The Application Effect of 3D Body Technology in the Teaching of Anesthesiology Interns: A Randomized Controlled Study

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Abstract: Anesthesiology requires strong anatomical knowledge and operational skills. Traditional 2D teaching methods struggle to display complex 3D structures, hindering theory-to-practice transitions. This study introduced 3D Body technology, using high-precision models and interactive operations to visually demonstrate airways, nerves, and vessels, improving understanding. A randomized trial divided 20 anesthesiology interns into experimental (3D Body) and control (traditional) groups. Results showed the experimental group significantly outperformed in anatomical visualization, operational skills, learning interest, and clinical thinking ($P<0.05$). Students found 3D Body more intuitive and engaging, while the control group saw limited improvement. 3D Body addresses traditional limitations, enhances clinical training, and supports medical education innovation, with potential for broader application.

***Keywords*:** 3D Body technology, anesthesiology teaching, anatomical structure visualization, operational skill training, learning interest stimulation

1. Introduction

Anesthesiology, reliant on anatomical knowledge and operational skills, faces challenges in transitioning students from theory to practice[1]. Traditional methods, using 2D images and text, often fail to convey complex 3D structures like airways and nerves, leading to inefficiencies and errors. This study introduced 3D Body[2] technology-assisted teaching. Developed by the Third Human Body Digital Technology Co., Ltd., it uses high-precision 3D models and interactive features to display complex anatomy[3], such as airway layers and nerve pathways. This immersive approach compensates for traditional limitations, offering dynamic perspectives to help students grasp key landmarks. For example, students can simulate intubation under various conditions, building confidence before real-world practice. Mobile learning allows access anytime, anywhere, while interactive features like rotation and zooming foster independent exploration, reducing reliance on physical specimens and lowering costs.

The experimental group using 3D Body technology showed significant improvements in anatomy, skills, interest, and clinical thinking, while the control group saw limited progress. This highlights 3D Body's value in addressing anesthesiology's complexity and practical demands. Its intuitiveness, interactivity, and convenience enhance learning and skills, with potential to revolutionize medical education and benefit other anatomy-dependent fields.

2. Materials and Methods

2.1 General Information

This study involved 20 anesthesia interns (20–25 years old) from Zhengzhou University, randomly divided into control (traditional teaching) and experimental (3D Body-assisted teaching) groups. Both completed training within the same timeframe, with outcomes assessed using Likert scales. No significant differences were found in gender, interest, attitudes, or prior performance ($P > 0.05$). All participants provided informed consent.

2.2 Research Objectives

This study assesses the impact of 3D Body technology-assisted teaching on clinical skill training in anesthesiology, comparing it with traditional methods in terms of knowledge acquisition, operational skills, and learning interest. The analysis aims to explore the value of 3D Body technology in optimizing anesthesiology training.

2.3 Research Methods

2.3.1 Experimental Design

This study used a randomized controlled trial design, dividing participants into an experimental group (3D Body technology-assisted teaching) and a control group (traditional teaching methods) to compare their effectiveness in anesthesiology clinical skill training. Random grouping ensured balanced baselines, reduced bias, and improved result reliability.

2.3.2 Control Group

The control group received traditional teaching: theoretical lectures (textbooks, 2D images), model practice, and clinical internships (instructor-guided hands-on experience).

2.3.3 Experimental Group

The experimental group received 3D Body-assisted teaching, including dynamic 3D anatomical lectures, virtual simulation training, and case discussions using 3D models. This enhanced intuitiveness, interactivity, and practical skills, improving anatomy understanding, operational proficiency, and clinical thinking.

2.4 Evaluation Indicators

The Likert scale assessed 3D Body technology's effectiveness in anesthesiology training, covering anatomical visualization, operational skills, learning interest, and clinical thinking. Using a 5-point scale (1 = strongly disagree, 5 = strongly agree), students rated statements based on their learning experience.

2.5 Statistical Analysis

Data were analyzed using statistical software such as SPSS. Differences in indicators before and after the course were compared between the two groups using statistical methods such as t-tests.

3. Results

3.1 Likert Scale

By comparing the experimental and control groups, the experimental group showed significant improvements in anatomical visualization, operational skills, learning interest, and clinical thinking (Table 1). Students reported that anatomical displays helped them identify key landmarks accurately, and operational training boosted their confidence in skills like puncture and intubation. The novel teaching methods also increased interest and motivation for active learning. In contrast, the control group saw limited improvements, with traditional methods being less effective in enhancing anatomical intuitiveness, operational skills, and learning interest. The experimental group's progress highlights the value of 3D Body technology in anesthesiology training.

Table 1. Likert Scale

Review content	Control group			Experiment group		
	Pre-study	After-study	p	Pre-study	After-study	p
Anatomy display, skill training, interest stimulation, clinical thinking.	4±0.3412	4±0.3412	>0.05	4±0.2060	5±0.1618	<0.0001
Teaching demonstrations help me accurately identify key anatomical landmarks.	3±0.1843	3±0.1843	>0.05	4±0.1824	5±0.1809	<0.0001
The teaching method effectively improved my anesthesia operation skills.	4±0.2317	4±0.2317	>0.05	3±0.1427	5±0.1295	<0.0001
The practical training in teaching makes me more confident in actual operation.	3±0.8546	3±0.8546	>0.05	4±0.1860	5±0.1175	<0.0001
The teaching method made me more interested in studying anesthesiology.	3±0.1297	3±0.1297	>0.05	4±0.1531	5±0.1546	<0.0001
The novel teaching method inspires active learning.	3±0.1534	3±0.1534	>0.05	4±0.1141	1±0.1747	<0.0001

4. Discussion

Anesthesiology education faces challenges in conveying complex 3D anatomical structures using traditional 2D methods. This study explores the use of 3D Body technology, developed by the Third Human Body Digital Technology Co., Ltd., which employs high-precision 3D models and interactive features to enhance learning. Students can dynamically visualize structures like airways and nerves and simulate procedures such as intubation, improving understanding and confidence. Mobile access and tools like rotation and zooming further support independent learning, reducing reliance on physical specimens and costs.

The experimental group using 3D Body technology showed significant improvements in anatomy, skills, interest, and clinical thinking, while the control group saw limited progress. This highlights 3D Body's value in addressing anesthesiology's complexity and practical demands. Its intuitiveness, interactivity, and convenience enhance learning and skills, offering transformative potential for medical training and other anatomy-dependent fields.

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