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## TEACHING HISTOLOGY IN TIMES OF WAR – EXPERIENCE OF MODIFYING EDUCATIONAL PROCESS

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## ВИКЛАДАННЯ ГІСТОЛОГІЇ В ЧАСИ ВІЙНИ – ДОСВІД МОДИФІКАЦІЇ НАВЧАЛЬНОГО ПРОЦЕСУ

**Abstract.** The process of conducting the educational process of “Histology, cytology and embryology” subject in a medical university during ongoing aggressive war includes psychological, legal and organizational components, where the focus for this fundamental theoretical subject should be made on high-quality digital tools, constant monitoring of feedback and maintenance of all participants of the educational process in safe conditions. The purpose of this work is to highlight main changes and innovations during the distant educational process in “Histology, cytology and embryology” discipline for medical students of the 1st and 2nd years. The studies in February-June 2022 period were held remotely, using the experience of organizing practical, lecture and modular classes under the conditions of the COVID-19 pandemic. The peculiarities of conducting remote classes during active military operations were, first of all, maintaining constant contact with each member of the academic group, obtaining up-to-date information about their location, health conditions and the availability of technical opportunities to attend classes. Taking into account air alarms of different durations, being in relative proximity to active hostilities and technical malfunctions of power grids in certain regions, the duration of practical, lecture and module classes could change, or be transferred to a time that is relevant for the teacher and the group. Conducting and discussing theoretical content of topics for Ukrainian- and English-speaking medical students of the 1st and 2nd years was carried out on the “Google Meet” platform using the interactive “Jam” board and the broadcast of visual material through the teacher’s access. Tasks in the form of multiple-choice questions, situational clinical cases, electronic microphotographs and flash cards have been used. It was high-quality digital materials of histological preparations, obtained from the existing material base of the department, that served as a basis for studying the microscopic structure of tissues and differentiation of the cellular composition of those in various types of organs. It is important to note that maintaining a high-quality educational process in wartime is not only a guarantee of the formation of a conscious generation of medical professionals, but also the maintenance of the academic front of the country in wartime.

**Key words:** distance learning; histology; practical classes; online educational process.

**Анотація.** Процес проведення навчального процесу з предмета «Гістологія, цитологія та ембріологія» в закладі медичної освіти під час воєнного стану включає психологічні, правові та організаційні складові, де у фокусі фундаментального теоретичного предмета повинні фігурувати якісні діджитал-інструменти, постійний моніторинг зворотного зв'язку та перебування всіх учасників освітнього процесу у безпечних умовах. Метою роботи є висвітлення основних змін та нововведень під час проведення навчального процесу з дисципліни «Гістологія, цитологія та ембріологія» для студентів-медиків 1 та 2 курсів в умовах дистанційної освіти воєнного стану. Навчальний процес за період лютий – червень 2022 р. проводився дистанційно, із використанням досвіду організації практичних, лекційних та модульних занять за умов пандемії COVID-19. Особливостями проведення дистанційних занять під час активних військових дій стали перш за все підтримання постійного контакту з кожним учасником академічної групи, отримання актуальної інформації щодо їх перебування, стану здоров'я та наявності технічних можливостей задля відвідування навчальних занять. Враховуючи повітряні тривоги різної тривалості, перебування у відносній близькості до активних бойових дій та технічні несправності електромереж у певних регіонах, тривалість практичних, лекційних та модульних занять могла змінюватись або ж переноситись на актуальний для викладача та групи час. Проведення й обговорення теоретичного змісту тем для україно- та англійськомовних студентів-медиків 1 та 2 курсів проводили на платформі “Google Meet” з використанням інтерактивної дошки “Jam” та трансляції наочного матеріалу через доступ викладача. Використовували завдання

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у формі тестів, ситуаційних задач, електронних мікрофотографій та флеш-карток. Саме якісні цифрові матеріали гістологічних препаратів, отримані з існуючої бази матеріалу кафедри, слугували підґрунтям для вивчення мікроскопічної будови тканин та диференціації клітинного складу тканин органів різного типу. Важливо зазначити, що підтримання якісного навчального процесу у воєнний час – це не лише запорука становлення свідомого покоління медичних професіоналів, але й підтримання академічного фронту держави у час війни.

**Ключові слова:** дистанційне навчання; гістологія; практичні заняття; навчальний процес он-лайн.

**Introduction.** Nowadays experience of maintaining a qualified educational process in the conditions of a world pandemic era has faced new horrific challenges: continuing teaching in realities of ongoing aggressive war in Ukraine. An article that we propose is not aimed to describe the horrors of war that Ukrainians are facing day by day - with the loss of relatives, destroyed homes and working places, as well as destroyed lives - but to light up teaching experience gained through the past 4 months of aggressive military invasion. On the background of gained experience from arranging academic processes during pandemic, conducting online teaching at the times of war has borrowed much from the previous two years and forced tutors and university administration to adjust studying process to the technical and psychological demands of new realities. Bukovinian State Medical University didn't interrupt the educational process, as well as other institutions that are located in relatively secure regions (in relation to the battle line). Maintaining the educational process after 24th of February, 2022 at once gained a specific feature, besides the basic fact that we rise and educate the next generation of medical professionals - we all are part of the scientific battlefield. This preserves Ukrainian education ongoing, as well as represents scientific outcomes of our country worldwide. That is why the Department of Histology, Cytology and Embryology has implemented some re-arrangements and additional methodical tools that we found important to continue working and strengthen the academic front.

**The aim.** The aim of the work is to discuss implementation of additional tools during online teaching "Histology, Cytology and Embryology" subject in the conditions of ongoing war (March-June 2022) in Ukraine at Bukovinian State Medical University.

**Theoretical framework.** The Department of "Histology, Cytology and Embryology" at the time of February 2022, was conducting studies for students of Medical Faculties No.1-4 for both English- and Ukrainian-speaking students of the 1st and 2nd course. Starting from the date of Russian invasion, we have organized online studies for safety conditions of the students and tutors. Main tasks for tutors in the days of war remain the same as those in pre-war

conditions, that is a student-oriented learning, aimed to develop clinical and critical thinking, interpersonal skills and problem-solving. This means that we don't perceive war conditions as those which might weaken academic requirements for both students and tutors. We arrange more student-adjusted schedules and activities, but never lower the standards for their future occupation. What is rather changed is stronger emotional connection between students and academic tutors, usage of tools for gathering and analyzing feedback information, modifying practical classes by the means of digital histology and adjusting control classes. All the re-arrangements were purposefully made depending on the actual regional conditions of shelling. This fact (actual shelling and military actions) demands regular and real information obtained from students (mostly group leaders of academic groups) on students' location within the country.

"Histology, Cytology and Embryology" subject didn't undergo compositional changes of the curriculum. Course was held through two semesters and was divided into "Cytology and medical embryology. General Histology" (Final Module I) and "Special Histology and embryology" Final Module II. These are subdivided into smaller modular courses: "Cytology and Medical Embryology", "General Histology" content modules within Final I block; "Histology and Embryology of Regulatory and Sensory Systems", "Special Histology and Embryology of the Skin, its Derivatives and Digestive Organs", "Special Histology and Embryology of the Respiratory, Urinary and Reproductive Systems" within Final II block (totally 5 content modules within the subject). Activities through the subject include practical classes with academic groups, lectures with 5-10 block of groups, rework sessions and student's scientific workshops.

Changes that were implemented within war conditions have been connected with methods of reaching out and communicating with students, online-adapted practical classes and lectures. After a two-week academic break starting from 25th of February, established by the Ministry of Education of Ukraine, studying process was held online. All members of the educational process stayed at safe conditions and were regularly informed by the university's military

administration on the ongoing conditions in the region and country. Some of the students had an opportunity to reach their home places that are different from the Chernivtsi region, and some were fleeing abroad. Tutors of academic groups were constantly collecting information on the places of student's presence, health conditions, need for shelter or any other aid. Cancellation of face-to-face teaching was substituted by online tools used for conducting all ranges of academic activities. Practical classes and lectures were held synchronically by the means of the "Google Meet" application; duration was left unchanged. Free unlimited access was supported by the university administration since the times of pandemic in 2019 and was used with broader tolls in 2022. "Google Meet" allows joining the webinar from any device connected to the internet. Through practical classes, each student in the academic group could participate in discussion, use the "Jam" board for illustration and participate in solving histological or clinical cases. Tutor could share his/her screen for presenting slides, working with virtual microscopy, and arranging problem-solving histological cases, depending on the topic and structure of the class. Mostly these were activities, involving interdisciplinary correlations (with material from Anatomy, Normal Physiology and Biochemistry).

Each academic group received a link for practical classes and links for lectures in advance. In case some of the students were not reachable, tutors could seek help from the curator of the group for arranging extra classes. Practical classes were held due to the previously established schedule in January. In May, owing to the initiative and guideline from the Ministry of Education, students from forcibly displaced medical institutions (such as Kharkiv) could also join the webinars and continue their education. The logistics of their attendance was provided by Faculty Dean's Offices. That is a great initiative that supports those students and scientific workers, who were forced to change their place of living because of devastating military actions going on in their cities and show our solidarity with them.

In terms of war, duration and structure of the classes could have been largely dependent on air alarms (secure conditions), which made it impossible to continue the webinar. As a result, content and the amount of practical tools, used through such interrupted classes, could be changing and flexible and possibly solved additionally during other topics. Another problem that we could face was that the duration of air alarm in each region could last differently, which sometimes required

additional time out of schedule with the group for covering specific tasks or even the whole topic. Such meetings were arranged individually with demanded groups, depending on the availability of the tutor. Besides practical classes, problems with attendance because of air alarm or the safety conditions (active military operations in the region, shelling, and ongoing evacuation) could also happen during Final Modules control classes, and the logistics for such students/academic groups was the same: it was arranged individually in extra time with the tutor. Still we would like to notice that the general student's presence was stable high through the March-June period.

Corporate BSMU accounts in "Google" enabled students and tutors to keep in touch easily ("Gmail" application) and to share information by the means of "Google Drive" corporate access. Moreover, corporate accounts made it easy to collaborate on common group projects through the class.

Besides classical multiple-choice questions tasks, we have developed interactive tasks for smaller teams within the group. Depending on the topic, each group received individual tasks (open questions, solving histological slides, determining cellular structures on the electronic microphotographs) that they had to present after finishing. Basically, such tasks included histological specimens and revision questions from previous topics, generalization of material from the theatrical block of topics.

Lectures were held online both synchronically, according to the schedule, and asynchronously through uploading materials to the Moodle site with an open access admission. Besides lectures, Moodle remained an indispensable tool with basic theoretical information, access to self-control assessment of multiple-choice questions and a database with all histological specimens with labelings. Syllabus, additional digital sources, lists of necessary slides and topics for each module control are also represented there.

Digitalization of studying materials for Histology was a common step for providing extensive visualization of ultramicroscopic morphology, as well as in other medical establishments worldwide [3]. We didn't have the opportunity to conduct conventional microscope examination of the histological glass slides, so the main change at time of war was the usage of digital flash-cards. Inspired by worldwide usage of Digital pathology and virtual histological databases implementation in Histology courses for students in medical universities [2, 4], Department has created flash cards in both printed and digital versions, based

on slides and material that is achieved at the department [1]. Flash-cards are high-resolution digital images, advantages of which is usage of a focused image with an optimized contrast and illumination. Flash cards

also have numbers with pointers (*picture1*) on the main structural components (or layers) of the tissue on slide which students should describe during topic discussion or module controls.



**Picture 1.** Flash-card demonstration during online class on the “Google Meet” platform (histological arrangement of the large hemispheres of brain).

Essential problem that arises while studying at war is maintaining a psychological convenient environment during practical classes online. Academic groups (Ukrainian-speaking) may include students from a variety of regions, most of which could be involved in active military operations either in comparatively secure regions. English-speaking academic groups, even though comprise students who do not leave in the terms of war, but could face some complications with evacuation abroad in February. These and other more factors challenge tutors to maintain a good balance during webinars for students in different psychological statuses. Tutors did their best for webinars being a psychologically safe place for students, who might be currently suffering from losing relatives, immigrating to other regions or abroad, challenging anxiety or other problems caused by war. This requires keeping contact with group leaders in an out-of-class time by means of messengers, emails or social media. We have also provided help for those students who might face difficulties with having internet coverage for joining or preparing for the classes. Besides, Bukovinian State Medical University provides costless psychological support for students and tutors who seek it in the Medical-Psychological Center. Aid of specialists of the Medical-Psychological center helped a lot of people to overcome dismay, fright in February and on.

At the end of the semester of work in the ongoing war conditions, it is important for us to have qualified

feedback. Receiving clear feedback from students means highlighting zones for professional growth, improving scenarios of practical classes (in case they are criticized or are inconvenient for students), confirmation of final results and of course sharing emotions and feelings about the collective work of teacher and the group. This is also an opportunity to say words of gratitude to each member of the educational process for making it actually happen at the time of war. We would like to thank professionals of the Ukrainian-Swiss project “Medical Education Development” for conducting pilot training for the tutors of Bukovinian State Medical University in 2021 on Competency-based approach and Feedback tools. Skills and tools obtained on this training were implemented when building strong connections with students in the conditions of war. Clear feedback allowed seeking needs of students and working better on receiving the best quintessence of practical classes [5].

**Conclusions and Prospects for Research.** Together, we experienced that the implementation of a “Histology, Cytology and Embryology” course in an online-format at the time of war is technically realizable with specific tools that enabled digitalization of histological specimens, arranging databases and programs for module assessment and controls. It is possible under the conditions of adequate internet connection and safety regions, arranged in a schedule that seeks extra time and flexibility in case of air alarms, evacuation

actions or possible aggravation of military actions in close regions. Online studies at the time of war should fit psychological demands of students, as well as considering feedback mechanisms through semester. Thus, our experience through March-June period supports the positive potential of distance learning for teaching Histology subject and emphasizes the need for a synchronous learning environment with additional

visualization tools, constant tutor's guidance and responsibility to maintain scientific front.

We are interested in creating more digital tools for digital microscopy and imaging and the best ways of their implementation during online and offline studies for 1<sup>st</sup> and 2<sup>nd</sup> year students. This demands also providing additional tools for feedback collection.

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