



COVID-19: the time for reconsidering and improving on-line learning in the context of medical education in Ukraine

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The purpose of this review article is to highlight peculiarities of distance learning and methodology of its implementation and improvement at the Department of Microbiology, Virology and Immunology, Ukrainian Medical Stomatological Academy under the quarantine during the COVID-19 pandemic.

Current paper highlights the main differences of distance learning from traditional classroom education in Ukraine. Moreover, we emphasise methods and forms of distance learning and some difficulties, which we faced in the state of COVID-19 emergency. However, transition from the traditional, in-person, learning to distance learning in the Ukrainian Medical Stomatological Academy during the COVID-19 pandemic was successful

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Introduction

Ukraine is known to have built robust and extensive medical education system including a large number of higher educational settings, post-graduate institutions,

outstanding academic and teaching staffs, whose mission is to provide high-quality educational services to both national and international students. Nowadays the rapid evolvement of the society, on the one hand, and challenges we are facing globally, on the other, requires highly qualified medical professionals. Providing high educational standards implies

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the selection and renovation of teaching approaches and methodology, elaboration of new types, forms and techniques of educational activities. The fast pace and heavy workload of contemporary life, ever-increasing amount of information, growing professional demands have resulted in inevitable changes and reconsidering of classical educational technologies to produce results.

Distance learning has demonstrated significant growth over the last decades throughout the world. Having reached the mainstream in 2014, the online-learning market, according to Market research firm Global Industry Analysts and Forbs, will increase from 107 billion USD (2015) to 325 billion USD in 2025 [1]. In 2017, approximately 77% of US corporations used online training [2], whereas 98% planned to integrate e-learning into their programs by 2020. For comparison: statistics on online-learning show that this segment occupied only 4% in 1995 [3]. This surge of supply and demand in the field of innovative learning technologies is revolutionary and opens up new opportunities for more fruitful and flexible collaboration between students and teachers [4]. Despite its growing recognition, there are a few reports on its innovative pedagogy, the advances of learning away from the classrooms, and the approaches to apply distance learning into the training program of medical and healthcare professionals and its effectiveness in long run.

Ukrainian system of medical education provides full-time programs, except some fields of pharmacy education. This can be attributed to the following causes: besides of massive amount of theoretical knowledge, medical students have to build up a large repertoire of mastered skills. The truism is that people's health depends on the doctor's training quality. Fostering highly motivated and well-trained healthcare professionals underlies improvement in providing healthcare services. Medical professionals who get training in Ukraine are well recognized around the world for their fundamental knowledge and outstanding practical skills. This has created a growing demand for seeking medical education in Ukraine by international students.

The COVID-19 pandemic has made adjustments to the conventional educational technologies widely applied in medical universities to train future healthcare workers around the world [5 - 7]. In quarantine conditions, distance learning seems to be the only possible way to continue the professional training. Ukrainian educational settings have never faced a pandemic like this before in modern times as well as never been put under prolonged strict quarantine, therefore, we made an attempt to analyze how the learning models had changed during the COVID-19 pandemic and what technologies were used for this purpose.

The **purpose** of this review article is to highlight peculiarities of distance learning and methodology of its implementation and improvement at the Department of Microbiology, Virology and Immunology, Ukrainian Medical Stomatological Academy under the quarantine during the COVID-19 pandemic.

Results and discussion

The system of higher education in Ukraine provides several types of training programs: full-time programs involve studying at the educational setting for the whole of each normal working week; extramural programs are

characterized by the prevalence of independent learning, but also includes classroom sessions mainly aimed to control the learning outcomes; distance learning (correspondence education) is to provide interaction between lecturers and students at remote location from, including the provision with instructional materials, guidelines, checking academic progress, etc., i. e. the delivery of learning and teaching via Internet. In accordance with the Law of Ukraine "On Higher Education", distance education is defined as "a learner-focused education process implemented mainly through the indirect interaction of distant participants in a specialized environment; based on applying up-to-date psychological, pedagogical and information technologies" [8]. Distance learning differs from traditional classroom education in a number of traits, and in particular:

- it increases attendance and participation in the course as required by course syllabi;
- it is time-efficient, and some reports emphasize that "students learn more and quicker when computers are used, and many of the "generation Y" students prefer computer-aided learning packages compared to just using a textbook" [9] .
- it provides mobility and customizable learning environment for participants;
- it furnishes students with quality educational materials (audio-, video resources, PPT of lectures, e-library resources and others through the availability of the significant number of e-learning resources created; moreover, all instructional materials can be retaken and updated when needed;
- it promotes improving of IT skills;
- it creates an opportunity to learn from any locations where there is a reliable and stable internet connection;
- content delivery may be either synchronous, including "real time" lectures, practical classes online via webcam, or asynchronous, and in the last case the students can plan their own schedule and adapt it individual pace and rhythm, thus practicing their own learning style;
- it stimulates students' independent cognitive activity, creativity, nurtures self-awareness, independence and responsibility [10].

The above mentioned characteristics of distance learning are typically viewed as its indubitable advantages. However, this form of education has a number of drawbacks, especially palpable in the context of medical professionals' training. Distance or e-learning is far from being as personal and interactive as classroom learning, while person-to-person learning experience does matter for some students. This is especially true, when an educator or instructor can not only motivate students by his or her enthusiasm, but can create encouraging classroom environment for purposeful and effective learning that covers organizational issues, superior ability and manners to transmit knowledge, good techniques of classroom conduct, etc. Otherwise, the personality of instructors does not significantly effect on student academic success, or, worse still, can impact and diminish students' motivation. Distance learning may pose some problems with user authentication when performing online tests or other tasks. Limited teacher's control and supervision in the course of distance learning presumes that students have to demonstrate more self-control, self-discipline, and self-motivation, the characteristics, which can be insufficient or not robust enough. And it seems to be of a

particular relevance for medical training, distance learning, even when it is perfectly developed, standardized, organized and delivered, can be effectively applied to transfer knowledge on theoretical disciplines and even then when it comes to putting to use whatever students have learnt, it may be a little different. Medical training implies a mandatory mastering of a repertoire of practical skills, therefore, as distance learning and assessments tend to be mainly knowledge-based, not practice-based, thus, it is impossible to assess a number of special skills via internet sessions in Zoom or Viber. The last, but not the least, online learning can not be organized without easy access to personal computers, tablets or other gadgets and reliable Internet connection.

The main purpose of distance learning technology is to create conditions for the independent development of professional competencies of the future medical and healthcare specialists, for the promotion of lifelong learning, which is considered as a precondition of the continuous professional growth in the field of medicine and healthcare. Through the flexible combination of conventional and innovative teaching approaches, state-of-art media technologies, distance learning contributes to the cultivation of students' self-reliance, proactive attitudes when selecting learning style, learning strategies, learning resources, responsibility for learning outcomes [12]. Distance learning enables to comprise and transfer larger amount of relevant information, while ensuring the rather good quality of training. These goals are especially relevant in the situation when the number of contact hours (classroom contact hours) is being cut down while the number of hours for students' independent learning is growing.

The question is: to what extent distance learning can be effective in the medical training? L. Pei and H. Wu [13] have found out no evidence that offline learning yields better outcomes and is far more effective in the system of undergraduate medical training compared with online learning. They also point out clear benefits of online learning in enhancing students' knowledge and skills and recommend it as a promising method worthy to be implemented into the methodology of professional medical training. H. Richmond, et al. 2017 [14] have demonstrated that online training for licensed healthcare professionals can be as effective as offline training.

The effectiveness of distance learning is greatly influenced by a number of factors, including social interaction, routine organizational issues, learners' motivation, IT skills of both parties, personnel readiness, involvement, openness to fresh approaches and new thinking, access to the internet, technical obstacles [15].

Although the overall conclusion we can draw based on the own experience and relevant reports is that distance (online) learning in terms of theoretical disciplines works just as well as offline learning, this does not mean that online learning is a superb method of learning for every student in any learning context. Both online and offline learning can guarantee good learning outcomes only when the learning goals are clear and well-defined, structured and approachable [13]. Some researchers demonstrated that the effectiveness of distance learning can be dependent on the personal traits of learners, their gender, learning style [16],

attitudes towards the discipline [17], satisfaction [18] and involvement [19].

Higher medical educational institutions in Ukraine are mainly equipped with networked ICT infrastructure. At the Ukrainian Medical Stomatological Academy, specialized information systems provide effective educational management, educational services, big data storage services, security and monitoring. Each department and division of the Academy develops and updates package of instructional materials to support individual learning, to extend and diversify classroom activities. These materials can be solely used in connection with the aims and purposes of the departments and the policy of the Academy.

COVID-19 crisis forced educators worldwide to search for alternative pathways to continue education and distance (online) learning was viewed as a panacea. The learning process in all educational institutions in Ukraine was suspended from the 12, March, 2020 by Order of the Ministry of Education and Science of Ukraine until the 4, April, 2020. As the number of COVID-19 cases increased, quarantine measures introduced in Ukraine were extended until June 22. Because education can not wait and there was not time for correcting, amending or reformatting curricula, the only possible way found was to continue teaching and learning from remote.

As we mentioned above, transition to distance learning implies the well-developed ICT infrastructure, including easy access to computing facilities or devices, reliable internet, packages of didactic and instructional materials. The faculty of the Academy is quite familiar to the existing IT technologies due to the system of training cycles in the context of ongoing professional development organized by the Academy in collaboration with other educational institutions in Poltava, e.g. National University "Yuri Kondratyuk Poltava Polytechnic", Poltava National Pedagogical University, and in Ukraine. New generation of medical students have not only to digest huge amount of ever-increasing information throughout their learning at the universities, but feel more than competent in searching information needed or when performing professional tasks independently, thus, students must be self-motivated and proactive to adapt to life-long technological development and other challenges they will face in the medical profession and surrounding world. In this view, the role of teaching staff is not limited by providing quality instructional materials, including video-support, diverse range of activities, tasks, tests, etc, but also assist students in mastering a number of search techniques critical for independent online learning and searching for reliable sources. It is important to stress that today most medical students in Ukraine as representatives of "digital / net generation" demonstrate good technical skills sufficient enough to be actively involved in online learning. To download materials or get connected via internet, which is affordable for most Ukrainians, they use laptop computers, tablets, and other devices.

Students of Ukrainian Medical Stomatological Academy have free access to educational resources, including a variety of instructional materials (textbooks, manuals, guidelines, lectures adapted into PPT or a written format, videos, test banks, etc.) of all the departments. As medical and dental education programs are taught in Ukrainian, Russian and

English, all resources are offered in the three languages. Individual department web-pages were amended providing more specific guidance and placing new information on regular basis.

Dean office staff did much to support teachers' and students' pass through the quarantine-induced rebuilding of education system in the Academy: they served as a primary administrative contact centre supporting interconnection between the Academy administration, faculty and students, they also provided general assistance to students who have concerns or questions by using phone messaging or email communication. The Administration of the Academy and faculty made great endeavours to provide the smooth transition from classroom to distance learning, to ensure the consistency in discipline delivery, and to create the most favourable and comfortable conditions for students in their mastering educational material from remote.

The structure and forms of distance learning were overhauled, debated and adopted by the online panels of experts of the Academy taking into consideration the specificity of the discipline, existing curricula, and even peculiarities of a particular theme. Forms of online teaching and learning could be reconsidered and customized based on the technical possibilities of the parties. While designing and implementing distance learning, the most challenging and time-consuming tasks for us were to set up and support good regular feedback, which was of especial importance because the lack of live person-to-person interaction, elaborate objective standardized assessment instruments for grading students' learning outcomes on regular basis as well as to minimize or completely exclude breaches of academic integrity from the students. Thus, we tried to blend the best experience of classroom instruction and advantages of online teaching and learning.

Practical classes on the theoretical disciplines, including Microbiology, were predominantly conducted in accordance with students' daily fixed schedule approved at the beginning of the spring semester. In some cases the schedule could be flexibly adjusted, so each class started on fixed hours. During the quarantine none of the classes or other online activities at the Department of Microbiology, Virology and Immunology was cancelled. Attendance on online sessions was high enough.

Online learning covers synchronous (equivalent to scheduled classes) and asynchronous (equivalent to independent learning) components. Synchronous scheduled sessions were held via Zoom and Google Meet (right from Google classroom) with a wide variety of their functions to combine multimedia and instructional design, include practice activities and real-time feedback to some extent replicated the traditional in-person pedagogical practice. These tools are also good to take attendance. Another reason for videoconferencing to be highly appreciated by the students is that they felt engaged and connected. Google Classroom, Easyclass are excellent digital tools for asynchronous independent learning: by using this platform, we organized materials and created assignments by themes, posted them to wide audience, which might involve several groups, or to individual students. This tool is sophisticatedly designed to use multimedia, to set up time limits for submitting tasks, to give instant feedback and

recommendations, to grade and return assignments, to fix students' performance. The students can complete their e-worksheet questions, perform online quizzes and get their scores immediately following quiz completion. Moreover, teachers hold additional online consultations to reinforce the information received independently or in online sessions via videoconferencing, chats, phones, messengers, e-mailing.

Visual aids and video-materials in delivering Microbiology, Virology and Immunology can be extremely helpful when used as meaningfully and memorably as possible. For example, it might be difficult for students to conceive morphology of a pathogen, its elements, or to understand the relationship between some properties of a pathogen and pathogenetic mechanisms of the development of a disease. Therefore, photographs, mental pictures, graphs, flowcharts, animations, videos when selected for their pertinence to the textual information can be widely used in online teaching as they condense information into a readily accessible format.

Tracking students' progress and transparency of results are among the key components of education. Typical tools for fixing students' learning results applied by the teachers of the Department of Microbiology, Virology and Immunology included making notes on the students' oral assessment during synchronous Zoom or Google meet sessions. This assessment is useful to determine the limits of what the students know, to evaluate their abilities to apply knowledge in problem-solving tasks. Most of the quizzes used were created to be assessed automatically. At the end of the synchronous session the scores for the every student class activities were summed up and converted into traditional Ukrainian grading system and then entered into gradebook in Google classroom. Most of the assignments for independent asynchronous learning were standardized and designed for automatic grading and fixing. A decade ago the Academy introduced central "electronic grade registrar portal", where the grades should be entered by teachers on regular basis to fix and monitor students' overall performance. The grades fixed in Google classroom of Easyclass should be re-entered into the e-registrar manually. Students and their parents can easily access to their own discipline pages in this database. This service demonstrates students' rating, i.e. achievements in disciplines from the curriculum over a certain period, and is expected to enhance students' motivation to active and balanced learning.

The final module control traditionally implies performing closed book standardized written assignments of varying complexity to evaluate the overall knowledge and competencies on the discipline. But when the course ended up in the quarantine period, the Academy administration approved the grading based on cumulative totals on some disciplines (some of social sciences and humanities) as acceptable alternative.

Organization of distance learning based on meticulous selection and combination of various forms, provision with instructional materials, elaborated grading system enabled to achieve good learning results at our Department. Balanced distribution between online session hours and independent learning hours according to the workload gave the students reasonable time for preparation and recuperation and allowed them to demonstrate their good performance. Student-centred approach, interactivity,

versatility in using multimedia contributed into quality medical training. The teachers are remaining the key figures in the learning process regardless its form (classroom or distance), bearing primary responsibility for the course organization and guidance.

Conclusion

We can conclude that transition from the traditional, in-person, learning to distance learning in the Ukrainian Medical Stomatological Academy in the state of COVID-19 emergency was successful. Thus, we suggest that e-learning can be more extensively and flexibly incorporated into the system of medical education under condition that the number of key requirements is met. E-learning can be quite effective in delivering courses on theoretical disciplines, but it is a disputable issue how it is possible to develop practical clinical skills, which need direct observation and live training.

Distance learning in this critical period had a positive effect on the students' motivation, contributed to fostering their profession-relevant personal traits (responsibility, independence in decision-making, self-organizing), updated their IT skills and shaped their own learning styles. At the same time this transition, especially at the very beginning, was extremely time-consuming for the faculty in terms of adapting teaching to online-format on regular basis.

Some students were appeared less interested in learning and less motivated through this period than under condition of habitual classroom sessions. They seemed to need an authoritative figure to guide and direct them. Therefore, it was critical to set clear learning goals (what to do), to detail how to achieve them (how to do) and to give immediate feedback.

The students have demonstrated deep knowledge on the course of microbiology, virology and immunology they took though the quarantine. And this can serve as evidence of e-learning effectiveness in delivering some basic sciences or at least themes in the wide context of professional medical training. But the integration of blended learning requires investment of times, costs and efforts to elaborate high-quality competitive online provision and infrastructure.

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