Information Technology for Distance Education*

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Abstract. The positive and negative aspects of information technologies used to implement distance education in universities are discussed: case technologies, television-satellite technology, and network technology. The information technologies involved in the organization of distance learning are compared. It also describes the services for organizing online training in terms of both functionality and capabilities for conducting online lectures, practical exercises, and laboratory work.

Keywords: Distance Educational Technologies, Case Technologies, Online Training, Online Learning Services.

1 Introduction

Now, in response to social advancement, science, and information technology, a situation has arisen regarding the prospects for the development of distance learning and its place as a system in the educational system [1]. Modern information technology allows you to conduct the learning process remotely. An important advantage of distance education is that keeping up to date; it uses several information technologies to conduct training or retraining, which allow for training via the Internet. Technologies widely used in distance learning can be divided into three types.

The first type is the case technology – a technology based on the acquisition of sets (cases) of teaching materials (on paper and CDs) and sending them to students for self-study. Choosing this type will require teaching aids (both in paper and in electronic form), which should be available throughout the course, and which should contain the necessary theoretical information and practical tasks. Tasks that students will perform. For the implementation of case technology in distance learning, and the successful completion of tasks by students, it is also necessary to accompany a tutor - a curator who supports all possible types of communication with students. This means that the student

can at any time contact his tutor to consult on a particular issue. When required, the tutor can personally meet with students

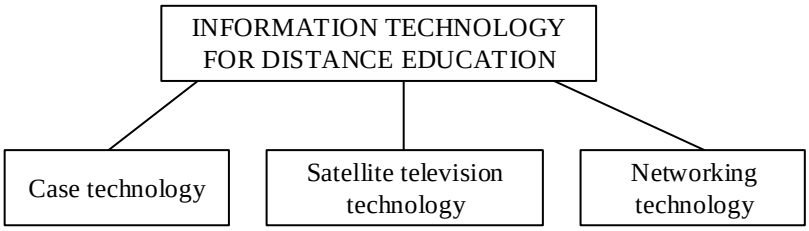

Fig. 1. Types of information technology in distance education

However, the realization of case technology (training) - a technology based on the application of situational-training teaching methods will contribute to better learning by students and greater involvement in the material.

Relatively recently, the active use of case technology (training) in education has begun, and now this approach has become a popular learning technology. Advantages of the case method:

- Practical orientation. The case method allows you to apply theoretical knowledge to solving practical problems. This approach provides a broader view of processes;
- Interactive format. The case method provides a more effective assimilation of the material through the high emotional involvement and active participation of the students. Participants are immersed in the situation: the case has the main character, in the place of which the team puts itself and solves the problem on its behalf. The emphasis in training is not on mastering ready knowledge but on its development;
- Specific skills. The case method allows you to improve "flexible skills" (soft skills), which are extremely necessary for a real workflow.

The next type is satellite television technology. This is a technology that implements television training, as well as replenishing and updating information in local networks via satellite communication channels. It is very expensive, and therefore not in great demand. It also has poor interactivity, which means it has feeble feedback. To this date, in Russia, only the Non-governmental Educational Institution Modern University for the Humanities has this technology developed back in 1997 as an experiment for testing and analyzing various aspects of distance learning, as well as for preparing regulatory documents by the Ministry of Education of the Russian Federation.

The third type is network technology. This is a technology based on the use of the Internet to provide students with teaching materials and their education.

Network technologies most suited for use in distance learning include:

- Webinars;
- Multimedia lectures and laboratory-based practical’s;
- Electronic multimedia textbooks;
- Computer training and testing systems;

- Simulation models and computer simulators [2];
- Consultations and tests using telecommunications;
- Video conferencing meetings.

2 Remote Information Technology Features

Consider the comparative characteristics of information technology for distance learning. Comparative characteristics of information technologies involved in the organization of distance learning are shown in Table 1.

Table 1. Comparative characteristics of information technology [3]

Types	Tools	Specifications	Actual technologies
CASE technology	• Audiovisual media (printed, audio-video materials), • Email	• Low communication interactivity. • The cost of production linearly depends on the number of students. • Well-known methods of developing educational materials. • High longevity • Medium interactivity. • Low cost	Cloud storage, email services (Google, Mail, Yandex), online library systems (Urait)
Networking technology	Real-time video conferencing by the Internet	• The high degree of interactivity. • Using widespread computer platforms. • Low cost.	Distance education portals (Moodle, ATutor, Teachbase), Google Classroom platform, video conferencing services (Skype, Discord)
Televisional-satellite technology	• Video conferencing over a digital dedicated satellite channel using video compression. • Videoconferencing via an analog satellite channel	• The high degree of interactivity, good image transmission quality. • High price. • The highest possible image transmission quality with the minimum technological delay in image and sound transmission.	Satellite LMI-1, since 2006 renamed to ABS-1

For proper assimilation of all the material in the process of distance learning, all the above-mentioned types of distance learning technologies are used in different proportions. Theoretical material can be recorded in advance and presented in the form of video lectures. At the same time, to get feedback from students, it makes sense to give online lectures to answer questions or explain the material in more detail.

3 Description of Services for Organizing Online Training

Such services as Skype, Zoom, and Discord are suitable for delivering online lectures in terms of functionality and capabilities. To create a complete and systematic course using videos, tests, tasks, etc. it is convenient to use, for example, such a platform as Google Classroom, which is organized specifically for studying. The platform allows its users:

- To create one's class/course;
- To arrange for students to enroll in the course;
- To share the necessary educational material with students;
- To offer tasks for students;
- To evaluate students' assignments and monitor their progress;
- To organize communication between students.

It turned out that the app, initially aimed at gamers, is very well suited for conducting online lectures. Discord is a free messenger with support for two-way voice messaging and video conferences.

The app can organize voice conferences where it is possible to customize the communication channel and operate on the principle of push-to-talk, create public and private chats for exchanging text messages.

The advantages of the app include a simple interface, good opportunities for assigning rights, high-quality communication, and the ability to create separate chats for people so that they do not overlap with each other, the ability to share the screen. Text chat supports attaching files, images, and inserting links.

There are also services originally designed for video conferences, which are growing in popularity every year. For example, ZOOM.US is a cloud platform for conducting online video conferences and webinars in high-definition. However, a security hole was discovered on the platform that allows a remote unauthorized attacker to remove users from conferences, send fake messages on behalf of users, or intercept shared screens.

Nevertheless, many platforms have proven themselves in online learning and were never accused of insecurity of usage, for example, the distance learning system of Russian development Teachbase.

Teachbase is a system with remote access, which means that you do not need to install it on your computer or mobile device, maintain it, and configure it. For all its simplicity, Teachbase has a wide range of functions. Available opportunities include:

- Personal account for each user. When you log in to your account, you can immediately see the materials assigned for learning;

- Testing after learning the material with settings for verification parameters;
- Statistical reports for the course organizer to analyze and improve the course;
- User base which can be filtered;
- Editing tools – course materials can be handled right in the system. The author can have free space on the server for remote storage of materials;
- Communication between users with the help of webinars and other tools.

Another network technology for distance learning, which is the basis for distance learning in most higher education institutions and refresher courses, is the MOODLE technology [4], which allows educational institutions to create online resources for studying, testing, and taking exams. The essence of this technology is the creation of an interactive website of an educational institution, were both students of this educational institution and their teachers have to register. The content of this website, which is essentially a learning platform where the entire process of distance learning takes place, consists of the following components. First, it is direct communication between students and teachers through the exchange of electronic messages and video conferences. The teacher also uses this resource for placing educational materials for independent study with their subsequent check-up. The student is allowed to perform the next task only after completing the previous one, which ensures the continuity and consistency of the educational process.

Each task is evaluated both by the teacher, whose assessment may be subjective and by the final testing using the test system. This system allows you to objectively evaluate the student's knowledge and gaps and, if necessary, point them out to the students, and help them learn the new material. Since the final grade for the subject is based on the sum of points received for, completing each of the tasks, as well as the teacher's overall assessment of the tasks, this distance learning system has proven itself well.

If the problem with lecture materials is solved without any problems thanks to network technologies, the issue with practical and laboratory work has yet to be fully resolved. It does not suit all the specialties and not all the disciplines as well as their practical exercises can be implemented to run remotely. Nevertheless, some of it can be carried out using the same Internet technologies. On many platforms, for example, in Google Classroom, you can create online tests, both for evaluating the comprehension of lecture materials and for testing one's knowledge. In the cloud service, all about the same Google, students can get acquainted with Google documents and Google tables (network analogs of Word and Excel) and learn how to use their main functions, under the supervision of a tutor. The teacher can leave comments on a specific place of the document and highlight errors as well as students who can mark places causing difficulties. Apart from installing the development environment, one can use online compilers, such as onlinegdb.com, that supports most programming languages, while to solve problems and communicate with the teacher, there is a web app called Pastebin, which allows you to download text fragments, fragments of source code so that it can be viewed by others. Of course, not all software is publicly available to students, and not everyone has the technical ability to use it. This problem can be solved by setting up a remote connection to computers with installed software, strictly on a schedule and in compliance with the policy of differentiation. Another tool is Cisco Packet Tracer, a

multi-functional network simulation program that allows students to experiment with network behavior and evaluate possible scenarios. One can study geographic information systems using QGIS and Argo.

Conclusion

Based on all the above, the positive aspects of distance education include:

- The use of distance learning technologies allows the teacher to conduct simultaneous education of a much larger number of students than in full-time training;
- Students who study remotely can decide for themselves how much time during the semester to devote to the study of the material, i.e. to build an individual learning schedule for themselves, which can increase academic performance if the student also has a job;
- The relative cheapness of obtaining knowledge is another plus of distance education. Getting a diploma from a University where you studied remotely will cost about three times less on average than full-time study. Still, quite a few universities offer distance learning in its pure form.

Distance learning suits busy students very well. However, in addition to the positive aspects, there are also negative ones. The disadvantages of distance education include:

- The need for strong motivation. Distance learning students on their own master almost all educational materials. This requires great willpower, responsibility, and self-control. Not everyone can maintain the required pace of learning without some kind of external control;
- Distance education does not help to develop communication skills. In distance learning, students' personal contact between each other and teachers is minimal, if not completely absent. Therefore, this form of training is not suitable for the development of communication skills, confidence, and teamwork;
- Lack of practical knowledge. Distance learning in specialties that involve a large number of practical classes is difficult. Even the most modern simulators will not replace the first-hand experience for future doctors or teachers.
- The problem of user identification. So far, the most effective way to check whether a student passed exams or tests honestly and independently is video surveillance, which is not always possible. Therefore, students have to come to personally the University or its branches for the final certification.

Looking at the disadvantages, it is easy to conclude that distance learning is not suitable for everyone: if a person is better at listening to information, then such training may seem boring and difficult. If someone cannot exchange live communication with a teacher and other students for e-mail correspondence, Internet education is unlikely to suit them.

In conclusion, we can conclude that the advantages and disadvantages of information technology in distance education are approximately equal in number, so the development of technologies for better use in education is yet to come.

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