system of interactions of the subject with the surrounding world and thereby form such a trait of the student's personality as independence.

The analysis of scientific sources proved that the issues of independent work were relevant in different periods of the development of higher education. But, if at the initial stages of the development of a higher school, independent work was defined as an important form of organization of the educational process, which had a much smaller amount of hours, then modern normative documents distinguish it by the main type of activity when studying educational material and the method of learning in correspondence and distance forms of education.

In our study, the independent work of students in the conditions of distance learning will be considered as a purposeful set of subject actions of the student, which are carried out under the guidance of the teacher based on the use of rational information support of the educational process and a system of organizational, technical, programmatic and methodical measures.

There are two levels of independent work: teacher-directed independent work and actual independent work, which some researchers call students' extracurricular work.

Independent work in the conditions of distance learning acts as a means of forming an independent personality. With the traditional system of organizing students' independent work, the teacher's role is more passive and consists in selecting questions for independent study, a list of educational and methodical literature, and monitoring work results. The development of personality and its independence is at best considered a secondary goal, and in most cases such a goal is not set at all.

Independent work in the conditions of distance learning is significantly different from the actual independent work of students. It is considered not only as one of the forms of learning and a type of educational activity, but is the main type of activity in the study of educational material and method of study in correspondence and distance forms of education. It requires students to have an appropriate level of knowledge of information and communication technologies, as well as developed skills of independent cognitive activity.

8. Information and communication technologies in the organization of independent work of students

For the success of independent work, teachers must explain to students how each academic discipline contributes to the formation of professional and personal qualities. Students have the opportunity to familiarize themselves with the course program, knowledge and skills that can be acquired in the course of studying the course. This will allow students to see the consequences of their work, maintain interest in learning, predict results and take an active part in the learning process. The formation of motivation will be facilitated by the teacher's instructions, which will depend on which questions will be the main ones, and which will require less attention.

Information and communication technologies make it possible to organize independent work of students at a higher and qualitatively new level. There are stages of increasing independence from the mediated leadership role of the teacher in the conditions of traditional education to self-management of cognitive activity in the conditions of distance education. The Internet provides ample opportunities for this. The main services of the Internet can be divided into three large groups: informational, interactive, search.

The class of information services has become widespread in recent years. A variety of this type of service is the distribution of electronic newspapers and magazines, computerized educational programs, as well as access to electronic libraries. Most often, access only to electronic library catalogs is free, but there are projects that provide free access to textbooks and reference literature. Textbooks, methodical and reference literature in the electronic version have their advantages over traditional publications, because they are automatically tracked by keywords. Thanks to Internet services, the university library, the library named after V.I. Vernadskyi in Kyiv (http:www/nbuv.gov.ua.leb) and the Library of Congress of the USA (http:www/loc.gov).

Internet services at the university provide an opportunity to participate in international conferences, scientific projects, and Olympiads; communicate with students from different countries, correspond, exchange experience; search and select educational, developmental, illustrative information; have access to the best libraries of different countries. Teachers and students can find useful information on the Internet sites of the Ministry of Education and Science of Ukraine, the Institute of Teaching Aids of the Academy of Pedagogical Sciences of Ukraine, etc.

Interactive services are based on dialog or other type of communication. Nowadays, the Internet provides various ways of organizing such dialogue, which fall into two classes: e-mail and electronic conferences. An important didactic quality of the Internet is the possibility of organizing free conversations in real time between students and teachers of various higher educational institutions, Internet Olympiads and scientific conferences. A telecommunications conference with delayed access is an exchange of written information, so the number of semantic nuances in such a conference is much greater than in its traditional counterparts. Moreover, such a conference remains open, after all issues have been addressed. Involvement of students in work at conferences and participation in Olympiads provides them with opportunities for further intellectual development, makes it possible to assess their real level, participate in international scientific projects and get involved in an open society. Search services allow students and teachers to use the resources of the global Internet network for preparation for classes and self-education.

Most of the Internet space of Ukraine consists of the websites of higher educational institutions. The sites not only advertise universities, inform about faculties, specialties, but also provide access to the university library, methodical materials, lecture notes, textbooks, and course programs developed by teachers of higher educational institutions.

Most of the leading universities of Ukraine provide free access to information about the higher educational institution, teachers, the educational process, as well as access to libraries on the Internet.

The Internet provides wide opportunities for distance education. The website of the Ukrainian Center for Distance Education (http:www/udec. ntu-kpi.kiev.ua) provides an opportunity to build an education system that provides access to the latest educational resources to everyone at any period of life, at the most convenient time. It is unrealistic to provide such access by means of formal educational institutions. Modern distance learning systems are designed to work in any network, on a platform with a web interface and the ability to save data in a standardized format.

Distance learning requires not only the readiness of students, but also the appropriate training of teachers. Most scientists consider the student and the teacher as the main subjects of the educational process, therefore there is a need to consider their functions.

In the process of organizing distance learning and ensuring its functioning, the teacher must carry out:

– planning students' educational activities, i.e. determining the goal and methods of achieving it;

– creation of a program for independent work with determination of the scope and number of tasks, terms of their completion;

– organization of information support of one's discipline (preparation of educational and methodological complexes, tests for computer control of students' knowledge, etc.);

– the actual conduct of independent work of students, i.e. ensuring the interconnection of individual components of the educational activity system;

– management of students' independent work, i.e. control of students' activities with subsequent correction to achieve the goal;

– planning and carrying out control measures of students' success.

The student must be guided by the following scheme of organizing his own cognitive activity in distance learning conditions:

– plan your actions, that is, choose your goals, determine the ways and methods of achieving them;

– to organize work, that is, to combine resources to solve the tasks;

– to manage one's activities, i.e. to carry out self-control with subsequent correction of one's actions;

– communicate on the basis of information support for independent work.

Formation of students' readiness for distance learning begins with the first year. At the same time, it is necessary to take into account the general level of intellectual development of first-year students, some of whom actually do not know how to work independently, therefore one of the tasks of the teacher is the development of the ability to learn with an orientation to self-education using information and communication technologies.

The following are among the means of technological support for distance learning: 1) Case technologies; 2) TV technologies; 3) IT technologies [14, p. 50].

The case technology method is a simple form of distance learning. The basis of its organization is the development of a basic package of educational and methodical materials, which is sent to the student for self-study. Feedback is provided through consultation with the teachers of the educational institution. Consultations are held on agreed days at the

educational institution. To determine the frequency of communication, it is necessary to draw up a consultation schedule. The role of the teacher in the organization of independent work of students when using case technologies consists in the creation of an educational and methodological complex for the discipline provided to the student and conducting consultations. Monitoring of educational achievements is limited to individual communication according to the schedule. Interactive communication is limited.

The most interactive form of distance learning is TV technology. Its essence consists in listening to lectures with the help of televisions and receivers. In the future, it is planned to use WebTV technologies, which allow using a decoder to receive training programs via the Internet directly on a home TV. Independent work using WebTV technology is more convenient for students and provides wider opportunities for self-education, but requires more developed self-organization and self-management skills from students.

The widespread and most modern form of distance learning is electronic distance learning based on the use of Internet technologies. This form of distance learning provides unlimited opportunities for organizing students' independent work. For self-education with the help of electronic distance learning, a student must not only develop self-management, but also possess a sufficient level of knowledge and skills in working with Internet technologies.

Independent work in the conditions of electronic distance learning has the following advantages for students:

1) availability of educational materials (texts of lectures, tasks for practical or laboratory and independent works; additional materials (books, handbooks, manuals, methodological developments) and tools for communication and testing 24/7;

2) availability of tools for group work (Wiki, forum, chat, seminar, webinar);

3) the possibility of reviewing the results of the distance learning course by the student;

4) the possibility of viewing the test results;

5) communication with the teacher through personal messages, forum, chat;

6) downloading files with completed tasks;

7) use of reminders about events in the course.

Organization of independent work in electronic conditions distance learning requires the teacher to have a high level of knowledge and skills in working with Internet technologies, a creative approach when creating author's courses and provides appropriate tools for monitoring the educational achievements of students, coordinating the periodicity and schedule of independent work, opportunities for constant and timely improvement of course elements.

Independent work in the conditions of electronic distance learning has the following opportunities for teachers:

1) provision of tools for the development of author distance courses;

2) placement of educational materials, as well as video, audio and presentation materials in various formats and through additional plugins;

3) the possibility of adding various elements of the course;

4) quick modification of educational materials;

5) the possibility of using different types of tests;

6) automatic formation of tests;

7) automation of the process of knowledge verification, reports on student completion of the course and reports on student completion of tests;

8) the possibility of adding various plug-ins to the course allows the teacher to use various third-party software tools for distance learning.

In order for distance learning to be as effective as possible, it must be properly organized using a system of organizational, technical, programmatic and methodical measures. Technical means: personal computers for server organization, personal and network computers.

Methodical: methods, recommendations on distance learning technology taking into account didactic and psychological aspects, lecture notes, textbooks and other methodical materials on paper and magnetic media, reference books, various methodical databases, etc.

Considering the essence of distance education, we note that its elements are implemented to a certain extent in correspondence and traditional education. On the other hand, in distance learning, in contrast to the correspondence form, there are no strict regulations regarding the time of instructional classes, intersessional work, examination and grading session, the list and sequence of disciplines offered for study, restrictions on the use of new information technology tools, contact time for communication with teachers, etc. Distance education is focused on the independent work

of students with information fields from various knowledge banks, project work, trainings and other types of activities with information and computer technologies, the introduction into the educational process of such learning models that involve the holding of conferences. The means of distance learning are modern information and telecommunication technologies, namely: the Internet, e-mail, teleconferences, chat, etc.

According to the traditional teaching method, the goal is to manage the system teacher-student is the assimilation of new information, which the teacher communicates, as a source of information and as a manager who creates conditions for the fastest assimilation of information, while feedback is carried out only thanks to the activity of students, under conditions of passivity of students, there is no feedback and the process cognition becomes unmanageable.

The distance learning system is characterized by a person-oriented approach to its subjects. It provides for a democratic, business-like management style with maximum delegation of management authority to direct executors. Both sides of the management process discuss and make decisions, contribute to the implementation of personal and collective decisions, as a result of which all participants in management activities get satisfaction from their own activities.

The functioning of the system of organizing students' independent work in the distance learning system depends on the activity of the teacher in the implementation of its tasks. Therefore, the teacher has the right to solve certain problems related to the implementation of the system and management pedagogical process. Correction of this work takes place in accordance with the degree of achievement of didactic goals for a certain period.

Software: network system programs, computer training programs, tool environments for creating training programs. To create computer training programs, you can use software environments hosted on different servers (WebCT) [12, p. 25].

Organizational: regulatory documents of the state and organizations, defining structures of organizations that provide distance learning. The organization of distance learning requires the coordinated work of all functional divisions of a higher educational institution that are directly related to the educational process. A teacher without the support and

help of the rectorate, faculty and department is not able to provide all the external conditions for the effective organization of distance learning of students.

The functions of the dean's offices in the organization, implementation and control of students' distance learning include:

– general organization of distance learning at the faculty;

– inclusion of distance learning hours in the curriculum;

– managing the work of teachers and group curators;

– creation of a schedule for counseling and monitoring remote work of students.

Cathedral events include:

– creation of distance learning programs for students;

– creating teacher consultation schedules;

– appointment of course authors for distance learning;

– preparation of educational and methodological complexes to ensure distance learning of students.

Technical support of distance education. This category includes the state of computer technologies used to implement distance education, connection to the Internet, the possibility of using analytical procedures (search, sorting, sampling, data comparison, etc.), the presence of an open structure that allows you to quickly make any changes to the content of the program depending on the results of its approval; the possibility of saving and processing a large number of heterogeneous messages (sound, graphic, text and video, etc.) and arranging them in a convenient form.

Technical and technological resources are what distance education is based on, which significantly expands the methods of obtaining educational materials. By access technology, the following are distinguished:

– synchronous systems – allow simultaneous participation of students and teachers in the educational process. Such systems include: interactive television, computer teleconferences;

– asynchronous systems do not require simultaneous communication with the system of students and the teacher. The student himself chooses the time and plan of classes. Such systems in distance education include courses based on e-mail, WWW, FTP;

– mixed systems – those that use elements of both synchronous and asynchronous systems.

The use of multimedia technologies allows you to activate the process of studying the material, make learning more interesting. Collections of two-dimensional and three-dimensional images, presentations, virtual simulators, virtual boards, games and olympiads with interaction via the Internet, audio and video conferences are widely used in this field.

Recently, the Internet is gaining more and more popularity in the study of certain disciplines along with traditional forms teaching. This is connected with three circumstances: the technical development of Internet technologies, which allow cheaper and more convenient means to implement any educational model; easy connection to the Internet; low connection cost.

To implement the mixed learning model in the educational process, it is advisable to use multimedia and virtual resources when working in the classroom.

These resources include videos, virtual tours, interactive Web sites, and software packages. This type of training is used when students do not have access to the network outside the classroom. In the classroom, traditional learning is combined with online learning, and at home, students can study the material using video and audio materials. The use of software packages in classroom work makes the learning process even more effective and visual.

The teacher can independently create a site that will support the relationship between the teacher and students. By visiting the site, you can view your grades, decide on the date and place of control, in particular, the rewriting of this or that material.

Such systems should include distance learning support platforms, the use of which in the learning process enriches the process itself and helps to organize work according to the blended learning model. In such systems, you can place all information about training: the schedule, theoretical material, make visualizations, a log of success, various tests, issue assignments and collect all information. Lecture material posted in advance will allow students to familiarize themselves with the topic and clarify unclear questions even before the topic is fully studied. The ability to archive files allows the student to refer to forgotten material at any time.

Distance learning carried out with the help of computer telecommunications has the following forms of classes:

– lectures;

– independent classes to study the material;

– practical classes for processing the lecture material presented in an audiovisual format, that is, recoding the memory – from the learned theory to its practical application;

– seminars and discussions; performance of practical and laboratory work.

Lectures are the main traditional form of conducting educational classes at universities, intended for the assimilation of theoretical material.

Laboratory and practical classes are necessary for students under the guidance of a teacher to conduct experiments or experiments with the purpose of practical confirmation of certain theoretical propositions, to acquire practical skills in working with laboratory equipment, measuring equipment, and methods of experimental research in a specific subject area.

Seminars are group classes held under the guidance of a teacher in higher education institutions, necessary for face-to-face discussions and discussions.

Extracurricular work is carried out based on the use of distance learning technologies in methodically prepared virtual environments. It includes work with an electronic textbook, e-mail, thematic forums and chat conferences, webinars. Extracurricular work is a fundamental addition to classroom work.

The electronic textbook is used for independent processing of the theoretical material of the discipline. Electronic a textbook is a complex of informational, graphic, methodical and software tools for automated training of a specific discipline. Information support includes hypertext (text, individual words or parts of which serve to connect and go to another text or image), an automated educational system as a package of educational, control and other programs, methodological instructions for working with an electronic textbook and for organizing practical classes on a computer. An electronic textbook should be distinguished by two important characteristics: multimedia content and a system of hypertext links.

A parameter for determining the quality of a computer-based educational system is the formation of a resource base. The innovative approach here is the predominance of independent work and the asynchrony of students' activities, therefore, electronic learning resources should meet the needs of each potential individual with different interests, inclinations and the initial level of readiness to learn the content.

The following are the main criteria for the quality of an electronic textbook: high quality of the content part; the presence of a defined concept in the use of the presented products and providing them with a sufficient number of methodological recommendations; the presence of such essential properties that can be realized exclusively by electronic means. It is also mandatory to take into account ergonomic, technical and educational and methodological requirements.

Chat conferences are a very convenient method of delivering educational material, which also includes knowledge testing.

The chat conference is used for discussions, discussion of problematic issues and problematic topics. Also, chat conference can be used for the purpose of short reporting on the completed work (for example, whether the individual or homework was completed) and for the purpose of providing group and individual consultations.

In the process of mastering the educational material, it is advisable to use thematic forums where you can leave questions and comments.

Unlike face-to-face consultations, remote consultations can be conducted in various ways using remote technologies. Correspondence consultations are divided into group and individual. The best way of such consultations is chat; however, the forum and e-mail can be used for consultations [10; 15].

Chat classes – educational classes that are conducted using chat technologies. Chat classes are held synchronously, that is, all participants have simultaneous access to the chat. Many remote educational institutions operate a chat school, in which the activities of remote teachers and students are organized with the help of chat rooms.

Web classes – distance lessons, conferences, seminars, business games, laboratory work, workshops and other forms of educational classes conducted using telecommunications and other possibilities of the World Wide Web.

For online classes, specialized educational web forums are used – a form of user work on a certain topic or problem with the help of records that remain on one of the sites with the corresponding program installed on it.

Web forums differ from chat classes in the possibility of longer (multi-day) work and the asynchronous nature of interaction between students and teachers.

Teleconferences are held using e-mail.

WebQuest is an interesting form of learning on the Internet. It includes game elements, virtual models, video conference. The main purpose is the development of thinking skills and group interaction. To achieve the goal, the participant needs to use his knowledge, as well as be able to interact with other participants [19, p. 45].

Distance education is developing at a tremendous pace, this is facilitated by the development of the Internet and the growth of its information and communication capabilities. However, remote technologies implemented in the educational process require more careful development of methods of knowledge acquisition, analysis of the priorities of factors affecting the effectiveness of the work of teachers and students in a remote environment.

A key element of distance learning construction today are interactive multimedia training courses posted on specialized sites or portals that provide normal support for both the learning process and control over the learning process.

For effective independent work, it is necessary to provide the student with a sufficient number of study aids of various types. A student should be able to choose study aids that correspond to his level of knowledge, abilities and financial capabilities. The more types of study aids, the more successful the work of students. In the course of independent work, a student can use both traditional educational materials and similar materials from other resources. The text of printed textbooks is replaced by hypertext in methodical support on CD or on the Internet. Textbooks, methodical and reference literature in the electronic version have their advantages over traditional publications, because they are automatically tracked by keywords and can be constantly updated with new information.

Manuals of theoretical and practical content are also necessary (teaching manuals, lecture notes, laboratory workshops, methodical recommendations, reference books, etc.). Some of these manuals may be in the library, some of them may be obtained by the student in electronic form.

Information from test and coursework, in addition to the actual material, should contain examples of similar works, samples of their design, remarks on the peculiarities of execution, that is, a certain algorithm that would allow students to orientate themselves on how to complete the task. Information support for different categories of students should be different: for part- time students, it should be more complete and thorough than for permanent

studies. Students should receive a set of lectures on an electronic basis for all academic subjects studied in a given semester, the programs they are studying, assignments for tests or coursework, etc.

The use of electronic educational and control programs allows solving specific tasks of independent work of students when studying various courses. Such programs consist of theoretical, practical parts and a control system. The main advantages of the electronic form of educational information for students' independent work are illustrativeness and accessibility (special archives on servers, electronic libraries, e-mail, educational WEB pages).

Today, a large number of educational resources are being created on the Internet. Testing systems, virtual lectures, and laboratories are gaining popularity. For this, the user needs only a computer and a network connection to receive assignments and communicate with the teacher. The use of networks increases the role of the student's independent work and allows to fundamentally change the teaching methodology. The student can receive all tasks and methodical instructions through the server, which gives him the opportunity to take into account his own capabilities and the time needed to complete the tasks. The provision of consultations by the teacher and other specialists can be carried out using electronic messages through server mail or social networks.

Themainpurpose of alleducationalandmethodological recommendations is to provide students with the opportunity to move from activities that are managed and directed by the teacher to independent activities, to replace teaching control with self-control. Therefore, they should contain not only a list of tasks and types of independent activity, but also rational techniques for performing these tasks.

Since one of the strategic directions of reforming the educational system of Ukraine is the active use of information and communication technologies for the development of distance learning, it is necessary to focus on the study of the use of distance learning platforms, without which it is impossible to organize distance learning. Choosing a distance learning platform is a very important step.

The distance learning platform is software to support distance learning, the purpose of which is to create and manage pedagogical content, individualized learning and teletutoring. It includes tools necessary for three main users – a teacher, a student, an administrator [16, p. 6]. That is,

the distance learning platform is the central element around which distance education participants gather.

The teacher creates a general course of study using multimedia pedagogical resources, individualizes it to the needs and abilities of each student and supports the students' activities.

The student studies online or downloads pedagogical content that is recommended to him, organizes his work, performs exercises, he can see the evolution of his activity on the computer interface, perform tasks for self-evaluation and submit completed tasks for verification to the teacher. Teachers and students communicate individually or in groups, offer topics for discussion and collaboration when studying or creating common documents. The administrator provides and supports system maintenance, manages access and rights of teachers and students, creates connections with external information systems (administrative documents, catalogs, pedagogical resources, etc.). That is, the platform administrator has a specific role that differs from the role of the institution administrator.

Today in the world there is a significant number of e-learning platforms for the organization of e-learning, which are divided into two large categories: closed source (commercial); open source (distributed free of charge).

The most important aspect of conducting distance learning is providing methodical support to students. Modern distance learning provides a number of tools that can be used during training: video conferences, forums, chats (from English chat – conversation), blogs (from English weblog – onlyne magazine, diary). The above-mentioned tools are used not only for organizing communication between the teacher and students, but also for communication students among themselves.

Also, when conducting training using distance learning technologies, it is extremely important to provide students with access to various materials necessary for training, for which purpose specialized electronic libraries are organized, which allow students to access materials at any time convenient for them.

The library is a repository of both traditional and electronic educational resources, including electronic textbooks. The creation of a library of intelligent computer textbooks and interactive educational and methodological materials is the most important strategic task of a higher educational institution, aimed at increasing the effectiveness of the

university's educational and research activities through the rapid use of the library's electronic information resources.

There is no consensus on which methods and means of distance learning are the most optimal in such conditions. In our opinion, the most appropriate technology is the organization of training on the basis of specially prepared distance courses, combined into a single system on the training portal, which organizes not only training in the form of transfer of educational and methodical material to the student for assimilation, but also in online mode. line, where control and assessment of acquired knowledge is carried out, analysis of the quality of learning material. Despite the need for high initial investments in the construction of distance learning infrastructure, their use in the future will ensure a reduction in training costs [17].

In the practice of distance learning of the teacher's work with students, it is convenient and useful to use such software products and services as: Padlet electronic wall, OneDrive electronic storage with support for the MS Office WebApps office package, e-Disk electronic disks.

An element of distance learning is the use of cloud technologies (cloud computing). Their rapid improvement and implementation is one of those key issues that in the next few years will significantly affect the development of not only information technologies, but also many areas of human life, including education. Competent implementation of information and communication technologies in education by teachers will improve the effectiveness of its use and ensure the individualization of the learning process, which is relevant for distance education.

In Ukrainian universities, cloud services initially appeared mainly as free hosting of mail services for students and teachers. Other cloud computing tools for education were practically not used due to the lack of information about them and the lack of practical skills to use them for educational purposes. Cloud technology is a technology that provides Internet users with access to computer resources of a server and the use of software as an online service, that is, if there is an Internet connection, then complex calculations can be performed, process data using the capabilities of a remote server.

Effective use of distance technologies in the educational process requires a systematic approach that provides solutions to technical, programmatic, educational-methodical, personnel, regulatory and legal

support, management of the distance learning process, and development of distance technologies. The most promising, in our opinion, is the MOODLE (Modular Object Oriented Distance Learning Environment) system, which gives the student the opportunity to remotely, via the Internet, familiarize himself with the educational material in the form of various information resources (text, video, animation, presentation, electronic manual), perform tasks and send the results of their execution for verification, pass electronic testing in self-monitoring and control mode. The teacher can independently create distance e-courses and conduct distance learning, send messages to students, distribute, collect and check assignments, keep an electronic grade accounting journal, configure various course resources, etc. The wider introduction of distance learning will stimulate further innovations in the provision of educational services to improve the effectiveness of education.

Another important stage of organizing students' independent work in the conditions of distance learning is the evaluation of the student's educational achievements. Control over the quality of distance education is a check of the results of theoretical and practical assimilation of educational material. The most effective method of assessing the success of students for distance learning is computer test control.

Building automated testing systems is a rather complex task. Its complexity lies in the fact that the improvement of such a system must take place in the process of its continuous functioning, moreover, the negative result of its actions is unacceptable. Thus, the possibilities of experimental verification of possible improvements are significantly reduced. In addition, the knowledge control system is also complex because it is a component of the education system as a whole. The above confirms the need for a comprehensive approach to improving the testing system, based on taking into account a large number of factors belonging to various branches of science. During its creation, it is necessary to use such fields of knowledge as: cybernetics, the subject on which the control is conducted, didactics, psychology, sociology, etc.

The following scientists made a great contribution to the development of the problem of knowledge assessment in automated testing systems: A.A. Andreev, O.Ya. Kravets, I.I. Tikhonov, V.O. Andrianov, N.F. Talizina, V.P. Bespalko and others.

Thanks to their research and the discovery of new opportunities for the use of modern information technologies, automated test control has become widely used in recent years for the organization of self-control, final and intermediate types of control of students' knowledge in distance learning.

The existing approaches ensure the full objectivity of the control results, as there is the possibility of taking a test with a wide variety of types of questions, choosing evaluation criteria, selecting tasks of minimal or, on the contrary, an increased level of complexity.

The test usually contains a large list of questions on the discipline, each of which offers several options for answers. The student must choose the correct answer among these options. The tests are well suited for self-monitoring and are very useful for individual studies.

Control can be current, milestone, final. The following forms are the most popular and adequate for current control in distance education: tests, open questions (which give the student the opportunity to formulate the answer relatively freely), various tasks and assignments, including work with sources.

The 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 [18, p. 165].

The final control is carried out after the end of the course, its content covers the entire course (or at least key aspects of the course). The most common methods of final control in distance education are: testing; control essay; a complex case (a set of logically connected situations of professional activity that require analysis and resolution); group or individual project.

If tests of the same type are usually used during current control, then tests of different types are combined during border control and, especially, final control. Thus, the final test can check the degree of mastery at all levels set by the objectives. The volume of the current control tests usually does not exceed 20 questions, the preliminary – 40-60, the final – 70-90. When

determining the number of questions, the purpose, volume and complexity of the course, the degree of its abstraction, and the complexity of the questions themselves are taken into account.

Testing is a means of pedagogical diagnostics, which allows you to quickly and accurately determine the level of assimilation of educational material, the characteristics of the educational process, and timely correct the actions of teachers and students in the learning process. Wide use of tests in the educational process creates an atmosphere of trust and openness. The wide implementation of testing is due to its following advantages: objectivity and independence of the test results from the subjective opinion of the examiner; high manufacturability of checking test results; creation of operational feedback, which allows timely adjustment of the educational process.

The first stage of creating a test is to define the diagnostic goal and tasks. When monitoring knowledge in the discipline, the goal of diagnosis may be related to checking:

– knowledge on a specific topic;
– knowledge of several interrelated topics of the course;
– knowledge of key sections of the course;
– basic knowledge and skills of students before studying the course.

I. Podlasiy gives specific suggestions regarding the correctness of construction of training tests, noting that the tests should be relatively short-term, that is, they should not require a lot of time; unequivocal, i.e. do not allow free interpretation of the test task; correct, that is, exclude the possibility of formulating ambiguous answers; relatively short, requiring concise answers; informative, that is, those that provide the possibility of comparing the quantitative assessment for the performance of the test with ordinal or even interval scales of measurement; convenient, that is, suitable for quick mathematical processing of results; standard, that is, suitable for wide practical application – measuring the level of education of the widest possible contingent of students who master the same amount of knowledge at the same level.

Testing should be carried out either during scheduled classes or on time, as a type of independent work of students. The first option is suitable mainly for subjects whose schedule includes classes in computer classes.

Computer testing is proposed to be carried out according to the following procedure: the teacher develops and places tests on the page of his course,

indicating the dates when the tests will be available for passing, the time allotted for one attempt, the number of attempts given to each student and the evaluation methods, after testing, the teacher analyzes its results.

Computer classes are allocated for testing or students take the test online. The Moodle system provides a wide range of possibilities for building and configuring various tests:

– setting the number of attempts to pass the test;

– setting time delays between attempts;

– choice of assessment method (in case of several attempts: first/last attempt);

– mixing both the questions themselves in the test and the answer options;

– educational mode: the student can try several times to give the correct answer;

– possible accrual of penalty points for each wrong answer;

– configurable mode for viewing results (scores, comments for each answer option, all answers, general comment for the entire test);

– construction of the test taking into account the random selection of questions from the categories.

Any test in Moodle is created taking into account the "Question Bank" (a special database). That is, before creating a test, you need to fill the data bank with questions for this test.

In Moodle, the concepts of bank of test questions and test are separated. The bank of test questions contains all questions of this course, allows you to structure and manage a large number of questions, and provides access to questions from published categories of other courses. The test is an important element with which the student works directly, and has a specific set of such test tasks. Any test in Moodle is created taking into account the Bank of questions (a special database). That is, before creating a test, it is necessary to fill the data bank with questions for this test.

In the distance learning system with the use of computer test control, the possibilities of providing feedback are more real, the openness of the results of independent cognitive activity makes it possible to systematically analyze the student's educational work by the teacher and offer him the necessary help in time, and not after the completion of the course. In addition, learning according to the principles of the modular system creates conditions for self-analysis, self-management of cognitive activity.

The conducted analysis of the information that the teacher received from the results of the test control provides conditions for the development of a set of management actions aimed at increasing the activity of students and their interest. Administrative influence can be aimed both at changing external conditions and at the student himself.

Therefore, the most favorable conditions for the organization of independent work of students in the process of distance learning are both the generally accepted didactic ones and the conditions determined by the specifics of the educational discipline and the content of the educational process (high level of qualifications of teachers and their personal traits (qualities); teacher-student relations should bear sub object-subject character; the content of tasks developed and proposed for independent work should contribute not only to intellectual development (acquisition of new theoretical knowledge and practical skills), but also the formation of the skills of effective organization of one's own activities; implementation of constant control over the performance of tasks of independent work both by the teacher and involvement in self-control; active involvement of students in modeling elements of future professional activity; active work of students and analysis of their activities at each stage of education.

9. Experience of organizing students' independent work during higher mathematics education

The issue of organizing students' independent work in the information and educational environment is very relevant in modern conditions. At the agricultural university, higher mathematics is a basic discipline that serves as the foundation of the professional training of a future specialist and provides the appropriate mathematical apparatus for his study of special disciplines. Mathematics as an educational discipline has great opportunities for the implementation of distance learning because the use of information technologies allows to strengthen the applied and practical orientation of the course of higher mathematics and creates conditions for the implementation of an individual approach at a qualitatively new level. Due to this, the student must not only have good theoretical knowledge, but also be able to apply it to solve specific applied problems. Therefore, together with the graduating departments, those sections of higher mathematics that are especially needed for this specialty and which students should know well are singled out.

In recent years, in connection with the transition to a four-year study on the basis of a bachelor's degree, new curricula were introduced in agricultural universities, where there was a significant reduction in hours of higher mathematics. Previously, to achieve the goals of visual practical application of mathematical apparatus in solving professional tasks in the educational process, calculation tasks were used, which each student received and solved individually with his subsequent defense.

Teaching higher mathematics in agricultural higher education institutions has its own specifics. In distance learning, it is the independent work of the student that acquires great importance. If during a traditional lesson the student is present in the classroom and in most cases uses visual (sight), auditory (hearing) and kinesthetic (fixation on media) channels of receiving information, then during distance learning the student can turn off one or more channels, relying on that later he will study the materials in a way that is convenient for him. At the same time, both positive and negative effects can occur. In an ideal case, the student works with the posted materials at a pace convenient for him. For example, if it is a video lecture or presentation, then he can watch several times precisely those moments that are necessary for better understanding, or break the viewing into such parts that fatigue does not occur, and the information is perceived as much as possible. He can also do this at the most productive time of the day. If it is posted text or interactive material, then it can also be studied at a comfortable pace, gradually passing control stages. But, as mentioned above, this is an ideal case. This will happen if the student is interested, motivated and highly organized. What prevents a real student?

First, a very large amount of independent work in general, as a similar situation exists with other disciplines. It can be difficult for a student to set priorities and determine the order and urgency of tasks for independent work. A fairly common phenomenon is observed when most of the tasks are performed "at the last moment", which does not contribute to the long-term assimilation of mathematical information.

Mathematical disciplines, especially if they are profiling, require not only reproductive actions, but also highly developed mathematical thinking, so urgent actions based on a sample do not lead to a deep understanding of the material. It can also be emphasized that in the conditions of time pressure,

the number of the simplest reproductive actions produced by a student may not be enough even for the formation of basic skills.

Secondly, it is insufficient adaptation of materials for independent student work and control materials to remote conditions. This can be manifested in the presence for the student of the possibility of finding ready-made answers, the use of information from those who have already completed the test or control work, and other techniques that the teacher cannot track. Thus, the assessment may not be objective. It will reflect not the knowledge of the discipline, but the ability to quickly find information or solve situational problems, sometimes far from mathematical ones.

Unfortunately, not all students aim to learn, learn, and understand. The priority for such students may be the goal of passing. Therefore, we can note another important factor that leads to insufficient efficiency of independent work – the appropriate mentality of some students.

It should be noted that part of the students of the agricultural university get to study during the admission campaign, using the "reserve option", that is, without gaining the required number of points for admission to the planned institution of higher education or to the specialty that he would like, so there is not enough motivated to obtain solid knowledge. Already at the first on-line or off-line classes in higher mathematics, the problem of the methodology of conducting a lecture or practical class arises, where the first goal is to stimulate the motivation to study the discipline.

Cognitive interest is an important component of effective learning. Materials for self-study should be varied and presented in different forms: for example, a teaching and methodical manual, preferably interactively adapted for distance learning but with the possibility of printing on paper (as some students still prefer paper options for various reasons), video lectures, video analyzes of the solution of the main types of problems and proofs of theorems, interesting and useful facts about the application of the presented materials in various fields of knowledge and in life. Therefore, both students who prefer brevity and minimalism and those who need additional information for better understanding and increased interest can study the materials in a convenient way. In this case, students will be able to choose the most acceptable channel of information perception for them or use all of it [19].

The methodical system of distance learning of higher mathematics is considered as an independent, open, branched system, which in interaction with

the informational and educational environment of distance learning ensures the mandatory achievement of both normative and individualized goals.

Random, but with certain conditions, generation of numerical data in typical tasks is also effective for individualizing tasks in mathematical disciplines. This allows you to instantly create unique tasks for each student. The generation of "beautiful" numerical data is especially convenient for solving and checking, for example, in the following variants: integers, no more than two digits; decimal, with no more than two signs before and after the comma; ordinary fractions (perhaps improper) such that the numerator and denominator are no more than two-digit numbers. An interactive module with a similar generation, created at our university, has been used by us for the past few years, does not lose its relevance and is quite effective for independent work of students during distance learning. But, in our opinion, in many modern environments that allow creating tests, this function is often missing, since even once completed task or test can nowadays be considered obsolete. The same can be said about the number of attempts to pass the same test during the intermediate or final control. The second attempt is no longer an objective reflection of knowledge, especially if the student can see his mistakes after passing the first attempt.

In our opinion, it is advisable to leave part of the independent work in handwritten form with subsequent scanning or photography, or in the form of a legible record "on the screen" in the appropriate editors. If the solution of problems, especially those in which many complex formulas and conclusions are performed "by hand", then this is quite enough to be checked in the same way as open-ended questions are checked in the unified state exam. Spending time on submitting a decision in the form of a typed text in many cases can be unnecessary, therefore, in our opinion, it is not always necessary to set strict requirements for filing in electronic form. It is enough that the solution is presented mathematically correctly and the records are legible.

From our point of view, another technique for increasing the efficiency of independent work can be to submit individual tasks in parts. The teacher sets several control deadlines, for each of which a clearly defined part of the completed tasks must be submitted. This especially helps a first-year student to organize his independent work by discipline, to acquire independent work skills. As our own experience shows, first-year students have huge problems organizing independent work when studying higher mathematics topics.

The system of control in the process of learning sections of higher mathematics in the distance education system can be carried out with the help of:

– written surveys (conducting them in the mode of synchronous interaction);

– tests designed to control the assimilation of each educational element (implementation and verification in online mode);

– independent works supplementing the system of tests and designed to control the formation of the ability to apply learned mathematical facts to solve problems;

– homework, individualized depending on the specific goals of learning topics in mathematics;

– typical calculations for the quality of knowledge verification;

– control papers that provide comprehensive control of the level of assimilation of the system of knowledge on the studied topic.

Thus, taking into account the requirements set forth in the regulatory documents of Ukraine on education, the introduction of distance educational technologies into the educational process contributes to the formation of an informational educational environment that contributes to the development of the mathematical abilities of each student and implements the principles of modern pedagogy. Constant use of remote technologies by students will ensure the formation of appropriate competencies and universal educational activities.

The main goal of distance learning is to create conditions under which a student can independently study disciplines without attending classes. Various training and control programs are being developed for this purpose. It should be noted that the development of such programs is quite a complex and expensive event. Control of knowledge is carried out with the help of tests to which the student answers without the presence of the teacher. In theory, everything looks very good. And what actually happens? Let’s share our own experience.

To organize the guided independent work of students in higher mathematics at the Vinnytsia National Agrarian University (VNAU), from the most important sections of the “Higher Mathematics” course and based on the needs of the graduating departments and to improve the quality of students' results, calculation and graphic tasks (RGZ) were developed.

RGZ is an individual task on all topics of the semester, which the student performs independently with further protection from a teacher conducting practical classes, in fact it is an admission to the exam. Let's give an example, for first-year students of higher mathematics in the first semester, materials for distance learning were developed and placed in the Socrates system according to the sections: "Linear algebra", "Vector algebra", "Elements of analytical geometry", "Derivative and its application", "Functions of one and many variables". Every student had access to this system, it is convenient for use by both teachers and future specialists. Work in the Socrates system of teachers and students is carried out with the support of methodologists of the dean's offices and the system administrator. The site is organized in the form of a teacher's virtual office, which contains information resources and interactive services for preparing and conducting lectures and practical classes in higher mathematics [20; 21].

This system uses many elements of distance learning technology. The open educational platform of this site provides the possibility of: online and offline support of the educational process by teachers, conducting individual and group educational activities. The comprehensive system of evaluating students' achievements is based on the principle of accounting for their individual abilities and priorities and creates a situation of success for students.

The teacher displays all auxiliary educational materials in the discipline cards. These can be training manuals, lecture notes, presentations on the main topics, methodological guidelines for practical classes and independent work, etc. Where the theoretical material was presented, examples of problem solving for each type of problem were given, and control tests were given. For example, students of the "Agroengineering" specialty were informed about the availability of such materials in practice and were recommended to use them for independent preparation.

At the same time, for students of these majors, the curriculum for higher mathematics in the second semester provides for RGZ on the topics "Indefinite and Definite Integral", "Differential Equations" and "Series". Simultaneously with materials for distance learning, materials for WGZ on each of the topics were developed and published in the form of a workbook.

The workbook contains: theoretical questions, variants of individual tasks with an area for detailed recording of their solutions. 30 individual

versions of the tasks are composed in such a way that none of them differs in the level of calculation complexity from the others. After the student has completed the task, he "drops" the notebook in Word or Pdf format to the teacher. The teacher checks the work, and if there are errors, as it was discovered during distance learning, in order not to return the work, he leaves it to work on errors during a practical lesson or at a consultation. If all practical tasks are completed correctly, the student begins to defend the RGZ. He answers questions or tasks, and if necessary (suspicion of writing off) explains how he solved this or that task, or solves a similar one.

RGZ allows the student to learn to solve problems on his own, not just to memorize the material or copy it from the Internet. The student's complete understanding of the material is monitored during the verification of the recorded solution, and not as a result of comparing the answer he received. In all tasks, it is necessary not only to get a numerical answer, but also to give it a correct mathematical interpretation, which in turn minimizes the possibility of writing off and correcting the result. The student's cognitive activity is activated during lectures and practical classes. It is natural that it is quite difficult to complete the RGZ on your own, without the help of a teacher, but for this purpose, the teacher regularly holds consultations and conducts ongoing control of the completion of tasks.

Students were offered to use materials for distance learning when performing RGZ. After the defense of the RGZ, the final control work was carried out in the form of tests on the studied topic. The student must present the answers to distance learning tests, each according to its own option. The results of this control work are clearly not in favor of "pure" distance learning. This indicates the level of independent work during distance learning (writing off and the Internet), and therefore the low coefficient of usefulness of "pure" distance learning.

Therefore, in crisis situations, it is possible to teach students quite effectively in remote mode, but this requires much more effort and time expenditure from the teacher and from the students.

A necessary condition for this is high-quality technical equipment and high-quality communication. It is also important to note the desirability of face-to-face acquaintance of students with the teacher.

Materials used in distance learning of mathematical disciplines in agricultural universities must meet the following requirements:

1) should easily adapt to any form of education, both face-to-face and distance learning;

2) possess a sufficient degree of interactivity;

3) be as individualized as possible (this especially applies to control papers and test tasks).

For the effective organization of the process of independent work, the following built-in capabilities of environments, which are not always available yet, could be useful functions:

– generation of convenient numerical data;

– generation of options for independent work from the bank of tasks;

– automatic recognition and at least partial verification of handwritten text.

10. Conclusions

The use of distance learning as the main form of education during martial law has shown its advantages and disadvantages to the general public. It should be noted that, in general, distance education, despite its novelty and unusualness for the majority of subjects of study, was able to replace traditional education in higher education quite effectively. In our opinion, distance learning in the future will not be able to completely replace regular face-to-face education, but its advantages should continue to be used in traditional education, as it has proven its pedagogical effectiveness, in particular:

– systematization of group work, performance of independent tasks, creation of general and individual comments and additions, summarization of results;

– widespread involvement of multimedia resources to improve learning;

– comfortable holding of part of classes and consultations “from home”;

– a convenient system for evaluating and summarizing the successes of each student;

– a more flexible approach to the individual student, individualization of education taking into account the needs of everyone.

However, it should be noted that training in recent months has shown the unpreparedness of educational institutions to conduct mass distance learning, the lack of a single systematic approach to its technical and educational support, an insufficient number of electronic textbooks and materials, the limitation of educational platforms for conducting training, the ignorance of a significant number of them educators, inability to work remotely.

Therefore, there is an urgent need to develop a system of common national standards for distance learning, to create a single informational and educational environment to support the functioning and development of the distance education system, the same for everyone, but sufficiently flexible requirements for the organization and conduct of distance courses in order to enable a creative approach to educational activity to each of its subjects.

In educational institutions, it is necessary to organize special units such as electronic educational units for organizing the distribution of materials to students, for controlling and monitoring the activities of teachers and students by creating appropriate electronic resources and software, and not by imitating such activities and transferring all responsibility to teachers and creating numerous additional reporting documents to fill out. Provision of the most remote settlements with technical means and Internet connection, access to educational resources for all educators, creation of equal opportunities for all subjects of the educational process in order to contribute to knowledge.

The practical implementation of distance learning debunked a number of provisions that existed in theoretical research on distance education. In particular, the statement about facilitating the teacher's work. Even after the final adaptation of all educational materials to the new form of education, the load on the teacher will not decrease, since the preparation and organization of the distance course will take much more time, which, as practice has shown, is almost entirely the responsibility of the teacher.

Also, quite popular among some scientists, the statement about the possibility of studying with one teacher of large groups of students did not find its practical application, as it turned out that the number of students in traditional groups is even too large for practical distance learning and should optimally consist of 4-6 students. Even lectures are not very effective without communication between the teacher and students with the possibility of quick answers and clarifications of all unclear points.

A lot of time and effort is spent on creating, searching for, updating educational materials, and adapting them to distance learning. This process will not decrease in the future, but will only intensify if the educational institution wants to remain competitive in the global educational space.

The practical experience of introducing distance learning proved that an effective educational process requires significant capital investments and resources for appropriate training and retraining of teachers to work in new conditions.

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