

DIDACTIC POTENTIALS OF USING INTERACTIVE SIMULATORS IN MEDICAL EDUCATION

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Abstract: This article analyzes the didactic potentials of using interactive simulators in the medical education system. It explores how simulation technologies contribute to the development of clinical reasoning, practical skills, and decision-making abilities in problem-based situations. The study highlights the role of interactive simulators as pedagogical tools that facilitate the assimilation of educational content through visual, kinesthetic, and experiential learning modalities.

Keywords: medical education, interactive simulator, didactic potential, practical skills, clinical reasoning, educational technologies, reflection.

Currently, medical education is unimaginable without innovative approaches, technological tools, and advanced teaching methods. Improving the quality of education and strengthening students' preparedness for real professional situations has become one of the main priorities today. From this perspective, the use of interactive simulators introduces modern didactic opportunities into the learning process.

With the help of simulators, students can test their theoretical knowledge in real clinical scenarios, make mistakes in a safe environment, and analyze them. This not only helps shape their practical skills but also enhances their capacity for independent thinking, clinical decision-making, and reflective analysis.

Interactive simulators offer the following didactic opportunities to enhance the effectiveness of medical education:

1. Integration of Theory and Practice

Through simulators, students have the opportunity to apply their theoretical knowledge in practical scenarios. This helps to develop clinical thinking and practical skills.

One of the main advantages of using simulators is that they provide broad opportunities for integrating theory with practice. In traditional education, although students often master theoretical knowledge well, they face challenges when applying it in real-life situations. This issue is especially pronounced in the field of medicine, where clinical cases are complex and multifaceted, requiring students to make rapid decisions and apply their knowledge appropriately to each patient's condition.

With interactive simulators, students can apply theoretical knowledge in a virtual environment that closely mimics clinical scenarios. As a result, they not only gain a deeper understanding of the theory they have studied but also develop the skills to apply that knowledge directly in clinical practice. In this way, simulators significantly reduce the traditional gap between theory and practice and prepare students more effectively for real clinical settings [1].

Moreover, in simulated scenarios, students carry out clinical reasoning, diagnosis, and treatment processes in conditions that closely resemble real-life situations. This allows them to effectively apply their theoretical knowledge in practice during their future professional activities. Thus, by enabling the effective integration of theory and practice, interactive simulators play a significant didactic role in shaping students' professional competence.

2. Creating a Safe Learning Environment

One of the most important aspects of using interactive simulators in medical education is their ability to provide a safe learning environment for students. In medical practice, any error made by a student can pose a serious risk to patient health. Consequently, traditional educational settings often limit students' ability to act independently and actively, placing them instead in a more passive observer role.

Simulation technologies create a safe and controlled artificial clinical environment for students. In this setting, students can repeatedly practice clinical situations an unlimited number of times. Since there is no fear of making mistakes or harming a patient's health, students can perform clinical procedures freely and with confidence. As a result, they not only gain a deeper understanding of clinical scenarios but also develop skills in analyzing their mistakes and drawing appropriate conclusions from them [2]. At the same time, this safe environment supports students' psychological comfort and gradually helps them build the ability to work under stress and pressure. This forms the foundation for their ability to operate effectively and without errors in real clinical settings in the future.

3. Providing an Individualized Approach.

Another advantage of using interactive simulators in medical education is the ability to ensure an individualized learning approach. Considering that students have different levels of knowledge, learning speeds, interests, and needs, traditional education based on uniform standards often fails to meet the specific requirements of each student.

Interactive simulators serve as an effective tool for addressing this issue. With their help, students are exposed to individualized learning scenarios based on their initial level of knowledge and skills, personal interests, and learning pace. This creates the opportunity for each student to engage with clinical situations and difficulty levels that are specifically tailored to them [3].

By forming an individualized learning trajectory, students can more quickly identify their strengths and weaknesses and work effectively to develop the necessary competencies. Additionally, simulators allow the complexity of tasks to be gradually increased in accordance with each student's abilities and potential, which helps enhance their motivation and improves the overall quality of learning.

4. Repetitive Practice of Clinical Cases

Among the didactic potentials of interactive simulators, the ability to repeatedly practice complex clinical scenarios holds particular importance. In medical practice, some cases are rare or cannot be repeatedly carried out by students in real-life settings. This limitation hinders the thorough preparation of students for complex situations.

The use of simulators effectively addresses this issue. Students can repeat any complex clinical scenario as many times as needed in a virtual and safe environment, thereby refining their skills. Through this process, they can bring their practical abilities to an automated level and thoroughly develop clinical thinking and decision-making processes [4].

Repetitive practice is especially valuable in developing the reflexes necessary to act correctly in emergency and complex clinical situations. As a result, students gain greater self-confidence, make fewer mistakes, and strengthen their ability to make quick and effective decisions in real clinical environments.

5. Opportunity to Analyze Errors and Develop Practical Skills

Another important didactic potential of using interactive simulators is the opportunity to record, analyze, and learn from the mistakes made by students during training. In the field of medicine, errors often have serious consequences. However, in the learning process, it is crucial that students reflect on their mistakes and learn from them.

When using simulators, any mistake made by a student is automatically recorded by the system, allowing for later review and analysis. This gives students the opportunity to identify the causes of their errors, draw conclusions, and develop the necessary knowledge and skills to avoid repeating them in the future [5].

Simulators also offer the possibility of visualizing or reviewing mistakes, which develops students' reflective thinking abilities and fosters a critical and analytical approach to their actions.

The process of analyzing mistakes and developing practical skills enables students to better understand clinical situations, absorb knowledge and skills more deeply, and cultivate a sense of responsibility for their actions. This encourages students to make fewer errors in their future professional practice, ensure patient safety, and pursue continuous professional development.

6. Automatic Assessment of Practical Skills

The availability of automatic assessment for practical skills through the use of interactive simulators plays an important role in enhancing the quality of medical education. In traditional education systems, students' practical skills are typically assessed by physicians, and this can involve a high degree of subjectivity. As a result, the transparency and objectivity of the assessment process may not be fully ensured.

With simulators, however, students' actions are assessed automatically and objectively using specialized algorithms. This enables accurate and impartial evaluation of each student's skills and provides them with immediate, precise feedback on their performance. Consequently, students can clearly identify their strengths and weaknesses and determine the direction for personal improvement and growth [6].

Automatic assessment also reduces uncertainties and unfairness that may arise due to the human factor during evaluation. In addition, it saves instructors time, allowing them to focus more on individualized student engagement and on organizing the educational process more effectively.

Furthermore, the results of automated assessments can be analyzed statistically, making them highly useful for improving the overall quality of the educational process and enhancing methodological practices.

The use of visualization methods is critically important in medicine for accurately understanding and conceptualizing clinical situations. By effectively perceiving and processing visual information, students can learn educational material more quickly, deeply, and efficiently. From this perspective, interactive simulators significantly enhance the effectiveness of the learning process by modeling clinical situations visually for students.

Through the visual capabilities of simulators, students can clearly and in detail observe anatomical and physiological processes, as well as symptoms of diseases. This enables them to better understand clinical scenarios, retain information longer, and apply their knowledge more quickly in practical settings.

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