

Construction and Implementation of a Blended Online and Offline Teaching Model for Human Anatomy and Physiology

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Abstract: With the continuous advancement of higher education reform, educational digitalization has become an important direction for the teaching reform of medical and health-related majors. Against this backdrop, the blended online and offline teaching model has been widely applied and has demonstrated tremendous effects in enriching teaching connotation and improving teaching quality. It also points out a clear direction for the teaching reform of Human Anatomy and Physiology courses: we must take the general trend of educational digital reform as the foothold, actively adopt the blended online and offline teaching model to lift teaching effectiveness and push talent cultivation quality to a new level. This paper discusses the construction significance and practical paths of the blended online and offline teaching model for Human Anatomy and Physiology courses, aiming to provide new references for the majority of teachers.

Keywords: Human anatomy and physiology; Blended online and offline teaching; AI empowerment; Practical path

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1. Introduction

At present, we have stepped into the digital era. While digital technologies bring convenience to all social sectors and people's daily lives, they also offer new opportunities for higher education reform. Human Anatomy and Physiology is a core basic course for medical and health majors, featuring numerous knowledge points and abstract content. Under the previous teaching model, students often found it hard to understand relevant knowledge points deeply, and the lack of practical operation opportunities hindered the development of their comprehensive abilities. The adoption of the blended online and offline teaching model can supply abundant teaching resources for this course and create personalized practical chances for students, effectively guaranteeing the teaching quality of Human Anatomy and Physiology ^[1]. In this regard, all teachers should grasp its value and significance, and actively explore effective practical paths for blended teaching, optimize the curriculum teaching system, resolve teaching difficulties, and comprehensively elevate the educational effect of Human Anatomy and Physiology courses.

2. Overview of blended online and offline teaching

The blended online and offline teaching model, abbreviated as Blended Learning, is a teaching mode mainly based on the application of digital and information technologies ^[2]. In practical implementation, this model integrates the respective advantages of online teaching and offline teaching, and jointly promotes the improvement of teaching quality through their combination. Compared with traditional teaching modes, blended learning not only draws on the merits of offline teaching such as strong interactivity and guidance, but also assists teaching by adopting digital and information tools favored by students. It can effectively enrich curriculum teaching resources and lower students' difficulty in comprehension, so as to improve teaching quality and outcomes ^[3]. Meanwhile, this model can be applied not only in classroom teaching, but also in pre-class preview and after-class review sessions. It focuses on the in-depth integration of offline teaching and online teaching. While ensuring the efficiency of offline teaching, it gives full play to the flexibility and interest of online teaching, so as to better guarantee teaching effects and boost students' growth and development.

3. Significance of constructing a blended online and offline teaching model for human anatomy and physiology courses

3.1. Transform roles and stimulate learning interest

Interest serves the most direct and effective motivation for students to participate in learning activities. When contemporary students hold great interest in curriculum teaching, they tend to devote more energy and vitality, and their learning outcomes will be twice as good with half the effort. On the contrary, if they lack interest in courses, their classroom participation will decline, and learning effects will fall short of expectations. It can be observed that the previous teaching of Human Anatomy and Physiology had the problem of teacher dominance and student passiveness, which not only affected students' mastery of professional knowledge, but also hindered the cultivation of their anatomical and physiological thinking. The application of blended teaching can reshape the roles between teachers and students and create a new student-centered teaching form. Teachers will no longer be dominators, but guides and assistants. Instead of listening passively, students can conduct independent thinking, collaborative inquiry, and practical exploration based on their own learning progress and professional foundation. For example, during online teaching, teachers can rely on digital resources to promote students' autonomous learning and thinking inquiry; during offline teaching, teachers can answer students' questions and point out key directions. Therefore, under this model, students' interest and potential will be further stimulated, which will inevitably activate their thinking and facilitate better learning and growth ^[4].

3.2. Resolve teaching pain points and boost teaching effects

Human Anatomy and Physiology covers massive professional knowledge. Pure textbook-centered theoretical and static teaching cannot guarantee teaching quality. The application of blended teaching can advance theoretical knowledge to online platforms in advance. Students can conduct independent preview, study and reflection via Rain Classroom. Meanwhile, offline classrooms rely on digital tools to promote personalized practical operations for students, enabling them to quickly build a theoretical framework of expertise and comprehensively improve their operational abilities ^[5]. In addition, the adoption of this model can break the dilemma of insufficient resources in traditional teaching. Teachers can assist students' learning and practice by relying on rich audio-visual digital resources, thus resolving the pain points of abstract and hard-to-operate content in previous teaching and comprehensively lifting teaching quality.

3.3. Improve teaching system and boost talent cultivation

The core goal of medical and health majors is to cultivate comprehensive talents with solid professional foundations, proficient operational capabilities and sound clinical thinking. As a basic course for pharmacy majors, Human Anatomy and Physiology sets high requirements for students' ability to understand professional knowledge, as well as their knowledge application and practical operation capacities^[6]. The previous teaching model featured the problem of valuing theory over practice, which directly impaired the talent cultivation quality of this course. The blended teaching model can strengthen the connection between theoretical teaching and practical teaching. Through the integration of online and offline approaches, students' cognition can be consolidated and their comprehensive abilities improved. Diversified and personalized expansion activities can consolidate students' professional skills and cultivate their logical thinking and operational capabilities, which also helps perfect the curriculum teaching system and elevate talent cultivation quality to a higher level.

4. Practical paths of blended online and offline teaching model for human anatomy and physiology courses

4.1. Build diversified online teaching resource platforms to lay a foundation for independent learning

High-quality online teaching resources constitute the core prerequisite for the implementation of blended teaching. During the application of blended teaching, teachers should accelerate the construction of diversified online teaching platforms based on the syllabus, key and difficult points of Human Anatomy and Physiology as well as students' cognitive rules, so as to lay a foundation for students' autonomous learning and all-round growth^[7]. First, digital resource libraries for Human Anatomy and Physiology can be built relying on digital teaching platforms such as Rain Classroom. Diversified online resources are classified and stored. For instance, our college constructed the digital resource library of Human Anatomy and Physiology via Rain Classroom jointly developed by Tsinghua University and XuetangX. Teaching is carried out relying on 11 self-developed AI intelligent courses on the platform, realizing full-process AI empowerment for pre-class, in-class and after-class teaching. Diversified online resources are stored in categories. All students taking Human Anatomy and Physiology are uniformly matched with the self-developed AI intelligent course *Human Structure and Function* as core online learning resources to facilitate their autonomous learning and growth (Figure 1).

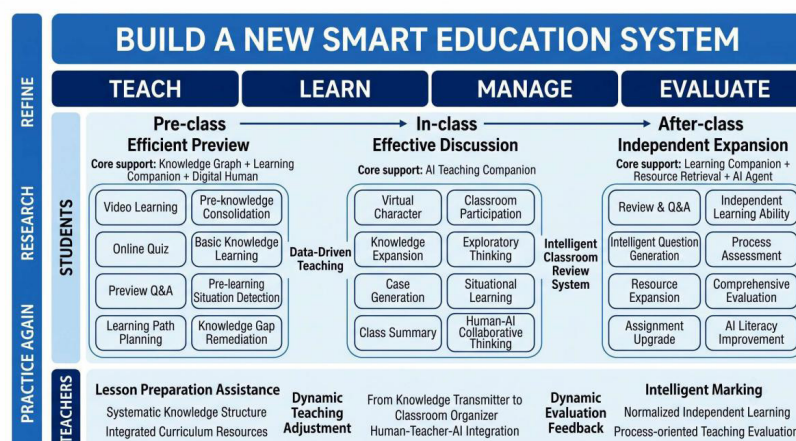


Figure 1. Framework for Constructing a New Smart Education System.

Second, the platform shall be equipped with comprehensive functions and an online interaction module, including chapter discussion zones, Q&A zones and assignment submission zones. Teachers regularly release preview tasks, thinking questions and case topics to guide students to conduct independent learning and online discussion before class. Meanwhile, online testing and chapter assessment functions are matched. Learning situation reports are automatically generated based on students' exercise performance, enabling teachers to accurately grasp students' learning status and identify their weak points, providing information support for the effective advancement of subsequent offline teaching ^[8].

4.2. Restructure offline classroom teaching procedures to realize targeted and efficient empowerment

Under the blended teaching model, offline teaching procedures of Human Anatomy and Physiology shall be restructured based on data feedback from online platforms. The traditional teaching model shall be abandoned, and a stepwise and systematic learning platform shall be built for students to comprehensively improve their professional comprehensive abilities—first, digital assistance. Digital micro-lessons, XuetangX MOOCs and AI-enabled Rain Classroom platforms are adopted for pre-class independent learning, after-class review and full-process formative assessment. Combined with verbal explanation, relevant knowledge is delivered to strengthen students' theoretical cognition. Second, in-class Q&A session. Based on students' pre-class preview and classroom feedback on online platforms, universal difficult problems are sorted out and explained in a targeted manner to help students resolve confusion and achieve knowledge transformation and improvement ^[9]. Third, in-depth interpretation of core difficulties of the course. The internal logic between knowledge points, physiological regulation rules and corresponding relations between human structures and functions are elaborated to help students gradually build their own knowledge framework of Human Anatomy and Physiology.

In addition, medical cases are introduced for group research. Multiple practical groups can be set up in class to form healthy competition among groups and active interaction within groups, creating a positive learning atmosphere. Clinical cases are introduced for group discussion and analysis, enabling students to strengthen theoretical cognition and deeply integrate theory with practice, as well as cultivate teamwork and logical thinking abilities ^[10].

Finally, practical teaching shall be strengthened. Digital software and virtual simulation platforms are adopted to build personalized practical platforms for students to receive timely skill training and boost their comprehensive capacities ^[11]. For example, teachers can introduce virtual simulation experiment platforms to guide students to carry out practical training on physiological diseases and abnormal human structures. Demonstration procedures shall be explained first, followed by guiding students to conduct independent digital virtual practice, so as to strengthen their professional operational skills and achieve the educational goal of targeted offline lectures, solid practical training and capacity improvement.

4.3. Improve after-class review and expansion system to form a closed-loop teaching model

After-class consolidation serves an important segment in the teaching of Human Anatomy and Physiology, linking pre-class preview and in-class teaching. Scientific and effective after-class expansion design can help students consolidate classroom knowledge, perfect their curriculum framework, and greatly improve their professional abilities and comprehensive quality. Under the blended teaching model, digital technologies can

be adopted to carry out personalized review and exercises after class^[12]. First, online exercises can be assigned via Rain Classroom. For students who fail to grasp basic knowledge of human anatomy and physiology, basic memorization materials and consolidation exercises are provided to strengthen their cognition. For students with strong capabilities, extended tasks including case analysis and practical design are set to realize stratified teaching and teach students in accordance with their aptitude. Second, teaching contents are matched with research findings, clinical cases and detailed analytical videos of operational skills for students to expand their professional vision and improve comprehensive abilities^[13]. Third, personalized after-class tutoring is provided via online platforms. Activities such as open Q&A can be held after class, where students are guided to raise confusing points and conduct exchanges before unified explanations. Online live streaming can be adopted to expand classroom space, answer students' questions after class and guide digital experimental operations, improving their comprehensive abilities^[14]. For example, live video streaming can be used to guide students in 3D model anatomical experiments, making up for the insufficient practical opportunities under traditional teaching and forming a complete closed-loop teaching system of pre-class preview, in-class research and after-class consolidation.

4.4. Innovate diversified teaching evaluation system to guarantee practical teaching effects

Teaching evaluation acts as the baton for the teaching reform of Human Anatomy and Physiology. Previous teaching evaluation models featured one-sided and traditional defects, which directly affected students' curriculum learning and ability improvement. Under the blended teaching model, the teaching evaluation system shall be innovated to guarantee teaching quality and outcomes effectively. First, previous result-oriented evaluation mechanisms shall be transformed. While focusing on students' learning results, comments and guidance shall be given on their performance in the learning process to promote their all-round development^[15]. During this process, digital platforms and artificial intelligence technologies shall be fully utilized to timely analyze and intelligently evaluate students' learning status, ensuring the targeted implementation of process evaluation and lifting teaching quality. Second, optimize teaching evaluation methods. On the basis of teacher evaluation, self-evaluation, peer evaluation and hospital tutor evaluation shall be introduced. For instance, students can be organized to evaluate and reflect on their pre-class preview, in-class learning and after-class review, cultivating their awareness of self-reflection and self-improvement. Students and groups can conduct mutual comments to exchange ideas and achieve overall progress. Combined with hospital tutors, students' curriculum learning and practical performance can be evaluated from a professional perspective, putting forward professional suggestions to boost students' comprehensive abilities and professional literacy.

5. Conclusion

In conclusion, under the general trend of educational digital reform, colleges shall adopt the blended online and offline teaching model in Human Anatomy and Physiology courses, further enriching curriculum connotation, enhancing interest and teaching efficiency, promoting high-quality teaching of this course and laying a solid foundation for the cultivation of application-oriented talents.

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