THE SIGNIFICANCE OF LABORATORY TEST RESULTS OBTAINED THROUGH THE APPLICATION OF COMPUTER TECHNOLOGIES IN MEDICAL EDUCATION

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Introduction The modern medical education system is undergoing a transformation to such an extent that it is unimaginable without the achievements of information technologies and medical informatics. In particular, the transition from traditional laboratory methods to digitalized, visual, and computerized analytical methods in developing practical skills among students is of urgent importance. The results obtained using computer technologies (digital microscopes, virtual laboratory simulators, automated biochemical and histological analyzers) are distinguished not only by their high accuracy but also serve to develop the analytical and clinical thinking of future doctors. The purpose of this study is to evaluate the impact of

laboratory test results obtained using computer technologies on learning efficiency and the significance of digital processing of the obtained data in the medical education process based on IMRAD standards.

Material and Methods The research was carried out during the educational process of a higher medical education institution, specifically in practical classes of subjects such as medical practice and histology. During the observation process, students were divided into a control group working with traditional methods and an experimental group working in a laboratory equipped with modern computer technologies and digital sensors.

Students in the experimental group used digital visualization software to study the morphological parameters of tissues and cells (for example, tissue changes in various pathological conditions). All obtained laboratory indicators, as well as quantitative and qualitative changes, were entered into a special database. Microsoft Excel was used as the primary tool to assess the reliability of the results, systematize the data, perform statistical and correlation analyses, and create infographics that clearly illustrate the processes. The students' results were measured through testing and assessing their ability to analyze data.

Results Comparative analyses conducted within the framework of the study showed significant differences in the learning performance of students in the control group taught using traditional methods and the experimental group performing laboratory tests based on modern computer technologies. Overall, the level of acquisition of practical skills and the ability to clinically interpret the obtained data among students educated in a digital laboratory environment was on average **38%** higher compared to the control group.

- **Formation of statistical data processing skills:** The highest growth in the experimental group was observed at the stage of independent analysis of the obtained quantitative indicators by students. The students entered primary results obtained from automated analyzers and digital microscopes directly into Microsoft Excel, where they performed complex calculations. As a result, errors related to the human

factor (mechanical errors) made during manual calculations decreased by **95%**. Students mastered the rapid calculation of the arithmetic mean, standard deviation, and confidence intervals of the collected data. Furthermore, the skill of conducting correlation analyses to find relationships between various variables was formed.

- **Digital monitoring of complex pathological conditions:** The advantage of computer technologies was particularly evident in modeling processes that require dynamic observation. For example, in practical classes aimed at studying the digital monitoring of endocrine diseases, students visualized time-dependent changes in patients' hormonal backgrounds and blood glucose levels in spreadsheets in the form of graphs and trend lines. These visual data were much more comprehensible than dry numbers and helped in accurately assessing the disease prognosis.
- **Accuracy in morphological and histological studies:** Computer morphometry was widely used to evaluate the sizes of cells and tissues during microscopic examinations. In particular, digital image analysis was applied to assess the morphological state of renal glomeruli and tubules (cell size, nucleus state, degree of tissue degradation) against the background of complex pathological processes such as chronic toxic hepatitis. While students in the control group observed with the naked eye and drew approximate conclusions, students in the experimental group measured tissue changes with micrometer (µm) accuracy using computer software and systematized the obtained quantitative data.

  As a result, students in the experimental group demonstrated not only the skill of working with equipment but also the ability to integrate medical informatics directly into scientific research. The fact that the obtained laboratory conclusions were precise, statistically confirmed, and graphically proven took their level of clinical thinking to a qualitatively new stage.

Discussion Digitalized laboratory tests in medical education are not merely visual aids, but the primary instrument that prepares the student for the environment of modern evidence-based medicine. The obtained results confirm that data visualized and statistically processed using computer software forms critical analysis skills in

the student. The future doctor not only reads the ready-made conclusion but also learns the evolution of the numbers leading to that conclusion, and how to properly build and analyze a database (especially in a spreadsheet environment).

These skills are particularly effective in assessing the dynamics of chronic diseases, working with large volumes of clinical data, and conducting scientific research in the field of medical informatics. Thus, computer technologies enhance not only the student's medical knowledge but also their information technology literacy.

Conclusion Laboratory test results obtained via computer technologies in medical education fundamentally change the quality of the educational process. Through the synthesis of digital devices and statistical software (including MS Excel), students gain the opportunity to accurately measure the microscopic and biochemical state of tissues and organs, and to systematically analyze the obtained data. This fully prepares future specialists for the high-tech demands of modern clinics and the environment of conducting independent scientific research. The widespread implementation of such an approach in higher medical education institutions and the creation of specialized educational literature and textbooks related to this field is one of the urgent tasks of today.

References:

1. Kurbonovich, T. B. et al. (2025). DIGITAL TECHNOLOGIES IN MEDICINE. TELEMEDICINE. *IMRAS*. Vol. 8. No. 12. P. 39-41.
2. Kurbonovich, T. B. et al. (2026). PROBLEMS IN MODERN CULTURE: SOCIO-SPIRITUAL ANALYSIS IN THE CONTEXT OF GLOBALIZATION AND DIGITAL TRANSFORMATION. *Global Science Review*. Vol. 18. No. 1. P. 183-188.
3. Panji o‘g‘li, C. O. et al. (2026). REGENERATIVE PROPERTIES AND MODERN HISTOLOGICAL ANALYSIS OF CONNECTIVE TISSUE IN THE MORPHOFUNCTIONAL SYSTEM OF THE ORGANISM. *American Journal of Applied Medical Science*. Vol. 4. No. 2. P. 230-235.

4. Turdimuratov, B.K. (2022). *Teaching Medical Sciences Using Innovative Methods and ICT*. Tashkent: Uzbekistan Medical Publishing House.
5. Kurbonovich, T.B., & Bahodirovich, B.B. (2026). Step-by-step acquisition of practical skills in studying information technologies in medicine. *Global Science Review*, 17(1), 203–209.
6. Kurbonovich, T.B., & Nurhayat, M. (2026). Compilation and steps of the medical situational issues algorithm. *American Journal of Applied Medical Science*, 4(2), 59–63.
7. Turdimurodov, B.K., et al. The essence of electronic textbooks in medical education. *European Journal of Humanities and Educational Advancements*, 3(4), 48–50.
8. Shoxrullo, S., Mirzohid, B. (2026). MODERN CARDIAC SURGERY: EVOLUTIONARY MILESTONES AND CLINICAL RELEVANCE. *American Journal of Applied Medical Science*. Vol. 4. No. 3. P. 56-58.
9. *Oliy ta'lim tizimini 2030-yilgacha rivojlantirish konsepsiyasi*. (2019). O'zbekiston Respublikasi Prezidentining Farmoni.
10. Qodirov, E. (2021). *Aniq fanlarni o'qitishda innovatsion texnologiyalar*. Toshkent: O'qituvchi nashriyoti.
11. Wieman, C. E., Adams, W. K., & Perkins, K. K. (2008). PhET: Simulations that enhance learning. *Science*, 322(5902), 682-683.
12. Xolmatov, T., & Tadjiyeva, N. (2023). "Ta'limda raqamli vizuallashtirish texnologiyalarining o'rni". *O'zbekiston pedagogika fanlari jurnali*, 12(4), 45-52.