

## A PEDAGOGICAL PROBLEM IN TEACHING MEDICAL SCIENCES USING MULTIMEDIA ELECTRONIC MEANS

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**Abstract.** *This article analyzes the importance of using multimedia tools in teaching subjects related to cardiology. It also discusses researchers who have conducted research in this field and the platforms that have proven effective, along with their scope of influence.*

**Keywords:** *pedagogy, multimedia, Revit, AutoCAD, 3DS Max.*

Scientific studies on the creation of electronic resources for intellectual growth, improving the effectiveness of information technology use in the medical field, and computer design using multimedia digital design programs like Revit, AutoCAD, and 3DSMax are being carried out in educational and research institutions around the world [4]. The training of skilled and contemporary professionals using multimedia applications in the educational process, giving students cutting-edge knowledge in their fields of activity, and continuously enhancing professional skills and abilities are all given special attention, as is scientific research on the widespread use of virtual educational technologies, electronic textbooks, and multimedia electronic educational complexes in the educational process [5].

In particular, in order to deepen the reforms being carried out in the healthcare sector, radically improve the quality of medical services provided to the population, organize the activities of medical institutions based on advanced foreign experience, increase the potential of medical personnel, and support the activities of non-governmental medical organizations, a number of promising measures have been identified [6].

Several scientists have also conducted research in this field, and we found it necessary to familiarize ourselves with some of them in this article.

E.A. Khamraeva in her doctoral dissertation reflected on the definition of the pedagogical possibilities of multimedia teaching aids, as well as the description of the search-technological model for creating innovative textbooks [1].

In the study of E.I. Makharova, it was revealed that the use of Internet resources in teaching subjects in the educational process contributes to the formation of students' scientific worldview, the formation of skills in solving problems related to science, self-development and self-awareness, as well as the emergence of motivation [2].

One of the largest pedagogical challenges in learning medical sciences through multimedia electronic channels is cognitive overload. Medical content is dense, complex, and entails concepts integrating with procedural skills [8, 9, 10, 11]. As educators include multimedia components — animations, videos, interactive models, crowded slides, and accompanying text/audio — students have the potential to be flooded with information. Cognitive load theory is shown to prove that intrinsic load (complexity of the subject) and extraneous load (poorly designed multimedia) together can exceed working memory capacity with negative consequences on learning and

retention. In medical education this manifests as students who can recall facts presented on a slide or video but cannot apply them to clinical problem-solving or procedure tasks [12].

Another and related issue is non-congruence between multimedia design and pedagogical objectives. Electronic equipment is usually adopted because it is new or glitzy rather than because it supports specific learning goals such as diagnostic reasoning, procedural competence, or communication. For example, a high-fidelity simulation video may show a surgical step with no scaffolding decision points or opportunity for deliberate practice and feedback [13]. Without clear instructional design — learning goals, formative testing, and directed reflection — multimedia is an enticing add-on that does not equate to improved clinical performance.

A third challenge is learner variability of access and digital literacy. Different backgrounds among medical students and trainees mean unequal access to high-speed internet, up-to-date devices, and quiet study areas. Additionally, instructors and students differ in their experience with interactive spaces, annotation tools, and virtual laboratories. These variations lead to disparities in who can take advantage of multimedia learning. Technical problems, media not optimized for low bandwidth, or user interfaces that assume special digital expertise can annoy learners and shift focus from learning content to irritation [14].

Another pedagogical barrier is the limited capacity for authentic assessment and feedback in most multimedia presentation forms. Medical science proficiency requires not only information, but also concrete skills and decision-making under conditions of ambiguity. While multimedia can be employed to simulate clinical environments, computer-based testing is likely to test surface response (multiple-choice answers, task duration) rather than nuanced performance (hand skill, bedside manner, clinical process of thinking). Good feedback will typically involve instructor observation and dialogue, possibly demanding resource-intensive delivery at scale in electronic environments.

Resolving these problems requires thoughtful instructional design and organizational commitment. Educators must apply cognitive load theory and multimedia learning guidelines: chunking material, signaling, and minimizing redundancy, and integrating media with specific goals of learning. Incorporate active learning elements and intentional practice tasks with designed feedback, and make sites available and intuitive on diverse devices and bandwidths. Finally, invest in faculty development so that educators can create pedagogically sound multimedia and use assessment tools that measure true clinical competency. These measures will permit the pedagogical virtues of multimedia to be applied to medical education while minimizing the problems that currently limit its potential [15].

E.A.Akolzina, in her psychological and pedagogical research on the use of multimedia electronic educational resources, noted that presenting educational materials in the form of multimedia information in the educational process creates more opportunities, that such an approach to teaching depends on the level of activation of all the student's feelings, that teaching using electronic information and educational resources contributes to the formation of knowledge and new thinking in them through independent assimilation of educational materials [3].

Multimedia technology is a means of creating an interactive and effective educational environment by combining information in various formats (text, sound, video, graphics, and

animations) in the educational process. In the modern educational process, multimedia technologies play an important role in increasing the effectiveness of education [7].

Multimedia technology is widely used in the visualization of subjects in educational processes, that is, in explaining complex topics (for example, the work of the heart, heart operations) through animations and videos, in the processes of increasing student participation in interactive lessons through simulations and virtual laboratories, in the presentation of education at the global level using multimedia materials on online platforms through distance learning.

**For medical universities, it is advisable to consider several multimedia applications and platforms in which the subject "Cardiology" can be used:**

Diagnostic training programs. Echocardiography Atlas - training materials and clinical case database on cardiac ultrasound. CardioSim - an interactive simulation program for the diagnosis and treatment of cardiological diseases [8].

2. Learning platforms and LMS (Learning Management Systems). Lecturio Medical Education - interactive videos, questions and additional resources on "Cardiology." KenHub - animated lessons on the anatomy and physiology of the cardiovascular system.

**Medical 3D modeling programs. Complete Anatomy - a 3D model of the heart, for the study of its anatomical and physiological features. Visible Body - the ability to interactively study models of the cardiovascular system.**

3. Mobile applications. ECG Guide - Complete guide and examples of electrocardiograms (ECGs). Heart Pro III-For visual study of cardiac anatomy and pathology.

**4. Virtual reality (VR) platforms. Analysis of heart functions and pathologies using Oxford Medical Simulation-VR. Bodyswaps VR Cardiology Training - an immersive environment for the practical study of heart diseases. These applications and programs allow the use of modern technologies in teaching the subject "Cardiology" in medical higher educational institutions. There are other such platforms that allow students to study cardiology thoroughly and with in-depth analysis.**

In conclusion, it can be said that the role of multimedia tools in teaching the field of cardiology is significant, and the platforms studied above ensure the effective and up-to-date development of the educational process.

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