

Effectiveness Of Using Digital Educational Technologies In Teaching The Theme Of The Respiratory System In Biology Lessons

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Abstract: This article analyzes the advantages and effectiveness of using digital educational technologies in teaching the topic "Respiratory System" in biology lessons. The methods of increasing the level of students' mastery of the subject through 3D modeling, virtual laboratories, and interactive animations are highlighted. The role of digital tools in shaping students' logical thinking and cognitive interest in the subject is also substantiated.

Keywords: Digital education, 3D modeling, interactive lesson, ICT, breathing, virtual.

Introduction: In biology, the respiratory system is a complex and multi-step process for students, requiring effective teaching with modern pedagogical approaches. Traditional lesson methods are often dominated by theoretical information, which makes it difficult for students to understand the subject in depth. Therefore, the use of digital educational technologies serves as an important tool in solving this problem.

Using digital technology, complex processes such as the stages of the respiratory process - air intake, lung function, and gas exchange in the alveoli - are visually demonstrated. Especially through animations and 3D models, students can accurately visualize the structure and function of the respiratory organs. This concretizes abstract concepts and leads to a robust appropriation of knowledge.

Also, virtual laboratories allow students to practically consolidate theoretical knowledge. For example, students can perform experiments such as measuring breathing rate in a virtual environment, observing changes in lung activity when exposed to exercise. This develops their research skills and fosters independent thinking.

Multimedia tools – video lessons, interactive

presentations, and audio materials – make the learning process more interesting and effective. Information presented through different sensory channels increases students' recall. In addition, interactive test platforms allow for quick assessment and analysis of student knowledge. This helps the teacher determine the level of student knowledge and adapt the lesson.

Another important aspect of digital education technologies is the provision of an individual approach. Each student can master materials in accordance with their ability and speed. For example, some students learn better through videos, while others reinforce their knowledge through interactive exercises.

As a result, the use of digital technologies in biology lessons, particularly in teaching the respiratory system, significantly increases the effectiveness of education. It increases student engagement, simplifies complex concepts, and ensures solid knowledge retention.

Virtual laboratory method

The virtual laboratory method is one of the effective pedagogical approaches in biology lessons, especially in teaching the respiratory system. This method is based on information and communication technologies and allows students to perform real experiments in a virtual

environment using computers or mobile devices.

The essence of the virtual laboratory method is that students model respiratory processes, conduct experiments, and observe the results using special programs or online platforms. For example, students can determine lung capacity, observe changes in breathing rate during exercise, or virtually study the processes of oxygen and carbon dioxide exchange.

One of the main advantages of this method is safety and comfort. Because conducting certain biological experiments in real conditions can be difficult or dangerous, a virtual laboratory will eliminate these

problems. At the same time, it saves material resources and allows each student to experience the experiment individually.

It is also effective to apply the “reverse class” (flipped classroom) method through digital platforms. In this, students familiarize themselves with the topic before class through video materials and electronic resources, and in the course of the lesson, together with the teacher, Discussion, Analysis and practical classes are carried out. This method increases the activity of students in the lesson and allows you to more efficiently distribute Time.

Table 1.

Digital technology type	Application methods	Advantages
Animation and 3D models	Virtual observation of the breathing process	Complex processes are clearly understood
Virtual laboratory	Simulation of experiments and observations	Practical skills are developed
Multimedia presentations	Explanation through video, audio and slides	Attracts attention
Interactive tests	Online assessment (kahoot, Quizizz)	Quick results and analysis
Mobile applications and AR\VR	Learning 3D objects	Fun and innovative
Electronic textbooks	Materials for independent learning	Convenient and constant use

In conclusion, we can say that;

- The use of digital educational technologies helps to convey complex biological processes in a simple and understandable form when teaching the topic of the respiratory system.
- Interactive and visual tools increase students' interest in the lesson, develop their activity and independent thinking skills.
- Through virtual laboratories and testing platforms, students' theoretical knowledge is reinforced with practice, and the effectiveness of knowledge assessment increases.
- Digital technologies provide an individual approach

and help increase the level of mastery of each student.

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