

**ABSTRACT**

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**Virtual Interactive Bacteriology Laboratory in the System of Training a Health-Care Specialist**Pavliak U. V.<sup>1</sup>, Hural A. R.<sup>1</sup>, Kovalenko I. V.<sup>1</sup><sup>1</sup> Danylo Halytsky Lviv National Medical University, Ukraine**Background:**

Coronavirus – perhaps, this fragment in the history of mankind will be an instrument that, like the sword of Damocles, that hung over society.

It makes you think about those questions that we often hold in ourselves, but they remain unresolved of everyday life.

In the conditions of self-isolation, higher educational establishments have also received a serious challenge, in particular medical, because the attention of the society was focused on this spectrum of medicine for a certain period time.

Online magazines are full of bright headlines about the unpreparedness of modern higher education institutions to create an interactive distance learning space that there are many problems connected with it.

Indeed, in quarantine, higher educational medical institutions had to meet with competitive virtual systems which offer affordable training courses, in difficult quarantine conditions, we are talking about a reduced cost of the training course of oriented in a distance learning online environment.

Also a lot of foreign medical institutions provide favorable conditions, including distance learning for the modern entrant.

Brochures say a lot of about modern innovative approaches to the completing of educational-methodological and multimedia technologies and an interactive tools of the educational process.

Because the introduction of innovative technologies in the education of higher medical institutions is an objective and inevitable process, which is the result of scientific and technological progress, then the problem of creating virtual laboratories for training as one of the ways or models for introducing online education is really relevant.

*The aim of work study* is to determine the aspects of effective use of modern computer environments, in particular virtual labs, in the study of microbiology by students of higher medical institutions.

**Results:**

We have repeatedly published the results of research about the motivational aspects of future health professionals and the competitiveness of future professionals in today's market conditions.

In previous experiments, the key task was to find models for building a motivational educational process for students in the context of informatization of health care.

Employees of the Department of Microbiology of Danylo Halytsky Lviv National Medical University successfully applied this approach for several years, that is, before the introduction of quarantine, a distance learning on the Moodle platform.

There are creating an audio and a video with Innovative tools, and presentations with sound on the platform.

This practice is also supported by Poland's universities such as Humanities and Natural Sciences University in Sandomierz, University of Humanities and Economics in Wloclawek, University of Medicine in Lublin, Tallinn University of Technology (TALTECH), Lorand Eotvos University of Budapest. The use of external platforms Microsoft Teams, Zoom, BigBlueButton, Skype, Google Classroom has given more positive results in the motivational complex of training a modern healthcare professional.

First of all, given the curiosity of a live communication with peers in the computer and virtual environments, this provided a 100% virtual audience during the period of distance learning of quarantine.

The information and computer environment should be viewed as an exciting opportunity to gain new experiences, develop new skills and knowledge.

Ukrainian and foreign educational platforms such as Prometheus, iLearn, Coursera, edX, Coursera for Campus provided free access to their courses during quarantine.

And this gave the opportunity and was the driving force to gain experience with combining two or more applications in the process of distance learning.

In particular, the combination of the Moodle service and the Socrative web application allows you to create tests with different types of questions with accompanying images and sound effects.

Combination of e-learning Navoica – the project is implemented with the support from the Ministry of Science and Higher Education of the Republic of Poland and a promotes cooperation work between universities and scientific research institutions.

This is an online training system for organizing scientific and pedagogical internships.

That allows for the teachers, in quarantine, to take online internship courses and gains modern experience in foreign universities that already have a database for creating virtual classrooms.

The popular, technical, and scientific interest is inspired, in large part, by the advent and availability of increasingly powerful and affordable visually oriented, interactive, graphical display systems and techniques.

Virtual Lab of Microbiology in distance learning system, according to department staff, process is quite promising, but expensive at the same time.

The components that make up the laboratory are the basis of any scheme.

In a real bacteriological laboratory, a standard set of components is determined.

It is therefore necessary to first of all to create a library of electronic components, which are accompanied by analytical models suitable for rapid modeling.

The functional training model of the virtual microbiological laboratory (vLAB) includes three parts: the student interface, the teacher interface, and the administrator interface. Each of the parts has its own functions and tasks.

In particular, the student interface determines the admission into the work by testing the student's theoretical knowledge before starting work in a virtual laboratory.

The next step, it is the visualization of the technological model of the etiological agents of infectious diseases, and imaging of role of the etiological agents in the clinical picture.

The third stage of vLAB, it is a virtual staging for the experiment that includes all stages for isolation of a pure culture bacteria, viruses and other microorganisms.

The final step, it is the explanation and processing of the results of experiments, which provide insight into cause-and-effect by demonstrating what outcome occurs when a particular factor is manipulated.

The teacher's interface estimates how much time spent in the virtual laboratory was useful for the students and how the future specialists are orientating into the symptoms of the disease, and how they held the skills of express tests.

So the benefits of a virtual educational laboratory at the client stage, it is the lack of need to purchase expensive equipment and reagents.

Due to insufficient funding, many laboratories have installed the old equipment that can distort the results of experiments and serve as a potential source of danger for students.

Besides, in such areas as microbiology, virology, in addition to the equipment, a wide range of reagents and consumables are also required, the cost of which is quite high.

Another advantage is the opportunities provided for processes are modeling that are fundamentally impossible in the laboratory. And visualization of them on a computer screen.

An important superiority of using virtual laboratories is safety, in cases where there is work with particularly dangerous etiological agents or chemical substance.

Due to the fact that a computer controls the virtual process, it is possible to quickly conduct a series of experiments with different values of input parameters.

Some works require further processing of large enough arrays of digital data, which are performed on a computer after a series of experiments these data can be entered into a spreadsheet during performing experiments by a performer or automatically.

This saves time and significantly reduces the percentage of possible errors, which is a weak point in performing real laboratory work.

### Conclusions:

The introduction of Virtual Interactive Bacteriology Laboratory in the educational process is a mandatory element, which will develop the methodology of study microbiology and virology, taking into account modern advances in science and technology.

Such laboratory work will significantly increase the efficiency of the educational process and will form and improve the professional competencies of future health professionals.

Teachers prepare students to be the innovators of the future.

Our intent is to create an exciting, hands-on curriculum that will inspire and brings theory to life.

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