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Construction and Implementation Path of "Fire Engineering" Course Ideology and Political Teaching Model

Ying Song[1], Junwei Shi[1], Daxin Ren[2,*], Yuhuan Yin[1]

[1]College of Management Science and Engineering, Shandong Technology and Business University, Yantai, Shandong 264005, China
[2]School of Modern Service Management, Shandong Youth University of Political Science, Jinan, Shandong 250100, China
**Corresponding author*

Abstract: *In order to comprehensively implement the fundamental tasks of cultivating morality and talents in universities, and promote the harmonious development of students' ideological and political education and professional education, this study takes the course of "Fire Engineering" as an example to explore how to integrate ideological and political education into professional course teaching, and analyze the connection between professional core courses and ideological and political education. The course is based on the registered fire engineer exam outline to construct a course framework system, connecting the course teaching content with ideological and political elements, and integrating it into the "scaffolding+BOPPPS" integrated fire engineering course teaching mode .Through the full process rain classroom and modern information technology teaching methods such as Pyrosim simulation software, the ideological and political construction of the "Fire Engineering" course is fully implemented, promoting new achievements in ideological and political education of the course.*

Keywords: *Fire Engineering; Course ideological and political; Scaffolding; BOPPPS; Ideological and political elements*

1. Introduction

The 2016 National Conference on ideological and political work in colleges and universities pointed out that ideological and political work in universities was related to the fundamental issue of what kind of people universities cultivate, how to cultivate people, and for whom to cultivate people. We must adhere to the central link of cultivating morality and talents, and integrate ideological and political work throughout the entire process of education and teaching, achieving full and all-round education, and striving to create a new situation for the development of higher education in China. At the same time, it was pointed out that in order to make good use of the main channel of classroom teaching, the course of ideological and political theory should be strengthened in the course of improvement, and the affinity and pertinence of ideological and political education should be enhanced to meet the needs and expectations of students' growth and development, and other courses should maintain a good channel and cultivate a good field of responsibility, so that various courses and ideological and political theory courses can go hand in hand and form a synergistic effect [1]. In 2020, the Ministry of Education issued the “Guidelines for ideological and political development of the course in colleges and universities”, which clearly defined the overall objectives and key contents of the ideological and political development of the course, and comprehensively promoted the ideological and political development of the course in colleges and universities [1]. This puts forward higher requirements for integrating ideological and political education into the teaching of engineering major courses. It is necessary to combine knowledge and skills learning with ideological and political education, ultimately achieving the goal of harmonious development of knowledge literacy and ideological and political quality, and walking in the same direction.

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2. Fire Engineering Course Ideological and Political Education Model Construction

2.1 Course Analysis

Fire Engineering is a compulsory professional course for the safety engineering major, which is a comprehensive course to explore the fire law and study the theory and technology of fire prevention and control. The textbook covers a wide range of knowledge, has strong theoretical significance, involves multiple aspects, and has certain difficulties. The course aims to familiarize students with the system structure and working principles of building fire protection systems, master the basic theories and methods of designing and analyzing building fire protection systems, develop certain engineering practical abilities in fire protection design and management through various teaching links, and cultivate fire protection and safety professional technical talents who can adapt to on-site technical work.At the same time, it lays a theoretical foundation for students to successfully pass the registered fire engineer exam after graduation. Usually, the study of professional courses focuses on professional knowledge and technical abilities, neglecting moral education content such as ideological and political education, legal concepts, social responsibility, and humanistic spirit.

2.2 Construction of Course Ideological and Political Teaching Model

Exploring an effective path for the goal of course construction that combines knowledge transmission, ability cultivation, and value guidance, using "course ideology and politics" as the carrier. By exploring the ideological and political education elements in the fire engineering course, the implicit educational function of the "Fire Engineering" course is exerted, so that ideological and political theory education is coordinated and synchronized with professional education, complementing each other, and truly achieving all-round, all-process, and all-staff three-dimensional education in the main channel of classroom teaching.

a) The course is closely integrated with the current registered fire engineer exam outline, constructing a course framework system, and cultivating students' ability to connect theory with practice with a professionalization oriented approach.

b) The course is based on constructivist theory, fully exploring the ideological and political education elements contained in the course itself, and constructing a scaffolding teaching design for fire engineering course.

c) The course combines the rain classroom and "BOPPPS" to effectively organize the teaching practice of fire engineering course.

d) The course utilizes information technology to promote the construction of smart firefighting classrooms and comprehensively enhance students' practical application abilities.

(1) Building a Course Unit Knowledge System Based on the Examination Outline of Registered Fire Engineers

The fire engineering course is the main content of the "Fire Safety Technology Practice" in the national registered fire engineer professional qualification exam. In the course of teaching, the key points and difficulties of fire engineering teaching were determined by the examination outline of registered fire engineer, and the support system of course unit was constructed [2]. The teaching content of fire engineering was divided into 3 knowledge modules: basic knowledge of fire, general building fire protection and building fire protection facilities, and 13 teaching knowledge units. The basic knowledge of fire was divided into two teaching units: Combustion and fire. The general building fire prevention was divided into 6 teaching units, which were building classification and fireproof grade, general layout, fire prevention and smoke prevention zone, safety evacuation, building decoration fireproof material, fire fighting and rescue facilities. Building fire facilities were divided into 5 teaching units, which were indoor and outdoor fire water supply system, automatic sprinkler system, automatic fire alarm system, smoke control and exhaust system, building fire extinguisher configuration.

(2) Integrating ideological and political elements into the scaffolding teaching design of fire engineering course

Constructivism, also known as structuralism, holds that knowledge is not passively accepted by cognitive subjects, but rather an active process of construction. Through the guidance of teachers and the help of partners, learners combine their existing learning foundation, gradually establish a system for recognizing new knowledge through absorption, construction, and internalization processes [3]. The

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course content seeks to explore the "touchpoints" and "fusion points" of moral education elements related to socialist core values, professional ethics, learning ethics, national sentiment, international perspective, innovative thinking, craftsmanship spirit, humanistic sentiment, etc. Through the design and application of teaching materials such as typical cases, the correct value pursuit, ideal beliefs, and national sentiment are effectively conveyed to students in a "moistening and silent" way. The course can be designed in conjunction with the ideological and political elements in Table 1.

Table 1 Integration Points of Ideological and Political Elements in the Course

Ideological and political themes		**The content of ideological and political integration in fire engineering courses**
High quality connotation	Patriotic sentiment	Love the motherland; love the people; love the hometown; love the school. Road Confidence; Theory Confidence; System Confidence; Culture Confidence. Political consciousness; Overall situation consciousness; Core consciousness; Alignment consciousness. National spirit; Era spirit,etc.
	International Perspective	A community with a shared future of mankind; World Culture and Global Issues; Openness and Respect; Communication and Collaboration; Morality and responsibility, etc.
	Innovative thinking	Responsibility and Mission; Personal growth and dedication; Social integrity awareness; Inheritance and Innovation
	Craftsmanship spirit	Dedicated to work; Dedication; Striving for excellence; Patriotic for the people, etc.
Graduation Requirements for Non Technical Factors of Professional Certification	Engineering and Society	Students are familiar with the laws, regulations, culture, and other knowledge of fire engineering. They can correctly understand their social responsibility. They can apply professional knowledge in fire engineering to evaluate the impact of engineering practice and implementation on society, environment, health, law, and culture.
	Environment and Sustainable Development	Students can understand knowledge related to environmental and social sustainable development, analyze the impact of fire engineering on environmental and social sustainable development, and make reasonable evaluations.
	Professional norms	Students should have a strong sense of professional ethics and social responsibility, have a legal awareness when applying fire protection knowledge to solve practical problems, and fulfill corresponding responsibilities and obligations.
	Individuals and Teams	Students are able to assume the roles of individuals, team members, and leaders in teams with a multidisciplinary background.
	Communication	Students are able to effectively communicate and exchange with peers and the public on fire engineering issues, including writing reports and design drafts, presenting speeches, expressing themselves clearly or interacting with each other. They have a certain international perspective and the ability to communicate and exchange in cross-cultural contexts.
	Project management	Students can possess basic abilities in project management and economic decision-making, and can conduct fire engineering management, design, and evaluation in various industry production activities.
	Lifelong learning	Students can have the awareness of autonomous learning and lifelong learning, and have the ability to continuously learn and adapt to development.

(3) Integrating Rain Classroom and "BOPPPS" Teaching Mode into Classroom Teaching

The pre-class coursewares with MOOC video, exercise and voice were pushed to students' mobile phone by using Rain Classroom. Real time question answering and bullet screen interaction were conducted in the classroom. Rain Classroom can cover every teaching link from pre-class to in class and after class, maximizing the energy of teaching and learning, and promoting teaching reform. In teaching design, the Bridge-in, Objective, Pre-assessment, participatory, Post- assessment, and Summary of "BOPPPS" should be flexibly integrated into the knowledge teaching of each class. At the same time, through effective interaction (teaching appointments, brainstorming, problem-oriented learning, fish tank teaching, etc.), students' enthusiasm for learning was fully adjusted, students' participation was enhanced and teacher-student interaction was enhanced in participatory learning. And the change of teaching form was adapt to the diversified teaching objectives, and their own to re-examine teaching, constantly improve teaching skills, enhance their confidence in teaching, and ultimately to achieve the effect of promoting students' learning[4].

(4) Promoting the establishment of a smart firefighting classroom through information technology

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Modern information-based teaching methods, such as Pathfinder and Pyrosim, enter the classroom to simulate fire smoke and personnel evacuation, continuously improve students' practical application abilities, and achieve a student-centered three-dimensional education of "cognition+skills+emotions" in all aspects.

3. Design of Ideological and Political Education for the Course of Fire Engineering

Based on constructivist theory and guided by the exam outline for registered fire engineers, a scaffolding fire engineering ideological and political classroom teaching design combining rain classroom and BOPPPS teaching mode was shown in Figure 1 [2].

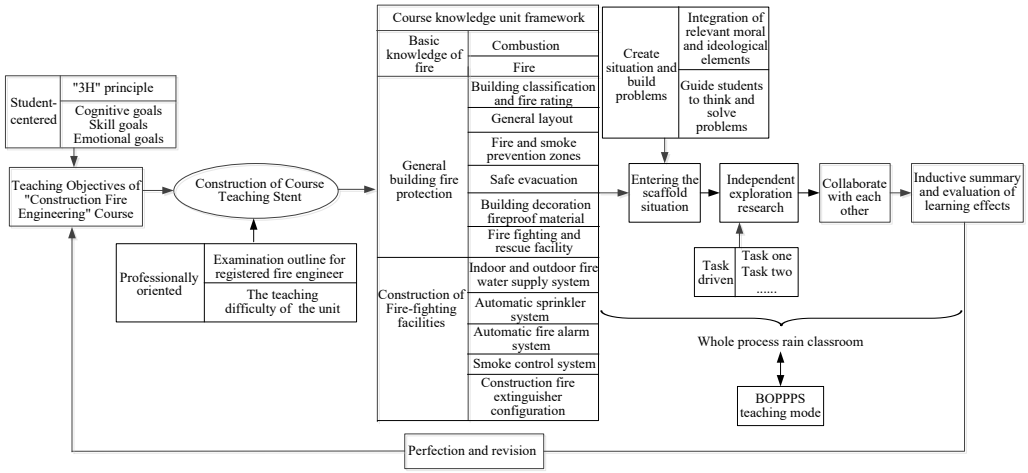

Figure 1 Design of ideological and political classroom teaching for fire engineering

During the teaching process, teachers should take students' cognition as the main body, provide a simulated situation by building scaffolding, integrate ideological and political elements such as ideal beliefs, value orientations, political beliefs, and social responsibilities, and combine scaffolding teaching and BOPPPS teaching mode to guide students to correctly combine and apply the relevant knowledge learned in a specific situation, promote students' creative thinking development, and improve their ideological and moral qualities and emotional intelligence abilities.The teaching design of fire engineering scaffolding combined with BOPPPS teaching mode is shown in Figure 2[4]. The following will combine the teaching content of fire engineering with examples to illustrate the integration points with ideological and political elements[5-9], as shown in Table 2.

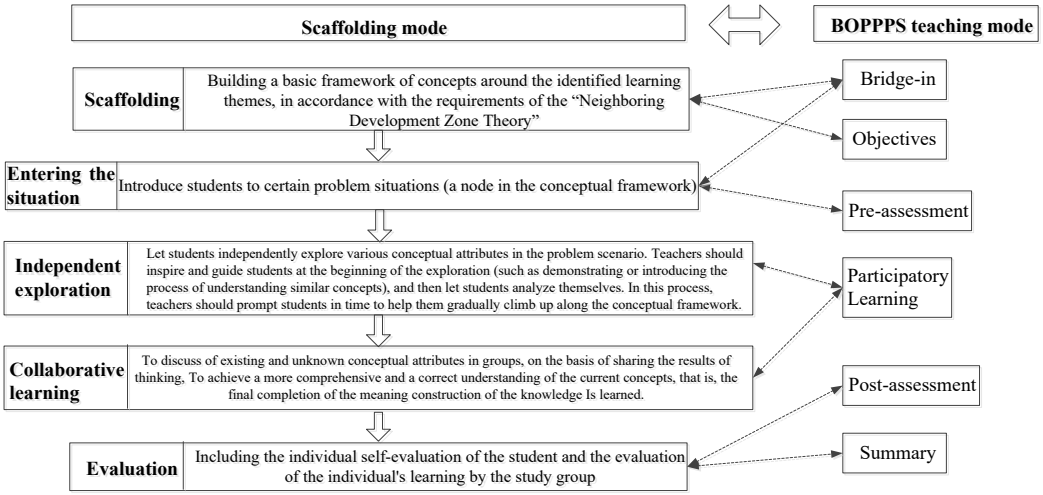

Figure 2 Teaching design of building fire engineering with the scaffolding and BOPPPS teaching mode

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Table 2 Integration points of ideological and political elements in the teaching knowledge unit of fire engineering

Teaching unit	Teaching ontent	Integration points of ideological and political elements
Basic knowledge of fire	Fire knowledge	Through the introduction of fire accident cases, to attract students' attention, cause students to think about the severity of building fire and the importance of fire prevention, and guide students to realize as a fire safety person, we should feel great responsibility and cultivate students' professional pride and sense of responsibility.
	Combustion knowledge	Introducing Lavoisier to overthrow the theory of phlogiston, he discovered the presence of oxygen in combustion, enabling people to grasp the laws of combustion and take measures to avoid and extinguish fires. Guide students to establish a scientific research spirit.
	The Mechanism and Approach of Building Fire Spread	By watching the video of Wanda Plaza fire inspiration and fire escape and self-rescue methods, cultivate students' emergency response ability and master escape skills during fires.
		Through Pyrosim simulation of smoke spread training, improve students' ability to integrate theory with practice and cultivate certain scientific research abilities.
Automatic sprinkler system	Design of Automatic Sprinkler Fire Extinguishing System	Guide students to learn how to use norms and integrate ideas such as "abiding by laws and regulations", "integrating theory with practice", and "testing true knowledge through practice".
		Emphasize that there should be no "design blind spots" in the process of nozzle layout, cultivate students to establish the concept of "fire prevention is no small matter, responsibility is as heavy as a mountain", and establish risk awareness, responsibility awareness, and safety awareness.
		Collaborate in groups to complete design tasks, guide students to maintain a style of integrating theory with practice and integrating knowledge and action, cultivate students' team spirit and the spirit of "loving labor" and "meticulous" craftsmanship.
Automatic fire alarm system	Overview of Automatic Fire Alarm System	A case study on the successful application of an automatic fire alarm system in an underground garage in Beijing to prevent fire accidents. The introduction of an automatic fire alarm system is of great significance for early detection and reporting of fires, reminding students to improve fire awareness, ensure fire safety, and establish the concept of "fire safety, everyone's responsibility".
	Fire linkage control mechanism of automatic fire alarm system	Through video animation demonstrations, students are familiarized with the working principle of the automatic fire alarm system, guided to maintain the connection between theory and practice, establish the concept of "going deep into the scene", and guide them to practice the spirit of craftsmanship in real engineering environments.

4. Feedback on the Learning of Fire Engineering Course

Student classroom feedback has important reference value for the evaluation results of teaching curriculum reform. Based on the feedback from the two classes of Safety Level 19 in the 2022-2023 semesters, most students expressed that this teaching mode can improve their classroom enthusiasm and enhance the classroom atmosphere. By integrating ideological and political elements into carefully designed scaffolding and BOPPPS teaching designs, and utilizing the Rain Classroom platform to showcase, the entire teaching process was clear and smooth, and new knowledge could be clearly and effectively conveyed to students. Teachers could also provide timely feedback on students' learning status and mastery of knowledge points through data, which can effectively improve students' learning efficiency and achieve good teaching results.

5. Conclusion

By fully tapping into the ideological and political education resources contained in the professional course of Fire Engineering, we can transform disciplinary and academic resources into educational resources, and integrate socialist core values into the entire process of teaching and educating people. Only when students truly feel the " Temperature" of their professional courses, they will have more motivation to learn this major well and warm up more people, which can also have a better effect of "moistening things silently".

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