

Developing High-Quality Forensic Medicine Talent through Teaching Reform in China

Hai Wu, Yadong Guo, Yang Xia, Chengxin Ye, Yanjie Shang*

Department of Forensic Science, Xiangya School of Basic Medical Sciences, Central South University, Changsha 410013, Hunan, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: With the introduction of the new medical education concept in China, traditional forensic medicine education faces challenges such as a disconnect between theory and practice, lack of student engagement, and inadequate ideological education. This paper analyzes the “dual-track” teaching model based on Outcome-Based Education (OBE), incorporating Case-Based Learning (CBL) and Team-Based Learning (TBL) within the new medical education framework. It also integrates blended online and offline teaching, develops an online resource platform for forensic courses, and consolidates various teaching and internship resources to create an offline teaching platform. The aim is to enhance students’ self-directed learning, practical skills, and professional competencies. The requirements for cultivating medical talents in this context are comprehensive and diverse, stressing the integration of ideological elements throughout the teaching process to nurture high-level forensic professionals with solid knowledge, ethical standards, innovative capabilities, and a global perspective.

Keywords: New Medical Education; Forensic Medicine; Outcome-Based Education (OBE); Teaching Theory Innovation

Online publication: November 14, 2025

1. Introduction

In August 2018, the central government and the State Council jointly issued the Opinions of the Ministry of Education on Accelerating the Construction of High-level Undergraduate Education and Comprehensively Improving Talent Cultivation Capability, in which the concept of “new medical science” was formally proposed for the first time. In the same year, the Ministry of Education and other three ministries and commissions jointly issued the Opinions on Strengthening Medical Education Collaboration and Implementing Excellence in Physician Education and Training Program 2.0, which comprehensively deploys the construction of the new medical science and emphasizes the need for medical education to take the initiative to adapt to the new requirements, to promote reforms through innovation, to promote the development of reforms, and to devote itself to cultivating a large number of outstanding medical talents^[1].

Forensic medicine its research object is mainly for the human body and the human body related substances

detection, crime scene investigation, etc., although the discipline is categorized under the medical category, but it belongs to the legislation, the judiciary and other social management matters to provide forensic scientific and technological evidence of forensic medicine, rather than prevention, treatment and other diagnosis and treatment of medical disciplines^[2]. It covers a wide range of areas, and as an independent medical discipline has its own unique research object, research purpose, and problems to be solved. Although the new medical science is concerned about the reform of all types of advanced medical personnel training modes, due to the existence of certain differences between forensic science and traditional medicine, this new concept for forensic science majors still lacks a certain degree of relevance and operability^[3]. In the context of the new medical science, it is necessary to explore the innovation of forensic science teaching theory for the unique characteristics of the forensic science specialty and students' needs, and it is necessary to promote the reform of forensic science teaching from the existing problems and challenges.

2. Existing problems and innovative ideas in forensic medicine education

The curriculum of the undergraduate forensic training program covers mathematics, science, and chemistry, basic medicine, clinical medicine, and forensic professional core courses, aiming to help professional integration through the accumulation of fundamentals. However, students have a vague concept of forensic science in the early stage, and it is difficult for them to use the medical courses in forensic science practice, even though they learn well. This problem has existed for a long time in the teaching of forensic medicine, and currently, through the adjustment of the program will be an introduction to forensic medicine, forensic toxicology analysis, and other core courses in advance and cross-studied with the medical courses, to help students grasp the key points of forensic medicine early and combined with practice, and achieved certain results. However, at present, the medical curriculum is still dominated by medical courses, and students are more concerned about the medical focus, ignoring the content of forensic practice, and there is a lack of solid professional knowledge, a weak sense of self-study, and a low degree of professional identity. At the same time, the teacher training awareness to be improved, the lack of the "student-centered" concept, a single teaching method, and low acceptance of new methods, making it difficult to implement the whole process^[4].

In recent years, the traditional "heavy theory light experiment" idea changed, with forensic forensics and other courses increasing the experimental hours, but the experimental class still exists, with the theory accounting for too heavy, and students' hands-on operation of the problem of less hours. Medical school teaching evaluation is still based on the memory mode assessment, resulting in students thinking, a high forgetting rate is not conducive to the cultivation of complex, innovative medical talents.

In view of the problems of disconnecting theory and practice, lack of students' interest in learning, and insufficient civic education in forensic medicine teaching, under the background of the new medical science, we have deeply implemented the concept of "three-whole-education", and integrated the civic elements into the whole process of forensic medicine teaching. Through the "dual-track" teaching mode of CBL and TBL based on the concept of OBE, combined with online and offline blended teaching, we have constructed a teaching resource platform for online forensic science courses, integrated teaching and internship resources, improved students' independent learning, practical ability and professionalism, and cultivated high-level forensic science majors with solid professional knowledge, noble professional ethics, innovative ability and international vision. international vision, and cultivate high-level forensic science professionals with solid professional knowledge, noble professional ethics, innovative ability, and international vision.

3. Theoretical basis and innovative solutions

3.1. Integrating ideological and political education into the curriculum to promote comprehensive education

After graduation, most of the forensic science students enter the public prosecution system, colleges and universities or forensic identification centers, and their work is crucial to the judicial system. The traditional teaching of forensic medicine focuses more on theoretical teaching, and sometimes the comprehensive quality cultivation of students is neglected, which will lead to a certain extent to the separation of the ideological and moral quality of students from the requirements of their work ^[5]. The Guidelines for the Construction of Civics and Politics in the Curriculum of Higher Education Institutions point out that colleges and universities need to integrate the education of ideology and politics into each curriculum, and cultivate socialist builders and successors who are all-rounded in morality, intelligence, physical fitness, and aesthetics ^[6]. In forensic science, Civic and political elements such as awareness of the rule of law and ethical thinking should be explored and integrated into teaching ^[7]. Xi'an Jiaotong University School of Forensic Science ^[8] emphasizes the importance of the preparation of the course Civics and Politics case base, through the combination of professional characteristics of the material, so that the professional course cases are more educational.

Forensic science as a comprehensive practice discipline, the content of education in addition to professional knowledge and skills, pay more attention to the comprehensive quality of students, especially ideological and political education. Teachers need to pay attention to students' thoughts and values when imparting knowledge, and guide them to establish the correct three views. Ideological and political education should be carried out throughout the entire learning process of students, through the curriculum design and choice of teaching methods, to cultivate students' sense of social responsibility and other qualities in professional learning. For example, case studies are integrated into courses such as forensic pathology to emphasize the importance of law and ethics, and to realize the combination of explicit and implicit education to build an all-round pattern of education.

3.2. Blended “Dual-Line” teaching: Online and offline integration

Forensic science, as an applied discipline with extensive knowledge, has limited offline resources and an inefficient organization. Online teaching can solve the location and resource limitations, but the practice content needs offline interaction for efficient cultivation. Combining the characteristics and job requirements of forensic science, we build an online course platform, integrate internship resources, and promote online-offline hybrid teaching under the concept of OBE in order to enhance students' theoretical application and technical practice ability.

3.2.1. Build a teaching resource platform for online forensic science courses

Forensic science is a multidisciplinary fusion, and its teaching resources are huge; and students often encounter problems such as a lack of information and time-consuming searches. In this regard, an online platform for forensic science can be set up, with resources covering three aspects: teaching subjects, experimental teaching, and extracurricular learning. The resources for teaching subjects include textbooks, courseware, and exercises; the resources for experimental teaching include experimental textbooks, videos, and virtual simulation experiments; and the resources for extracurricular learning include scientific research and reading materials. The platform is open to teachers and students in stages and modules, opening modules according to the teaching stage, and opening higher permissions for the whole stage of learning content for easy access. Setting up different learning boards, students pre-study marking doubts, teachers answer in class, cultivate independent

learning ability, and enhance the teaching effect. Virtual simulation technology is gradually maturing in medical education, which provides experimental scenarios through modeling, and students' human-computer interaction and operation, combined with the experimental process training, helps students understand the experimental principles and operations, and improves their practical ability, but at present, there are problems such as low coverage of experiments and poor stability of the platform. The online assessment board facilitates teachers to test the learning effect of students promptly, which should be combined with real cases to promote in-depth analysis of students, and assess students' mastery and adjust the teaching and learning programs through mutual assessment of students and teachers' comments^[9].

The academic tutoring system has been widely tried in China's colleges and universities, with remarkable results, but problems such as weak teacher-student interactions have emerged in its implementation^[10]. The online platform interactive board can be based on the academic tutoring system to develop teacher-student interaction, student questions into the usual grades, set anonymous questions and answers to enhance student initiative and trust. Mentor real-name question and answer system, set up a guidance team to solve the problem, the question and answer situation into the teacher assessment, to improve the enthusiasm of mentor participation.

3.2.2. Integrate multi-party teaching internship resources and build an offline teaching platform

Online teaching is flexible and has diverse resources, but lacks face-to-face communication, requires high self-discipline for students, and is easily affected by network equipment, which is not conducive to ideological education and practical simulation. The details of forensic work are crucial, and it is difficult to simulate actual case processing by online resources alone. Offline teaching can promote teacher-student interaction, enhance the emotional connection, and the public prosecutors and law departments, forensic science centers, and other practical platforms provided by the public prosecutors and law enforcement departments, can allow students to participate in real prosecution cases, to enhance their practical ability and professionalism.

Online and offline "dual-line" teaching combines the advantages of both, building an online resource platform and an offline teaching system. "Dual-line" courses have a wealth of resources as well as flexibility and convenience, etc., to meet the students' personalized learning, giving full play to the students' initiative, interactive, and engaging. Initiative, at the same time, the enhancement of interactivity and openness stimulates the creativity of teachers, constantly deepens the course content, improves the completeness of the course, and makes the forensic science course full and rich in connotation, full of attraction^[11].

3.3. CBL and TBL "dual-track" teaching under the concept of OBE

Forensic science, as a highly practical application discipline, its teaching and training objectives strictly implements the training mode of theory and practice. However, the traditional teaching method focuses on the teacher's lecture and the students' passive understanding and acceptance, which leads to poor learning initiative and is not conducive to the cultivation of thinking ability, working ability, and innovation ability. This filler education mode cannot help students combine theory and practice well, resulting in poor learning motivation and unsatisfactory teaching effect. It mainly centers around lecturers and ignores the students' main position^[12].

OBE (Outcome-based education) education concept is the education model advocated by American scholar Spady, which is oriented to the actual output of results, emphasizing student-centeredness and highlighting the subjectivity of students. Under the concept of OBE, the teaching program setting, implementation, and evaluation mode are all from the perspective of students. Teachers clearly understand the abilities and skills that students

need to have, and design the curriculum system and evaluation methods in a targeted manner to ensure that students achieve the expected learning results^[13].

CBL (Case-Based Learning) combines forensic science cases, explores the key points of the course, sets related problems, or extends the knowledge content, and organizes student discussions. Forensic science cases are mostly from real life, such as Simpson's wife murder case, Zhu Ling case, Fudan poisoning case, and other major social impact cases, as well as public security departments and identification centers' actual cases. The selection of cases should take into account the teaching objectives, content requirements to ensure that they are classic, profound, and representative. Real cases can stimulate students' interest in learning, and teachers guide students to think about the forensic knowledge and skills involved, encourage students to use basic theoretical knowledge to analyze and discuss, and consult relevant literature, so as to consolidate knowledge and enhance practical thinking. cooperative teaching method. It takes students as the main body and focuses on improving students' independent learning ability and lifelong learning quality^[14]. The concept of TBL is a combination of goal guidance and team discussion, and students are categorized according to their cognitive level and learning goals to form learning teams. Students can discuss and communicate with each other as a team to complete the task together and form complementary strengths. For example, in the case analysis, teamwork and clear division of labor improve the details of the case, to obtain the correct results, to stimulate the enthusiasm of students, strengthen the collision of ideas, exercise teamwork and critical thinking ability. Teachers can carry out various forms of teaching activities through learning teams, such as pre-study preparation, flipped classroom, team debriefing, and teaching assessment.

CBL and TBL have their own advantages and disadvantages. The "dual-track" teaching method, which integrates the two, has been used in many medical disciplines with good results. Introducing real forensic cases stimulates students' interest and cultivates forensic thinking. Teamwork promotes interactive exchanges and enhances communication, collaboration and problem-solving skills. These two methods emphasize the connection of theory to practice, promote students' independent learning, in-depth understanding of the application of knowledge, help students learn and improve from their mistakes, and focus on both academic achievement and comprehensive quality training, which is significant for personal development and future career^[15].

4. Evaluation of teaching effectiveness

Student-centered, through the "online + offline" multi-form, "teachers + students + internship base" diversified evaluation strategy, to build a "formative + diagnostic + summative" evaluation system. Formative evaluation is a dynamic assessment system.

Formative evaluation is a dynamic evaluation system that improves teaching and pays attention to the whole process of students' development through continuous feedback. Adopting the diversified subjects of "teachers + students + internship bases" and combining various methods, the assessment is comprehensive in three dimensions: knowledge and skills, classroom behavior and emotional value. Teachers observe students' performance in skills operation and thematic discussion, and dynamically track the growth of their abilities by combining teamwork, participation and other affective attitudes; students strengthen reflection through self-evaluation and peer assessment. The evaluation of internship bases focuses on practical ability to ensure the connection between theory and practice. Diagnostic evaluation quantitatively analyzes students' knowledge base and thinking level before and after teaching through online and offline scales and interviews, providing a basis for teaching adjustments; summative evaluation integrates formative and diagnostic data, combines with

examination results, and quantitatively evaluates the effectiveness of comprehensive education of “knowledge + ability + value,” realizing the closed-loop optimization of the evaluation system. Optimization.

5. Conclusion

As a cross-cutting and applied discipline, forensic science plays an important role in the fields of forensic identification and crime investigation. With the continuous development of science and technology and the continuous improvement of the rule of law, forensic science education will usher in a new opportunity for development, and by deepening the reform of forensic science teaching, we will cultivate more high-quality and high-level forensic science talents, and make greater contributions to the maintenance of social justice and the construction of rule of law in China.

Funding

Postgraduate Education and Teaching Reform Research Project of Central South University (Project No.: 2025JGB164); Education and Teaching Reform Research Project of Central South University (Project No.: 2025jy052)

Disclosure statement

The author declares no conflict of interest.

References

- [1] Ministry of Education, National Board of Health, State Administration of Traditional Chinese Medicine, 2018, Suggestions on Strengthening the Cooperation Between Doctors and Teachers in Implementing the Excellent Doctor Education Plan 2.0, visited on October 30, 2024, https://www.gov.cn/zhengce/zhengceku/2018-12/31/content_5443536.htm.
- [2] Cong B, 2024, Basic Framework of Science and Technology System in the Field of Forensic Medicine. *Chin J Forensic Med*, 39(1): 5–7.
- [3] Zhang Z, Wu M, Zhang W, et al., 2020, Discussion on the Professional Reform of Forensic Medicine Under the Background of New Medical Science. *Journal of Chizhou University*, 34(03): 104–106.
- [4] Pu W, Gao R, Lin D, et al., 2024, Exploration on the Teaching Innovation Path of Pathology Course Under the Background of “New Medicine Science”. *China Continuing Medical Education*, 16(02): 31–36.
- [5] Zhang Y, Jiang Y, Chen L, 2024, Exploration and Thinking on the Integration of Ideological and Political Elements and Forensic Medicine Teaching Reform. *Ability and Wisdom*, 2024(06): 13–16.
- [6] Ministry of Education of China, 2020, Circular of the Ministry of Education of the People’s Republic of China on the Issuance of the Guiding Outline for Ideological and Political Construction of the Curriculum of Institutions of Higher Learning, visited on October 30, 2024, https://www.gov.cn/zhengce/zhengceku/2020-06/06/content_5517606.htm.
- [7] Zhong S, Li L, Nie S, et al., 2022, Exploration on the Ideological and Political Teaching of Forensic Biology Course with “Ideological and Political Case” as the Carrier. *Advances in Social Sciences*, 11(9): 3972–3978.

- [8] Center of Forensic Medicine, 2024, The Compilation Meeting of Forensic Medicine, A National Case Library of Ideological and Political Issues of Clinical Medicine for Higher Medical Education, Was Held Smoothly, visited on October 30, 2024, <https://forensmed.xjtu.edu.cn/info/1018/1514.htm>.
- [9] Chen R, Lai X, Xu C, et al., 2023, Reform of Online and Offline Mixed Teaching Mode Based on OBE: Taking the Course of Clinical Forensic Medicine as an Example. *Education and Teaching Forum*, 2023(07): 69–72.
- [10] Yuan J, Zhu Y, 2023, Practice and Thinking of Academic Tutorial System on Cultivating Undergraduates' Scientific Research Quality: Taking Practice of Henan University of Chinese Medicine as Example. *China Educational Technology & Equipment*, 2023(12): 101–104.
- [11] Meng S, 2023, Study and Practice of Course-Based Ideological and Political Education in Forensic Medicine. *Research on Education and Teaching*, 35(05): 116–121.
- [12] Wang X, Cai J, Liu Q, et al., 2010, The Implementation of “Student-Centered” Concept in Forensic Teaching Reform. *Medical Education Exploration*, 2010(7): 3.
- [13] Ge L, Jiang Q, Yan J, et al., 2024, Construction of Comprehensive Experimental Course of New Medical Major Based on OBE Concept. *Journal of Higher Education*, 10(02): 61–65.
- [14] Qi H, Wang X, Yang Y, et al., 2023, Research on the Application of CBL and TBL Dual-Track Teaching Method in the Course of TCM Basic Theory Based on OBE. *Western China Quality Education*, 9(17): 191–194.
- [15] Jia F, 2022, Analysis on the Application of CBL and TBL Dual-Track Teaching Methods Under OBE Concept in Forensic Medicine Teaching. *Chinese Continuing Medical Education*, 14(6): 24–28.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.