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# Modern Information and Communication Technologies - as an Aspect of Improving the Quality of Teaching Biological Sciences: An Example of Teaching Human Anatomy and Physiology

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**Abstract**: The actual problems of modern pedagogy are the use of information and computer technology in the learning process in the classroom on “Human Anatomy and Physiology”, are considered in the work. Today, the Republic of Uzbekistan pays special attention to the use of information and communication technologies in education. Uzbekistan is dynamically integrating into the global information space. Particular attention is paid to providing higher educational institutions with modern ICT tools and computer equipment, in particular, the phased acquisition of computers, servers, wireless network equipment, projectors and other multimedia equipment. The article discusses the features of teaching "Human Anatomy and Physiology" in pedagogical higher educational institutions using information and communication technologies, traditional and didactic lectures, problem-based learning and multimedia teaching aids.

**Keywords:** Information and communication technologies, Competence, Multimedia teaching aids, Pedagogical higher educational institutions

## Introduction

Modern society sets the task to the pedagogy of developing personality-relevant qualities of students, and not just transferring knowledge. Humanization of education implies a value attitude to various personal manifestations of students. Knowledge does not act as a goal, but as a means of personal development. The richest possibilities for this are provided by modern information computer technologies. Biological sciences are an important direction in the field of education. "Human Anatomy and Physiology" is considered one of the fundamental disciplines of biology in the education system. The purpose of studying the subject "Human Anatomy and Physiology" in pedagogical higher educational institutions is to study the structure of the human body and formation of such concepts as the relationship between nature and man on the example of the functioning of organs. It should be noted that the subject of Human Anatomy and Physiology is both a science and an art. Human Anatomy and Physiology as an art is a pedagogical skill of the teacher. Pedagogical excellence is a special state. Pedagogical skill is a high level of pedagogical activity; it is possession of pedagogical technique, personality of the teacher, his experience. The main life purpose of a teacher is to become a master of his craft. Pedagogical skill is impossible not to be associated with a professional competence of the teacher. It is competence and skill that can improve the quality of education, which is required from the teacher of the discipline "Human Anatomy and Physiology". However, despite the widespread use of information and communication technologies in practice, one of the main reasons hindering the process of informatization of education is a lack of personnel who own new technologies and are able to include them in their professional activities. Of course, the teacher must possess certain qualities, such as:

- striving for the development and formation of personal creative qualities;
- being able to find, evaluate, select information;
- being able to choose and use multimedia learning tools (websites, presentations, electronic textbooks).

## Literature Review

If we do a comparative analysis of the introduction of information and communication technologies into educational process, we can illustrate several examples. For example, in Israel, modern teacher training forces them to adapt through exploring the means by which teachers are exposed to ITC and multimedia implementation processes. In the process of introducing ICT, in particular multimedia, teachers play a significant role; the reason for this is that teachers can influence knowledge, skills and professional abilities of their students, as well as their beliefs, views and perceptions (Ungar & Baruch 2016). Since 2004, Indonesia has a progressive development of information and communication technologies. On this basis, a new curriculum was created on a new subject of "Informational and communication technologies". To achieve the best result, the government has tried to equip all educational institutions with multimedia (Mahdum et al., 2019). As part of the state program for the development of education of the Republic of Kazakhstan in 2011 - 2020, educational organizations must be equipped with new computers, digital educational resources, necessary hardware and software. All of these initiatives are based on many scientific studies that have shown various benefits of using ICT, in particular multimedia, in education. An example of this is increasing motivation of students, contributing to clearer thinking. In addition, according to researchers, ICT is a tool for better teaching of natural sciences, which once again proves the relevance of the development of multimedia competence of teachers of biology (Suleimen N. 2019). In the Republic of Uzbekistan, educational films and TV shows were considered the first prerequisites for the development of multimedia, created based on visual and laboratory work. These TV shows and educational films were broadcast for students in grades 9-11, and originated from 1995 (Abdurakhmanov & Beknazarova 2011). Today, in the modern sphere of education, within training process of future specialists, it is important to ensure conditions for mastering multimedia technologies. Along with other important areas of education, computerization of education is one of the large-scale innovations that have come in recent decades (Alimkulov & Rustamov 2020).

## Methodology

The methodology for applying information and communication technologies should first of all be aimed at the best assimilation of educational material. Psychologists have proven that when conducting classes using information and communication technologies, the right hemisphere of the brain is activated, which is responsible for associative thinking, the birth of new ideas, intuition, psycho-emotional state of the student improves, and his positive emotions are activated (Starikov, 2017). The lesson built on the basis of the application of information and communication technologies is aimed at:

- improving the quality of education;
- improvement of the educational process;
- achievement of a wide range of educational goals;
- solves an urgent problem such as an issue of training highly qualified personnel;(Khamdamova, 2021)

The use of information and communication technologies in the educational process occurs in several directions. One of these areas is multimedia. Today, a modern lesson cannot be imagined without multimedia teaching aids. The use of multimedia tools allows learners to remember firmly the material being studied through involvement of the following senses: seeing, hearing, and remembering. Along with visual teaching aids, multimedia teaching aids make it possible to provide educational material in its entirety. Multimedia teaching aids contribute to the transformation of a traditional lesson into a multimedia lesson (Starikov, 2017). The use of multimedia in education allows educators to:

- solve the problems of humanization of education;
- improve the efficiency of the educational process;
- develop personal qualities, communicative and social abilities of trainees;
- identify the learner as an active subject of cognition;
- take into account subjective experience of the student, his individual characteristics;
- carry out independent educational activities; (Gustyaxina &Popova 2018)

Until today, we are accustomed to classify multimedia teaching aids in a rather simple way as a sound card, word processors, acoustic systems (speakers), a special computer video camera, presentation programs, a microphone, an organizer and others. The listed tools are not difficult to use, their purpose is quite clear, and they do not require special training. But we must not forget that the 21$^{st}$ century is the century of information technology (Starikov, 2017). It should be noted that while improving methods of teaching the subject "Human

Anatomy and Physiology" on the basis of modern information and communication technologies, it is advisable to combine individual, group and frontal work with the use of technical teaching aids. Taking into account the above suggestions, we have developed criteria for evaluating the effectiveness of improving methods of teaching the subject "Human Anatomy and Physiology" based on modern information and communication technologies (Table 1).

Table 1. Criteria for evaluating the effectiveness of the use of modern ICT

| | |
|---|---|
| *Reproductive* | the student has poorly mastered the educational material, has no idea about the structure of the body and its functions; does not highlight the main points of view; in the answers he makes significant errors that distort the meaning of the material being studied; the student does not have the ability to work independently and the ability to give self-assessment of knowledge; he does not know how to apply knowledge in practice. |
| *Productive* | the student's answer indicates that he knows the main provisions of the educational material, but does not know how to explain them; the student has the ability to work independently; he knows how to apply knowledge in practice; allows minor errors in the content and format of the answer. |
| *Research* | the student understands the meaning of the main terms of the subject, the contribution of the scientists of Uzbekistan to the development of Anatomy and Physiology; knows how to use self-assessment technologies; justifies his knowledge; student's answer is correct, but there are minor errors in the content and formatting the answer. |
| *Creative* | the student knows the history and methods of the subject; fully owns the program material and independently explains provisions under study; capable of independent work and able to give self-assessment of the knowledge; can apply control technologies; the student's answer is correct in terms of content and design. |

**Results and Discussion**

In order to determine the effectiveness of the use of modern information and communication technologies that ensure the improvement of teaching methods for the subject "Human Anatomy and Physiology", students of four pedagogical higher educational institutions were selected: 1) Tashkent State Pedagogical University named after Nizami; 2) Tashkent Regional Chirchik State Pedagogical Institute; 3) Kokand State Pedagogical Institute; 4) Navoi State Pedagogical Institute. As part of the study, we conducted testing and questioning among 387 students of “Biology" specialty (Table 2).

Table 2. Results of testing students at universities to determine the level of knowledge

| | University | Group | Number of students | before the experiment | | | | after experiment | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | high level 5 | middle level 4 | low level 3 | the lowest level 2 | high level 5 | middle level 4 | low level 3 | the lowest level 2 |
| 1 | NSPI | control | 42 | 1 | 13 | 23 | 5 | 3 | 14 | 23 | 2 |
| | | experimental | 40 | 4 | 12 | 20 | 4 | 5 | 15 | 20 | 0 |
| 2 | ChSPI | control | 46 | 2 | 15 | 23 | 6 | 2 | 15 | 26 | 3 |
| | | experimental | 47 | 2 | 14 | 25 | 6 | 5 | 19 | 23 | 0 |
| 3 | KSPI | control | 48 | 2 | 9 | 34 | 3 | 4 | 6 | 34 | 4 |
| | | experimental | 43 | 2 | 13 | 23 | 5 | 8 | 26 | 8 | 1 |
| 4 | TSPU | control | 57 | 9 | 6 | 41 | 1 | 7 | 9 | 40 | 1 |
| | | experimental | 64 | 6 | 6 | 50 | 2 | 13 | 37 | 14 | 0 |
| 5 | Total | control | 193 | 14 | 43 | 121 | 15 | 16 | 44 | 123 | 10 |
| | | experimental | 194 | 14 | 45 | 118 | 17 | 31 | 97 | 65 | 1 |

The results of testing students at universities obtained on the basis of the developed assessment criteria are reflected in the following figure (Figure 1).

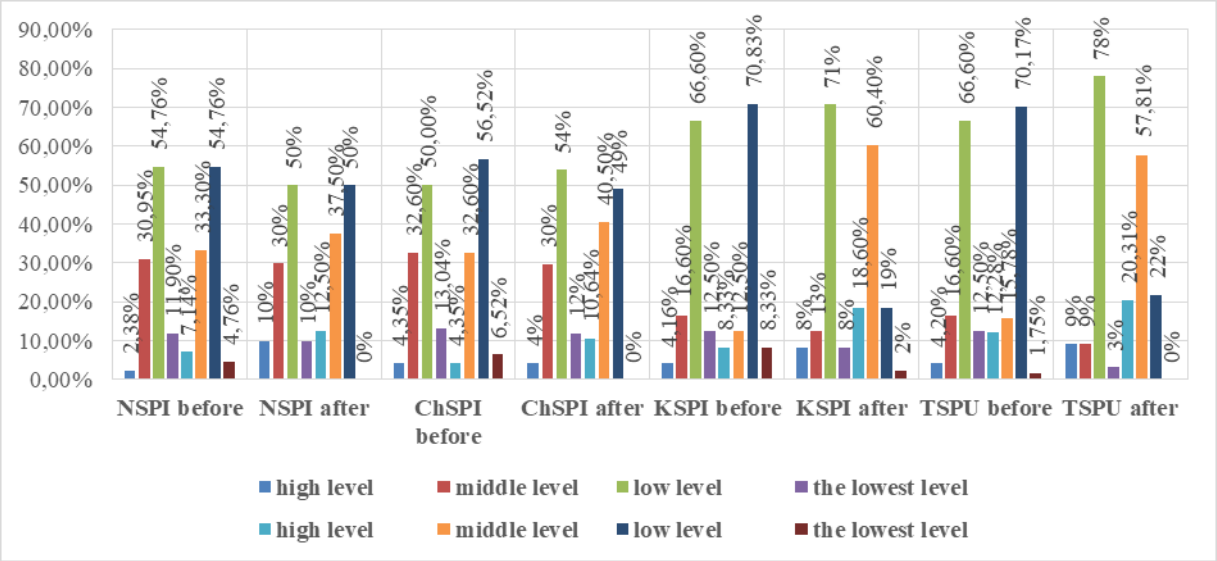


Figure 1. The results of testing students in universities to determine the level of knowledge (in percentage)

**Recommendations and Conclusion**

Based on the results of the study, methodological recommendations were developed to improve the methods of teaching the subject "Human Anatomy and Physiology" based on information and communication technologies Recommendations are as following:

- to improve the quality of education and the interest of future biologists constantly improving teaching methods for the subject "Human Anatomy and Physiology" based on the widespread use of modern, innovative, information and communication technologies;
- for the successful assimilation of the subject "Human Anatomy and Physiology" in practical work, actively use methods of multimedia technologies in the process of traditional and distance learning;
- in order to improve the quality of education, there is a necessity for creating a single interactive portal of electronic resources and systematic monitoring of its use by teachers, since at present, biology teachers in higher educational institutions have limited access to electronic resources for various social reasons.

**Scientific Ethics Declaration**

The author declares that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the author.

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