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# Study on the Application of the Combination of Drawing and Multimedia in the Teaching of Human Anatomy

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**Abstract:** With the widespread application of multimedia technology in the teaching process of human systematic anatomy, the efficiency of teaching has improved to some extent, and the content [1] has become more diverse. However, due to the subject-specific characteristics of anatomy, such as its complex content, intricate structures, and extensive use of specialized terminology, students often experience boredom and aversion during the learning process. The high memory demands of this subject frequently lead to feelings of inadequacy. Traditional drawing-based teaching, with its emphasis on artistic quality, engages students effectively and significantly enhances knowledge retention. However, this traditional approach progresses slowly and often cannot complete the required teaching tasks within limited instructional time. Moreover, it struggles to effectively present the structure, function, and spatial organization of the human body. Guided by the modern teaching concept of "student-oriented, teacher-assisted," an attempt was made to integrate traditional human anatomy drawing with multimedia teaching. This approach aligns with the structural characteristics of the course and the principles of students' cognitive processes. By taking students' interests as the starting point, the method aims to stimulate enthusiasm for learning, increase classroom participation, and ultimately improve learning outcomes [2].

**Keywords:** Human anatomy; Drawing; Multimedia; Organic combination

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## 1. Introduction

Systematic anatomy is a form-based science with a strong focus on visualization. It is a foundational medical course centered on studying the form, organizational structure, and spatial relationships of human organs, along with their functions. This course is characterized by its intricate structures, extensive use of specialized terms, and complex spatial descriptions, often presented through a combination of graphics and textual information. These characteristics make memorizing knowledge points particularly challenging for students.

For medical students, systematic anatomy is typically introduced in the first semester of their academic journey. Students often exhibit initial enthusiasm, followed by fatigue and aversion midway through the course, and even anxiety by its conclusion. Many undergraduate students, especially those with weak academic foundations, find it challenging to comprehend professional terminology and abstract concepts. This challenge is even greater for vocational students.

For instructors, achieving optimal teaching outcomes and enhancing students' learning efficiency presents several challenges [3]. These include managing extensive course content within a limited timeframe, presenting abstract and

complex knowledge in an intuitive and accessible manner, and addressing varying levels of student comprehension efficiently.

To address these challenges, the integration of modern multimedia technology with traditional drawing techniques has proven to be an effective solution. By leveraging the strengths of both methods, instructors can present anatomical content in a more logical, engaging, and efficient manner [4]. This paper provides a preliminary exploration of this integrated teaching approach.

## 2. Characteristics of multimedia and drawing teaching

Human anatomy is a fundamental and compulsory medical course, and mastering this subject is of decisive importance for understanding other medical disciplines [5]. The content and teaching process of this course exhibit the following characteristics:

(1) Complexity and high subjectivity: The course content is extensive, with intricate structures and numerous functions, making it challenging for students to integrate structural and functional knowledge. The spatial relationships and proximity of anatomical features further complicate understanding and memorization. Many students report finding the subject straightforward to comprehend but difficult to retain. Overall, student enthusiasm for learning this subject tends to be low.

(2) Heavy content load and limited time: The curriculum covers a vast amount of material within a constrained teaching schedule, leaving little room to delve into topics in depth. Consequently, achieving the desired teaching outcomes becomes difficult due to the discipline's inherent characteristics.

The traditional method of teaching through drawing has several advantages. It fosters clear thinking, engages students actively, aids memory retention, and encourages participation. For teachers, it is operationally straightforward and facilitates the emphasis of key points, further supporting students' ability to remember information. However, this method also has limitations, including slow teaching progress, challenges in depicting abstract concepts, and insufficiently vivid or aesthetically pleasing representations.

Modern multimedia teaching has its own set of advantages and disadvantages. Multimedia technology enables modular teaching, allowing teachers to manage class progress more effectively. It presents information through diverse, vivid, and visually appealing formats, making abstract content easier to grasp. However, its integration with the specific demands of anatomy education remains imperfect. The large volume of information presented may overwhelm students, disregarding their capacity to digest and process the material. Additionally, multimedia methods often reduce student participation and constrain independent thinking [6].

## 3. The teaching significance of the organic combination of multimedia and drawing

Traditional drawing and modern multimedia possess complementary advantages. Therefore, their organic combination in anatomy teaching is likely to yield results that are significantly more effective with comparatively less effort. For students, the integration of multimedia and drawing simplifies the learning process, making it more engaging and enjoyable. This approach fosters deeper participation in class and provides a unique emotional connection to the human anatomy course, thereby enabling a comprehensive mastery of the subject matter.

For teachers, the seamless combination of multimedia and drawing facilitates better control over teaching progress, allowing for flexibility in pacing. It provides opportunities for educators to showcase their creativity and skills in the classroom, enhancing the overall teaching experience. Moreover, this integration improves the interaction between teachers and students, fostering increased trust and engagement.

In the context of human anatomy teaching, and even for the broader medical curriculum, the combination of multimedia

and drawing contributes to curriculum innovation and progression. This approach supports the development of teaching methods that cultivate students with both solid foundational skills and creative thinking. Ultimately, it serves as a vital step in advancing medical education reform and promoting the continuous progress and development of teaching practices [7].

## 4. The application of drawing and multimedia teaching in an integrated manner

To effectively integrate drawing and multimedia teaching, it is essential to analyze and organize each section of anatomy teaching materials based on its specific characteristics, align these sections with appropriate teaching methods, and finalize a cohesive teaching plan. The content of human anatomy teaching materials can be broadly categorized into observable morphological structures and non-visible ones, static and dynamic morphological structures, as well as single and diverse morphological structures [8].

These complex and varied components require detailed analysis and segmentation. By leveraging the respective strengths of drawing and multimedia, tailored teaching plans can be designed and implemented to suit the unique requirements of each content type. This approach ensures that teaching methods are systematically aligned with the curriculum, enhancing both teaching effectiveness and learning outcomes.

### 4.1. Application methods of drawing and multimedia teaching

Based on the characteristics of anatomy content, the integration of drawing and multimedia teaching leverages their respective strengths to achieve a complementary “each according to its ability” approach. By aligning curriculum objectives with structural features, the content can be categorized into macro and micro, simple and complex, and static and dynamic aspects.

The single, static morphological structures observable by the naked eye are better suited to the traditional drawing method. In contrast, knowledge that is complex, dynamic, or unobservable by the naked eye is more effectively presented through multimedia. For example:

(1) Basic tissues chapter:

(a) The distribution and function of epithelial and connective tissues are more effectively demonstrated using multimedia, as it can visually represent their spatial arrangements and roles.

(b) Muscle and nervous tissues, which emphasize structural details such as muscle striations, neurons, and nerve fibers, are better taught using drawing techniques. Meanwhile, multimedia is more appropriate for illustrating dynamic processes, such as excitation-contraction coupling and neural signal transmission [9].

This dual approach addresses the monotony of the chapter while enhancing student engagement.

(2) Motor system chapter:

(a) The morphological structure and distribution of bones and muscles, which involve numerous terms and intricate details, are more effectively taught using drawing. This approach simplifies the memorization and understanding of the content.

(b) For dynamic content such as the functional coordination of muscle contractions, multimedia provides a more vivid and comprehensible presentation, aiding in visualization.

(3) Digestive system chapter:

(a) Structural details, such as the morphology, distribution, and adjacency of digestive organs, are well-suited to drawing, as this enhances interaction and memory retention.

(b) Processes like digestion and movement are better demonstrated through multimedia, enabling students to grasp the interplay between structure and function.

This principle can be applied across other chapters, tailoring the teaching method to the content’s requirements. The choice of teaching mode should remain flexible, focusing on achieving optimal learning outcomes. For complex chapters, such as the nervous system, which involve intricate functional relationships, multimedia should be the primary mode of

instruction, supplemented with occasional drawings to maintain engagement and clarity.

## 4.2. Precautions in drawing and multimedia teaching

The teaching and learning process is multifaceted, and even with proper matching of teaching methods, achieving an organic combination of drawing and multimedia poses challenges [10]. The effectiveness of this approach depends on the teacher's skills and the student's engagement.

Key factors include:

(1) The teacher's proficiency in blackboard drawing and writing ensures clarity and emphasis on critical content.

(2) The ability to select and time multimedia content effectively to complement traditional methods and maintain a coherent learning experience.

(3) Active student participation, which is crucial for achieving the intended learning outcomes.

By addressing these considerations, the integration of drawing and multimedia teaching can significantly enhance the effectiveness of anatomy instruction.

### 4.2.1. Reasonable design of drawing, blackboard writing, and multimedia

The design of drawings is crucial, as blackboard drawings must be logically organized and integrated with blackboard writing. Drawing serves as an auxiliary tool with the additional function of visual language. Blackboard writing acts as a specialized medium for explanation [11], helping students take notes and understand the structure of drawings. It also serves as a central platform for teachers to deliver instruction. If the layout lacks order, logic, or aesthetic appeal, it can lead to student fatigue, which hinders the overall teaching quality.

To ensure effective blackboard drawing design, layouts must follow a logical arrangement. Typically, the "principle of proximity" should be adopted, where the written content and the corresponding drawings are placed in close proximity. Ideally, their relative positions should remain consistent throughout the lesson. For instance, placing written content on the left side and drawings on the right, with descriptions flowing from top to bottom, helps students develop a pattern-based familiarity that facilitates learning.

Multimedia design also plays a significant role. Its primary purpose is to supplement content that cannot be effectively conveyed through drawings, such as microscopic structures, spatial distributions, and dynamic functional demonstrations. When selecting multimedia materials, clear picture quality, concise content, and vivid dynamic representations must be prioritized [12].

In combining the three methods, drawings primarily depict the structure, shape, and position of the human body, which aligns with the standards of human anatomy courses. Furthermore, drawings possess artistic quality and can significantly enhance student engagement. Therefore, in terms of the primary and secondary roles, multimedia content must be appropriately curated, avoiding mere replication of textbook material or generic online images or videos. Instead, multimedia should complement and reference blackboard drawings to ensure continuity and logical flow in knowledge delivery.

For example, when teaching the principles of skeletal muscle contraction, drawings should illustrate the structure of skeletal muscle and muscle filaments. Multimedia can then dynamically demonstrate the contraction process, while blackboard writing highlights the key aspects of the drawings. This integrated approach allows students to engage actively with the content, encouraging them to explore additional material inspired by their interest in the drawings.

### 4.2.2. Requirements of the teaching process

The successful integration of drawing and multimedia depends on the active participation of both teachers and students in the teaching process. Teachers must seamlessly combine drawing, blackboard writing, and multimedia presentations to maintain the continuity and logic of the knowledge being imparted. Additionally, teachers should use clear and engaging language to connect these elements, ensuring that drawing, blackboard writing, and multimedia content are linked effectively. This approach helps guide students' attention and facilitates their learning process [13].

For students, classes with a rigorous logical structure naturally encourage deeper involvement. Teachers should encourage students to participate actively in the drawing process, as this hands-on activity proves more practical and engaging than merely outlining key points from the textbook. From a psychological perspective, drawing is inherently more stimulating than passive theoretical learning. Creating vivid illustrations not only fosters a sense of accomplishment but also cultivates a sustained interest in anatomy. This sustained interest becomes a key driver of success over time.

For medical students, mastering the skill of drawing anatomical structures is an essential prerequisite for future clinical practice. Practical experience has demonstrated that consistent drawing practice significantly enhances students' learning outcomes, reinforcing their understanding and retention of anatomical concepts.

## 5. Effect and reflection

Research indicates that the integration of drawing and multimedia in teaching has significantly improved teaching efficiency and enhanced teachers' job satisfaction [14]. Students' participation in the learning process has increased, making lessons more engaging and fostering stronger interaction and communication between teachers and students. This approach also enhances students' scientific observation skills and critical thinking abilities, leading to a notable improvement in their ability to integrate theoretical knowledge with practical application. Furthermore, testing students' learning outcomes and mastery of theoretical concepts has demonstrated the positive impact of combining these two teaching methods. This underscores the potential for combining the strengths of multimedia teaching with the advantages of drawing to yield superior results.

However, certain challenges have emerged during the initial implementation. For instance:

(1) The effective integration of drawing and multimedia demands substantial time and effort from teachers in lesson preparation. Teachers must not only have a deep understanding of the teaching material but also coordinate various forms of knowledge while possessing advanced drawing skills and proficiency in computer applications to achieve the desired outcomes.

(2) Students often face difficulties with drawing, leading to unsuccessful attempts that can result in frustration and a lack of persistence. Enhancing students' interest in practicing drawing and fostering perseverance remains a challenge.

(3) For some complex knowledge structures, relying solely on these two teaching methods is insufficient to accomplish teaching objectives. Supplementary approaches, such as practical training or tactile exploration of real structures, may be necessary. Identifying ways to incorporate these additional methods into the combined system requires further consideration [15].

The quality of this integrated approach largely depends on the dedication of both teachers and students to mastering drawing. Cultivating students' interest in drawing, encouraging frequent practice, and promoting observation and critical thinking are essential to achieving success in learning human anatomy. Teachers can incorporate traditional drawing techniques effectively within anatomy lessons, supported by multimedia demonstrations, to amplify learning outcomes. Students, in turn, should practice drawing human anatomical structures from various levels and perspectives to master the spatial relationships of major organs and the paths of nerve and vascular trunks. This practice aids in understanding anatomical layers, adjacent relationships, and memory retention, while also encouraging problem-solving and critical thinking.

The integration of traditional drawing throughout the teaching process enhances the intuitiveness and vividness of human anatomy lessons, ultimately improving overall teaching quality. Additionally, the multimedia application plays a critical role in illustrating the functions and roles of anatomical structures within living systems, deepening students' understanding of life sciences and laying a strong foundation for related disciplines such as physiology.

In conclusion, delivering a successful human anatomy course requires teachers to possess a high level of theoretical knowledge alongside strong teaching skills, particularly in drawing and multimedia applications. By fostering students' abilities in these areas and achieving a seamless combination of teaching methods, educators can enrich course content,

increase student engagement, and enhance learning outcomes. This approach not only consolidates theoretical knowledge but also inspires students' enthusiasm and initiative in their studies.

## Disclosure statement

The authors declare no conflict of interest.

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