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## **VISUALIZATION APPROACHES IN MORPHOLOGICAL DISCIPLINES FOR DISTANCE AND COMBINED EDUCATION**

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Eric Gough in 1984 said: «It is the development of distance education as an academic discipline that will have the most profound effect on its practice in the future» [1]. We may confirm his thought now, as we see changes in quality and quantity of distance education services in higher education, especially during the pandemic era. To meet demands of nowadays medical science, higher medical education institutions should provide qualified and profound academic processes that are adjusted to technical and social conditions.

The Department of Histology, Cytology and Embryology has developed and implemented a list of simulating tools that facilitate the educational program of «Histology, Cytology and Embryology» course. On one hand, our aim was to provide online classes that cover the maximum theoretical base, and on another — develop practical skills that will combine analyses of histological slides, interdisciplinary integration by the means of simulation technologies. One of such tools is working with a digital histological database. Through the technical possibilities of the educational-scientific laboratory of Bukovinian State Medical University, we can prepare high quality histological specimens by applying common hematoxylin and eosin stains, as well as by using immunohistochemical methods and creating digital versions of microspecimens. The variety of material,

kept easily on the corporative cloud systems, riches practical online classes with examples on comparative, human and animal embryological stages and early tissue germs development and differentiation; study spatial arrangements of extraembryonic organs and early prenatal germ layers by the means of sectional sequential histological cuts; investigate slides on the highest magnification, which is not always possible during offline classes.

Moreover, a teacher can use real-time synchronous sharing and translation of the histological picture with measuring, distinguishing needed morphological elements or areas. In such cases, teachers can use real biopsy cases at the laboratory and discuss together with students tactics for using specific immunostains and later discover the results. This tool not only develops critical thinking and problem solving skills in second year medical students (speciality «Medicine»), but also responsibility for choosing appropriate diagnostic methods for patients. Raymond Coleman [2] has outlined a variety of advantages of using virtual microscopy during histology classes: from economic to time-saving, that all together bring the classes to the new level, and we can't agree more.

Besides this, our department's scientific work is highly linked with three-dimensional modeling [4], which is also used during distance and combined learning with first-year medical students (speciality «Medicine», «Dentistry»). Using prenatal human material (prefetuses and embryos), their sequential histological cuts, specific histological and computer equipment, by using specific methodology, enables us to receive spatial three-dimensional models of early human development. Models are multi-colored, which means scientists who are proceeding with model creation, may outline structures for students with specific colors, so they can trace morpho-spatial changes on different stages of fetal life. This tool helps first-grade students to understand sophisticated changes in embryos that are crucial in further normal organogenesis.

To summarize, nowadays online webinars or combined learning classes should face demands of community and epidemiological conditions without losing the quality of the educational process. A variety of tools for proper visualization and practical skills acquisition can be used on morphological departments, by applying which teacher can level up classical educational courses to higher levels with development not only practical, but also attitude skills.

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## **URGENCY OF IMPLEMENTATION OF SIMULATION TECHNOLOGIES IN THE SECTION OF EMERGENCY MEDICAL CARE**

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The rapid development of the latest technologies of medical care, improvement of procedures and methods require the appropriate professional qualifications of knowledge and skills of each specialist. One of the main strategic objectives of modern medical education is the introduction of new training standards, namely changing the specifics of training and the transition to the use of innovative technologies that will reinforce the knowledge gained by learning them in practice [1]. Simulation training provides an opportunity to expand the areas of skills by combining traditional forms of modern education with modified, modern, interactive aspects. The resulting concept of development helps to differentiate learning, stimulates the emergence of skills to analyze the problem and find the best approach to its solution [2]. In recent years, the demand for these technologies in Ukraine is growing. This is facilitated by the emergence of available equipment and the accumulated world experience.

Complex and integrated simulation systems are in great demand in the development of skills and stimulate the practical reinforcement of knowledge in modern emergency and urgent medical care. The opportunity to work out a variety of scenarios are carried out in the relevant emergency rooms and cardiopulmonary resuscitation [3]. The skills of determining signs of consciousness, primary and secondary examination of the victim, methods of coniotomy and tracheotomy, techniques of movement with hard and soft stretchers, stopping external bleeding, bandaging and immobilization of the upper and lower extremities, providing patency of the upper respiratory tract methods, basic resuscitation measures are mastered (including the technique of artificial lung ventilation and the technique of indirect heart massage), teach to recognize heart rhythms, demonstrate the rules of using an automatic external defibrillator [3]. By simulating the necessary situations, students can not only work with modern and necessary equipment, but also learn to