

The Practice of Case Teaching Method in the Teaching of “Fire Investigation”

Xinyu Wang *, Xiao Zeng, Nan Li, Yue Xing

China Fire and Rescue Institute, Beijing 102202, China

* Corresponding author Email: wangxinyu@cfri.edu.cn

Abstract. Fire investigation is a comprehensive applied discipline that studies fire traces, analyzes fire evidence, and deals with fire accidents. The case teaching method is conducive to integration of theory and practice, promoting the innovation of talent training mode, improving the comprehensive ability of students, and promoting the mutual benefit teaching. Combined with the training objectives, this paper firstly analyzes the necessity of the application of case teaching method in the teaching of Fire Investigation from three aspects: curriculum system construction, student literacy improvement, and teacher ability improvement. Secondly, it introduces the application practice process from three stages: pre class, in class, and post class. Finally, it proposes precautions from three aspects: case library construction, classroom design, and course evaluation.

Keywords: Fire Investigation; Case Teaching; Teaching Reform; Teaching Method.

1. Introduction

In the context of China’s higher education reform and the training reform of junior commanders of national comprehensive fire and rescue teams, the China Fire and Rescue Institute has comprehensively deepened the integrated talent training model of "teaching, learning, training, and combat", focusing on improving the practical operation ability and professional skills of students, cultivating their innovative spirit and challenge awareness of the trainees to meet the tatent needs of the fire rescue teams.

Fire investigation is an important component of firefighting, and the course of fire investigation is a compulsory course for firefighting-related majors. The purpose of course teaching is to enable students to have the ability to investigate and handle fire accidents and solve related problems on the basis of systematic theoretical knowledge, and have strong practicality. However, the traditional teaching methods mostly rely on textbooks for teaching, with knowledge points lagging behind and mostly one-way information transmission, which makes it difficult to mobilize students' learning initiative and the overall participation is low. Which is not conducive to cultivating students' innovative thinking and practical operation abilities, and it is difficult to meet the requirements of educational reform and talent cultivation. In order to achieve the goal of talent cultivation and achieve good teaching results, it is important to strengthen case teaching in the teaching of fire investigation courses.

2. The Necessity Analysis of Applying Case Teaching Method to the Teaching of Fire Investigation Course

Case teaching is originated in the West, which is an open, interactive, and collaborative classroom teaching method. It is student-centered, based on teaching cases, linked to textbook content, analyzes and explains typical cases, focuses on inspiring and guiding students to understand knowledge, discover and analyze problems, expand and update their knowledge system, and master the ability to solve and handle problems, thus breaking the traditional teaching model of teacher centered teaching and untimely textbook knowledge updates.

2.1. Promote the Optimization and Integration of Theoretical Knowledge and Practical Business in the Curriculum

Fire investigation is a comprehensive and applied discipline with a wide range of content and diverse knowledge, involving multiple disciplines. Taking "Fire Investigation" edited by Liu Yixiang and published by the Machinery Industry Press as the teaching material, if only the content of the textbook is taught, it can easily cause the classroom to be boring, the students to feel bored, the teachers to feel tired, and new knowledge and business to be lacking. When the actual fire case is introduced, which can be used as knowledge carriers, the theoretical knowledge is combined with practical business, so that students know what knowledge to use when conducting fire investigations in the fire scene, as well as the latest investigation methods and equipment currently used by fire rescue teams. For example, when teaching Chapter 3 "Fire Site Investigation", we will combine the Tianjin Port "8.12" Ruihai Company's dangerous goods warehouse special major fire and explosion accident to explain knowledge points such as "fire site protection", "fire site investigation procedures", "extraction of trace physical evidence", "on-site testing", and "on-site investigation records". Based on this case, with knowledge as filling and business operation as expansion, we will optimize the combination of theoretical knowledge and practical business, and introduce the latest knowledge while making the knowledge coherent and operable.

2.2. Promote the Overall Improvement of Students' Theoretical Literacy and Professional Abilitie

Through case teaching, according to the teaching design, students become the main body of teaching activities. Students actively and proactively search for relevant case materials, stimulating their learning initiative and self-learning ability. Guided by the theoretical problems in teaching, combined with the practical problems encountered in the case, stimulate students to think while cultivating their problem-solving abilities. Introducing new thinking, methods, and technologies from current fire investigation business practices into the classroom based on practical cases, while extending knowledge and cultivating students' innovative awareness and ability. The students search for cases in groups, and each group divides their work to analyze cases. This increases the cohesion among students and cultivates their ability to work together in solving practical problems in and out of class.

2.3. To Achieve a Two-Way Improvement of Teacher's Knowledge Reserve and Theoretical Application

With the development of society, fire investigation will encounter many new knowledge, problems, and challenges. In the process of case teaching, teachers collect extensive data, analyze cases, integrate cases into their own knowledge system, form their own experiences and insights, increase the literacy and direction of scientific research, and expand the depth and breadth of knowledge. At the same time, there are relatively few opportunities for college teachers to come into contact with physical fire scene cases. They combine their rich theoretical knowledge with practical fire investigation business, so that theory and practice promote each other and improve the comprehensive ability of teachers..

3. The Teaching Practice of Case Teaching Method in the Course of Fire Investigation

In case teaching, cases are the core of the entire classroom teaching. Teachers and students conduct teaching around cases, so it is very important to ensure that case design is not blunt in the classroom and knowledge instillation is like salt into water. The basic process of implementing case teaching in the course of Fire Investigation is shown in Figure 1. The overall process is divided into three parts: pre class, in class, and post class. In each process, "teachers" and "students" are taken as the main body, student-centered, goal oriented, emphasis on inspiring teaching, and strengthening practical application, in order to meet talent cultivation goals and promote mutual learning between teaching and learning.

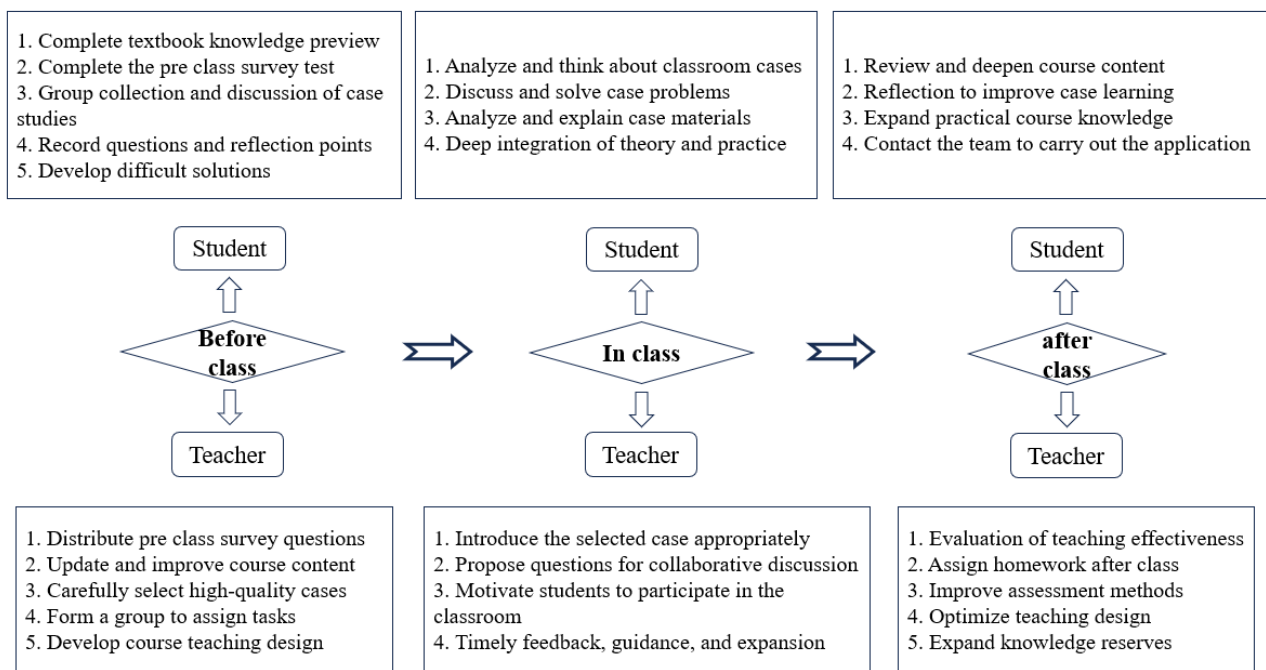


Fig 1. The basic process of implementing case teaching

3.1. Pre Class Preparation Stage

Before class, the teacher will distribute the pre class knowledge mapping materials according to the teaching plan, and adjusts the teaching design in a timely manner based on feedback from students. At the same time, combined with the teaching content, the teaching case are carefully selected to ensure the correctness, pertinence, inspiration, and goal of the cases, achieving the goal of "using cases to drive knowledge learning". Assign case tasks in groups, with a focus on moderate and appropriate difficulty, so that the course not only meets the requirements of high order and innovation, but also increases the level of challenge and enhances the learning desire and enthusiasm of students. Finally, carefully design the teaching plan, including planning teaching methods, discussion methods, and teaching environment; Conceptualize teaching atmosphere, methods for problem emergence and resolution; Refine follow-up activities and deepen case studies. Students should provide timely feedback on their knowledge reserves while conducting thorough previews. They should study and discuss the case tasks assigned by the teacher, record the key and difficult points and questions in the course, and develop a general solution to the problem.

3.2. Classroom Implementation Stage

In class, the teacher appropriately introduces teaching cases according to the teaching design, while exerting subjective initiative, proposing core topics for discussion, grasping the direction, providing opinions, and guiding and inspiring students to participate in the discussion. During the process, students are encouraged to extract their own viewpoints and questions, avoid ineffective or even inefficient discussions, and establish critical thinking to raise questions from different dimensions and seek solutions. Finally, the teacher provides timely feedback and explanations based on the group discussion and explanation. On the basis of listening attentively, students will think, discuss, speak, and analyze cases in groups, raise their own questions and problem-solving methods, and provide feedback and analysis on the opinions of different groups.

3.3. After Class Summary and Deepening Stage

After class, the teachers reflected on the teaching process, evaluated the effectiveness of case teaching implementation, the achievement of teaching objectives and existing problems, and propose experiences and existing problems; Assign homework according to the course plan, fill in any gaps

in the classroom content, improve classroom assessment methods, and further motivate students to learn. Students review and deepen the classroom content, reflect on the problems and shortcomings that exist in the case study process, such as whether they expressed their opinions and opinions smoothly in class, and identify the gaps with other students in case discussions. By studying relevant cases and knowledge points outside of class, expand the classroom content, propose new ideas that need to be studied and solved, and provide direction for technological innovation. At the same time, the knowledge learned will be combined with the actual fire investigation business of the team to realize the real integration of educational theory and practical operation.

4. Notes on Case Teaching in the Teaching of Fire Investigation Course

The application of the case teaching method in the teaching of "Fire Investigation" can strengthen students' ability to search for personal and physical evidence, process and analyze evidence, and determine and handle cases when encountering fire accidents. However, we still need to pay attention to some issues in the process of specific case teaching practice.

4.1. Emphasize the Construction of Case Libraries and Enrich Case Teaching Resources

Case teaching is based on actual cases, and case teaching cannot be carried out effectively if appropriate cases cannot be found. Therefore, the construction of a case library is the basis for case teaching. By the planning of the construction of the case library, the formation of a team, relying on teachers, students, fire team research, the Internet and other ways to develop the case. At the same time, the cases are classified, the best cases can be quickly and accurately selected when used, and the case library is maintained and updated in real time to ensure the typicality, comprehensiveness, standardization, novelty and objectivity of the cases, and create a case library with strong operability and rich resources.

4.2. Integrating Case Teaching with Multiple Teaching Methods to Achieve Optimal Teaching

In the application of case teaching, there is no fixed teaching paradigm, and the teaching design should be refined according to the actual content of the course, and the case should be analyzed in simple terms through a variety of flexible teaching methods, so as to penetrate the knowledge points into the process of case teaching. Student-centered and case-driven, it defines fuzzy problems and guides students to explore, think, discuss and defend, so that the theoretical knowledge of the course is deeply integrated with case practice and the teaching optimization is realized.

4.3. Strengthen the Subject Status of Students, Focus on Process and Evaluation

The traditional teaching method is accustomed to the teacher's "lecture" as the main focus, and the initiative of the students is poor. In the process of case teaching, it is necessary to fully leverage the student's subjectivity, put the student at the center, and allow them to seek knowledge, think about problems, and explain feedback. Teachers rely on their knowledge reserves and professional abilities to master the necessary classroom, pay attention to the process design and evaluation of case teaching, and taking timely measures to promote the process of case teaching, so that the teaching process can run benignly.

Through case teaching, the traditional teaching mode of teachers fulling the classroom is broken, the teaching efficiency of the classroom is effectively improved, and mobilizing the learning interest and initiative of students. At the same time, the typical fire scene is compiled into the case teaching, which exercises the teaching ability of teachers, and at the same time allows students to understand the real fire scene and real fire investigation business to the greatest extent in the college, which improves the comprehensive quality and meets the purpose of talent training.

Acknowledgments

The 2023 China Fire and Rescue Institute level educational reform project "Strengthening the Application of Case Teaching in the Teaching of Fire Investigation" (2023ALJX02).

The 2021 Beijing Higher Education Undergraduate Teaching Reform and Innovation Project "Research and Application Practice of Electrical Circuit Fire Simulation Test Device in Fire Investigation Experimental Teaching under the Background of New Engineering" (202110039001).

References

- [1] Ye Wenxia. Research on the Application of Case Teaching Method in the Course of Fire Evidence Science [J]. Journal of the People's Armed Police Academy, 2014,30 (05): 69-71.
- [2] Ye Wenxia. Application of Problem Based Teaching Method in Fire Investigation Teaching [J]. Journal of the People's Armed Police Academy, 2017, 33 (01): 75-78.
- [3] Pei Bei, Chen Liwei. Application of Case Teaching Method in Fire Investigation Course [J]. China Education Technology Equipment, 2013 (30): 80-81.
- [4] Ma Congming. Application of Case Teaching Method in Fire Investigation Teaching [J]. Guangzhou Chemical Industry, 2019,47 (01): 123-124.
- [5] Xiao Yihong, Zhou Xianzhong, Ling Haifeng, et al. Case Study Teaching: An Effective Teacher Education Method [J]. Education Theory and Practice, 2012,32 (32): 35-37.
- [6] Jiang Yang, Ding Qiuli. A Review of Case Teaching Models [J]. Shanghai Packaging, 2018 (02): 61-62.
- [7] Liu Jingjing. Practical Research on Case Teaching in Educational Research Methods Curriculum [J]. Education and Teaching Research, 2020,34 (05): 86-95.
- [8] Liang Qiaoyan. Research on the Application of Case Teaching in Vocational Education [J]. Journal of Jiangxi Electric Power Vocational and Technical College, 2023,36 (01): 58-60.
- [9] Chen Dongxu, Zhang Dong, Zhang Min. Case teaching for cultivating applied talents: constraints and strategies [J]. Journal of Chongqing University of Science and Technology (Social Science Edition), 2020 (05): 112-116.
- [10] Lan Xiaping, Chen Dachao. Problems and Solutions of Case Teaching [J]. Teaching and Management, 2017 (10): 1-4.