

Constructing a "Three in One" Fire Investigation Experimental Practice Teaching System Guided by Job Competency

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Abstract: The fire investigation business has strong practicality, involving complex and diverse disciplines with a wide range of categories. It is very important not only to improve practical and operational skills, but also to impart knowledge to students scientifically and reasonably. Guided by enhancing students' fire investigation capabilities, breaking the traditional single construction mode of experimental teaching, and constructing a "trinity" design framework of experiment, training, and practice, the focus is on starting from practical experience, strengthening the understanding of basic theories, deepening the knowledge of real fire scenes, focusing on the needs of job positions, improving the comprehensive ability of fire investigation, and laying the foundation for better cultivating composite applied fire investigation talents.

Keywords: Fire Investigation; Experimental Practical Teaching; Capability Oriented; Teaching System.

1. Introduction

Fire is the result of the interaction of various accidental factors. High temperatures and firefighting battles, etc. extremely damage the original fire scene, making it difficult to restore the fire scene and extremely hard to investigate the causes. How to scientifically and reasonably impart the complex and diverse theoretical knowledge related to fire investigation to students in teaching, flexibly apply it in actual investigations, construct the thinking of fire accident investigation, and improve the actual professional ability of fire investigation has always been the goal of teaching staff engaged in fire investigation. Experiments, practical training, and practical teaching play important roles in cultivating students' comprehensive abilities. Oriented towards ability cultivation, innovating the teaching contents of fire investigation experiments, practical training, and practical teaching, and reasonably constructing the design of the teaching system are crucial for strengthening the cultivation of students' innovative actual - combat abilities. At the same time, the China Fire and Rescue Institute comprehensively deepens the integrated talent - cultivation model of "teaching, learning, training, and combatting", adheres to the school-running orientation of "characteristic - discipline - oriented and actual-combat-application-oriented", combines with the general trend of the country vigorously promoting the cultivation of application - oriented talents, and explores the "trinity" fire investigation experimental and practical teaching system oriented towards post - holding abilities and aiming at cultivating application - oriented innovative talents, which has great practical significance for improving the teaching quality of fire investigation and promoting experimental and practical teaching work.

2. The Application of the Core Concept of Talent Cultivation Oriented Towards Job - Holding Capabilities. Section Headings

CBE stands for "Competency - Based Education", which means an education and teaching system centered on competency cultivation. Its core ideas are: student - centered, aiming at competency cultivation, and oriented towards practical application [1]. It is an educational model centered on cultivating the professional competencies required for job responsibilities, which is very effective for cultivating application - oriented talents and helps to strengthen students' comprehensive abilities such as self - directed learning, practice, and innovation[2]. Canada is the birthplace of CBE. It is widely used in developed countries such as Canada, the United States, the United Kingdom, and Australia in North America. It was gradually promoted in various countries in the early 1990s, and now more than 30 countries and regions are learning and applying the CBE teaching model. Experiment, practice, and practical training teaching are effective ways to consolidate theoretical knowledge and strengthen competency levels, and are important links in cultivating students' application abilities. Constructing a system for cultivating students' comprehensive abilities, which is oriented towards students' job - holding competencies and runs competency cultivation through the whole process of students' experiments, practices, and practical training, forming an integrated system of basic courses - experimental exploration - skill training - on - the - job practical training[3].

2.1. Guided by the Talent Needs of the Fire and Rescue Teams.

In the construction of the experimental - practical training - practice teaching system, the understanding of the "Four - sentence Guideline", namely loyalty to the Party, strict discipline, readiness to risk life and limb, and serving the

people wholeheartedly, should be strengthened. The goal is to cultivate comprehensive – developed talents with moral, intellectual, physical, aesthetic and labor education, who have firm political beliefs, solid theoretical foundations, rich cultural attainments, good disciplinary styles, excellent professional qualities, innovative spirits and international perspectives. Through experiments, the cognition of theoretical knowledge is deepened; through practical training, the familiarity with skill operations is strengthened; through practice, the fire investigation professional capabilities are improved to meet the job requirements. They are compound – application – oriented talents with the combination of command and technology, being proficient in one specialty and versatile in multiple skills, and are capable of handling fire accident investigation and processing work in the national comprehensive fire – rescue teams[4].

2.2. Based on the Cultivation of Job – related abilities for Fire Investigation.

Take the comprehensive abilities determined by job analysis as the learning objectives, optimize and restructure

the contents of experimental, practical training, and practice courses, construct a subject system, break the boundaries of traditional specialized courses, integrate relevant functional teaching modules, and form a shared experimental – practical – training teaching innovation platform with cross – integration, comprehensive functions, reasonable structure, and advanced technology, strengthening the cultivation of fire investigation job abilities in the interactive and inspiring teaching process. For example, in the learning of knowledge points about electrical fault traces at fire scenes, on the premise of learning theoretical knowledge, the objective of job – related abilities will be run through the “trinity” learning of experiment – practical training – practice, breaking the traditional education methods, aiming at the cultivation objective of job - related abilities, strengthening practical teaching based on job requirements, emphasizing the determination, learning, mastery, and application of the abilities required by occupations or jobs, enabling students to firm up their ideals and beliefs, master theoretical knowledge, understand professional trends, possess fire investigation abilities, and be able to meet job requirements during the practical process[5].

Table 1. Comparison between CBE and traditional education.

CBE	Traditional education (Knowledge points of electrical fault traces at fire scenes.)	
Focus on content.	Focus on job analysis and competency - demand analysis.	The identification, extraction, analysis, and judgment of electrical - fault traces.
The goals are abstract. What is studied in research?	The goals are specific. Study what can be done.	Be able to analyze, investigate, and handle electrical fire accidents.
It is mainly based on teachers' lecturing and demonstration.	It mainly focuses on self - learning, with teachers providing assistance and guidance.	Students design and carry out “experiment - practical training - practice” as the main body.
Feedback is lagging.	Timely feedback and dynamic control	The teacher designs a timely and comprehensive feedback evaluation system.
Rely on learning - time limits.	Focus on performance of abilities.	The assessment standard is the improvement of students' abilities.

2.3. Taking the Combination of Production, Teaching, Research and Application of Fire Investigation as the Approach.

Centering on the talent cultivation of the integration of production and education and the combination of work and study, combined with experimental - practical training - practical teaching, formulate talent cultivation plans and specific measures of work - study alternation. Through integrating resources and advantages in aspects such as the fire investigation industry, academia, research, and application, improve the technical level, equipment quality, and students' job - related abilities of fire investigation. Rely on the fire investigation laboratory to jointly form a fire investigation technical team with universities, enterprises, and social professional technical institutions. Through cooperation, it is possible to fully utilize respective professional advantages and resources to conduct in - depth research on specific types of fire accidents such as electrical fires and new - energy vehicle fires, analyze the fire - causing mechanism, and provide technical support for fire scene investigations. Improve the scientific and technological level of equipment, carry out skill training and talent cultivation, carry out skill training for fire investigators for fire rescue teams and social personnel, and strengthen the cultivation of grass - roots fire investigation professional and technical talents. Promote the transformation and application of scientific and technological achievements, jointly promote

the implementation and transformation of scientific and technological achievements with social forces, introduce fire - fighting scientific and technological achievements released by the National Fire Rescue Bureau every year, improve the scientific and technological level of fire - investigation technical equipment, transform research results into practical applications, and enhance the overall efficiency of fire investigation.

3. Construct a “Three-in-one” Experimental and Practical Teaching System for Fire Investigation

The fire investigation business is highly practical, and students are required to have high - level job - related capabilities. It involves complex and diverse disciplines. Therefore, experiments, practical training, and practice play important roles in cultivating fire investigation talents. However, at present, the experimental course projects designed in fire investigation teaching are single. There are only simple restorations and demonstrations of some trace evidence, lacking comprehensiveness. Fire investigation practical training projects are scarce, lacking necessary training sites and training instruments and equipment. Finally, the drills carried out in graduation practice relatively deviate from the job - related requirements of fire investigation. At the same time, there is a lack of overall planning and

connection among projects, and it is difficult for experiments, practical training, and practice to support and promote each other[6].

Therefore, as shown in Figure 1, the goal of constructing the “three - in - one” teaching system of fire investigation experiments - practical training - practice is to use the experimental teaching platform to deepen students' understanding of basic theoretical knowledge and strengthen their knowledge mastery through intuitive perception; use the practical training teaching platform to enhance students' cognition of fire scenes and improve their comprehensive

application ability of theoretical knowledge through simulated investigation scenarios; use the practical teaching platform to deepen students' understanding of real fires and fire scenes and consolidate the cultivation effect of investigation thinking ability through participation in practice; finally, in the entire experimental and practical teaching system, experiments, practical training, and practice are organically combined, resources are shared, and advantages are mutually transformed to achieve the organic integration of scattered professional knowledge of multiple disciplines, significantly improve investigation abilities, and rationally construct investigation thinking[7].

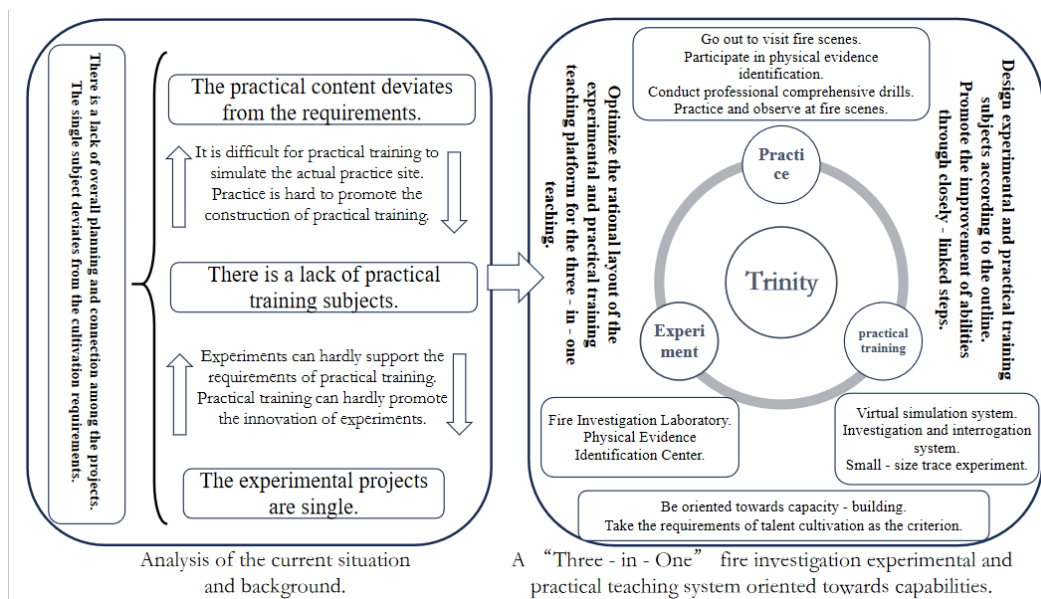


Fig 1. The practical foundation diagram of status analysis and reform research

According to the characteristics of cultivating professional and technical talents for fire investigation work and combining with the successful experience of disciplinary development, as shown in Figure 2, focusing on improving the post - competency of the trained talents, starting from cultivating students 'post - competency for technical positions, and combining with the characteristics of cultivating talents specialized in fire investigation, the original experimental teaching system is expanded into an "experiment - practical training - practice" teaching system. The single confirmatory experiment is expanded into an experimental - practice mode

with four levels: "basic - design - comprehensive - authenticity". A "three - in - one" experimental - practice teaching system is established, in which experimental teaching, practical training teaching, and practical probation teaching complement each other. Comprehensive teaching of fire accident investigation capabilities is carried out, and a talent cultivation model from point to surface, from basic to comprehensive, and from simulation to actual combat is adopted. Oriented by talent cultivation capabilities, the experimental - practical training teaching system is re - divided.

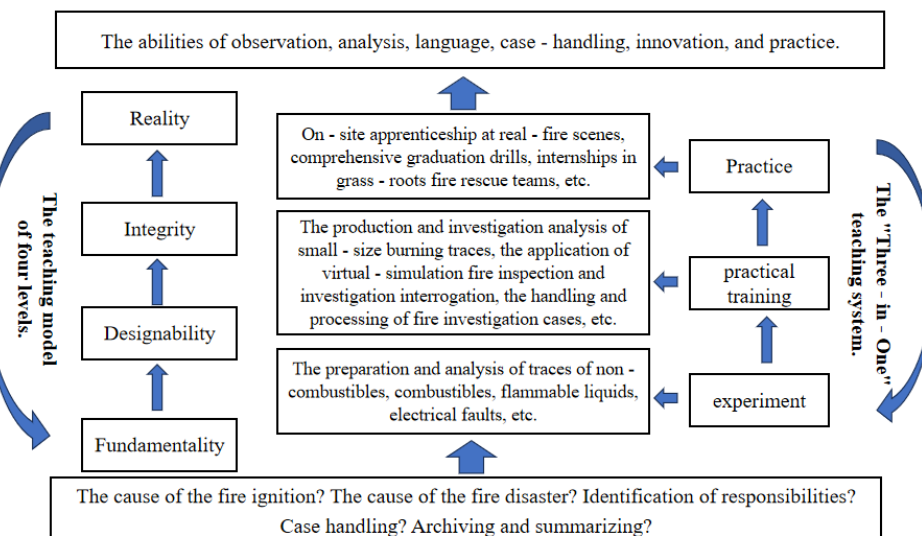


Fig 2. Construct a diagram of the “Three - in - One” fire investigation experimental and practical teaching system oriented by abilities

For the problems of scattered and diverse professional knowledge that is independent of each other, as shown in Figure 3, first, the core role of the experimental teaching platform is exerted. Using the college's fire investigation laboratory, experimental courses with rich content, depth, and levels are carried out. There is one teaching team for two curriculum systems of theoretical courses and experimental courses, enabling high - level teachers to participate in the construction of experimental teaching. Second, the guarantee role of the practical training teaching platform is played. Using the college's laboratories and the virtual reality training system platform for fire investigation, professional theoretical knowledge is consolidated and practical operation ability is improved in the simulation of actual fire accident investigations. Finally, the daily physical evidence identification work in the laboratory, as well as apprenticeship

and internship at real - fire scenes are regarded as on - campus operation - learning and off - campus practice platforms. In the analysis of case details, physical evidence, and application of conclusions, the content of experimental teaching is enriched, the degree of actual combat of practical training teaching is enhanced, and students' post - competency is trained. The three teaching and practice platforms are organically combined, resources are shared, and advantages are mutually transformed, thereby solving three major problems: scattered professional knowledge, relatively independent links, and training divorced from actual combat, and exploring a new teaching system with distinct characteristics, prominent features, clear functions, and remarkable results for cultivating professional talents in fire accident investigation.

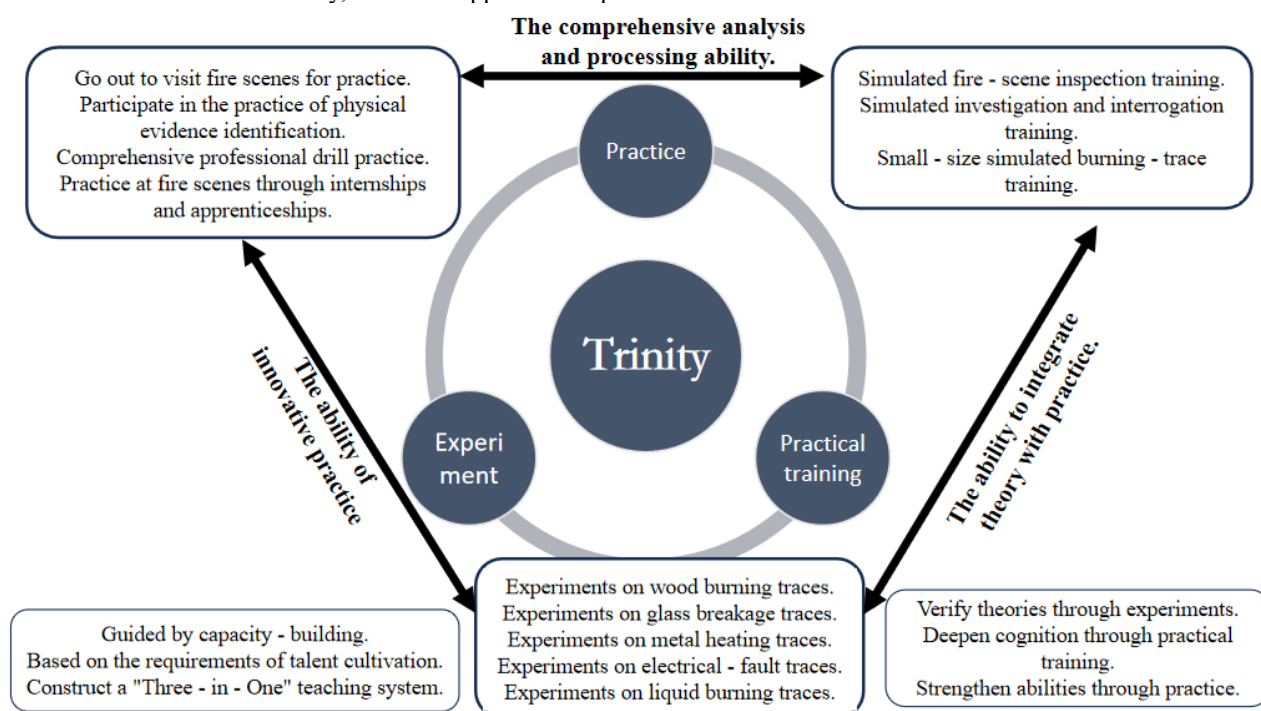


Fig 3. A research content diagram of constructing a "Three - in - One" fire investigation experimental and practical teaching system oriented by abilities

4. Summary

Guided by job - related capabilities, break the single construction mode of traditional experimental teaching, and construct a design framework integrating experiment, practical training, and practice as a "Three - in - One" entity. It focuses on starting from actual combat, strengthening the understanding of basic theories, deepening the cognition of real - life fire scenes, and focusing on the needs of job - related capabilities. It can effectively improve students' comprehensive capabilities in fire investigation, promote the actual teaching capabilities and knowledge reserves of teaching faculty, improve important aspects of talent cultivation, and strengthen specialty and curriculum construction. Meanwhile, it can promote the rapid development of the entire discipline of fire accident investigation, from undergraduate to postgraduate cultivation, and facilitate the improvement of the discipline's cultivation levels.

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