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TECHNOLOGY FOR DEVELOPING CRITICAL THINKING IN STUDENTS THROUGH BIOLOGICAL PROBLEM MODELING IN MEDICAL EDUCATION

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Abstract

This article is devoted to analyzing the opportunities for developing critical thinking skills in students through biological problem modeling technologies in medical education. Modeling technologies teach students to study complex biological processes and make independent analytical decisions in real professional situations. Through digital simulations, interactive platforms, and AR/VR technologies, learners not only strengthen their theoretical knowledge but also enhance their level of professional preparation. The article highlights the advantages of modeling technologies in developing critical thinking skills, which are crucial in students' professional lives.

Keywords:

Medical education, students, critical thinking, biological problems, modeling technologies, digital simulations, AR/VR technologies, interactive applications, medical teaching, biological processes

Introduction

The 21st century is the age of technology. Over this time, all fields have been developing rapidly, and now medicine and education can also be included in this list. The advent of modern computers, one of humanity's great discoveries, has also influenced the fields of medicine and education. Today, we can witness how representatives of these fields are wisely using these opportunities to enhance their knowledge and skills.

Have humans reached the highest levels of knowledge, or does an even more advanced path of development await us? Perhaps the time has come to conduct new research using computers and various statistics to treat diseases that currently have no cure! Planning for the future has been fundamental to human thinking since ancient times. Now, information and technologies are advancing every moment. Planning of the past has now given way to modeling.

The growth of computers and technologies allows the transformation of current and potential events into mathematical parameters, enabling the collection and storage of significantly more medical-biological data through specific systems. From nanotechnological medical devices to complex operations performed by artificial intelligence, it is essential to understand the role of biological modeling in medical technology fully. This paper examines how this concept is vital

for students, using several examples.

MAIN PART:

We believe that developing students' critical thinking skills in medical education plays a crucial role in their future professions. Furthermore, we can address biological problems effectively using modeling technologies. These technologies allow students to test their theoretical knowledge in practice, explore various diseases and complex processes in the human body, and analyze them in depth.

Developing Critical Thinking through Biological Problem Modeling

Biological modeling technologies encourage students to study the mechanisms of various diseases and biological processes. For instance, simulating the intricate processes of blood circulation using computer modeling programs enables students to better understand and master their knowledge. These technologies enhance students' analytical skills, helping them solve complex problems with unique, logical approaches.

Types and Importance of Modeling Technologies

Digital Simulations

Digital simulations allow students to test biological and clinical scenarios in a virtual environment. Using these programs, students observe and analyze the progression of diseases, applying critical thinking in the process. This improves their practical preparation and helps them better understand real-life scenarios.

Interactive Platforms and Applications

Interactive learning platforms designed for students engage them in solving complex biological problems. By using these platforms, students develop their analytical and critical thinking skills. Solving the problems presented in these platforms enables students to deeply analyze biological processes and view them from different perspectives.

Augmented and Virtual Reality Technologies (AR/VR)

AR and VR technologies provide students with the opportunity to view and test biological processes in realistic settings. For example, by virtually modeling organ functions, students can understand the interconnection of biological systems. These technologies enhance students' critical thinking on a scientific basis, offering them hands-on experiences that simulate real-life situations.

Contributions of Modeling to Education

Simplifying Understanding

Visualization:

Diagrams and Charts: Enables students to comprehend statistical data more easily. For instance, using line graphs to show changing trends over time or pie charts for proportional relationships.

Interactive 3D Models: Helps students grasp abstract concepts more clearly. For example, studying cell structures in biology or molecular structures in chemistry using 3D models.

Dynamic Processes: Allows students to observe physical processes (e.g., fluid dynamics or energy transfer) in real-time via interactive models.

Enhancing Practical Skills

Technological Skills: Students improve their technological capabilities, such as creating and editing 3D models, which are valuable in the job market.

Design and Prototyping: Enables students to design ideas through 3D modeling, fostering creativity and problem-solving skills.

Interactivity and Collaboration

Active Participation: Working with interactive models promotes active engagement in the learning process, increasing motivation.

Collaboration: Facilitates communication and teamwork among students, fostering collective problem-solving abilities.

Individualized Learning

Personalized Pace: Students can work with 3D models at their own pace, supporting individual learning needs.

Tailored Adjustments: Models can be customized to meet the unique needs of different learners.

Practical Experience

Simulations: Provides students with controlled environments to solve real-life problems, such as engineering projects or scientific research.

Testing and Experimentation: Enables students to experiment with various scenarios using 3D models, enhancing their understanding of scientific methods.

Impact of Modeling Technologies on Critical Thinking

Biological modeling technologies help students not only understand their educational content but also develop independent problem-solving skills. For example, modeling various physiological processes using computers enables students to better comprehend diseases, their progression, and the body's responses to certain drugs. This expands their ability to think critically and independently.

The Role of Digital Simulations in Education

Simplifying Understanding

Visualizing Complex Concepts: Digital simulations present complex scientific and mathematical concepts in graphical and visual formats, aiding comprehension.

Interactive Learning: Engaging actively in simulations boosts focus and understanding.

Practical Experience

Simulation-Based Experiments: Students gain hands-on experience by safely simulating real-life

processes. For instance, simulating chemical reactions in a controlled environment.

Problem-Solving: Students practice solving real-world problems using simulations, preparing them for practical applications.

Collaboration and Communication

Teamwork: Simulations often require teamwork, promoting communication and shared problem-solving.

Developing Communication Skills: Engaging in group activities enhances collaborative and interpersonal skills.

Enhancing Motivation

Engaging Education: Digital simulations capture students' interest, increasing their motivation to learn.

Immediate Feedback: Students can quickly see the results of their efforts, enabling self-assessment and improvement.

Interactive Applications for Solving Complex Problems

Specialized learning platforms and mobile applications help students tackle complex problems in interactive environments. These tools teach students to analyze biological processes and encourage them to find independent solutions. Through these applications, students enhance their understanding of theory and practice, fostering critical and analytical thinking.

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