

Development Practice of Fire and Explosion Prevention Course

Yu Hao^{1,*}

¹Science and Technology Department, Chongqing Vocational Institute of Engineering
Chongqing, Chongqing, CO 402260, China

* Corresponding author: Yu Hao (Email: 4453189@qq.com)

Abstract

Using the systematic paradigm of work processes as theoretical guidance, combined with the professional talent training objectives, course standards, and typical enterprise work tasks of the vocational college "Fire and Explosion Prevention" course, the course is developed and practiced, and teaching materials are redesigned. By implementing six steps, determine the typical work tasks for the complete occupational workflow of fire and explosion prevention related positions in vocational colleges; Develop action area content in the field of fire and explosion prevention, analyze learning areas, transform learning areas into courses, determine course objectives, select course content, and design course evaluations. This approach can improve the pertinence and practicality of the curriculum, enabling vocational fire and explosion prevention courses to better meet the needs of enterprises and cultivate technical talents that better meet market demands.

Keywords

Development of fire and explosion prevention courses; typical work tasks; induction of action areas; analysis of learning areas; course evaluation.

1. Introduction

Currently, vocational education in China is facing both opportunities and challenges for transformation and development. The introduction of policy documents such as the Implementation Plan for National Vocational Education Reform marks a new stage of high-quality development for vocational education in China. In this context, the focus of vocational education quality evaluation will inevitably change, shifting from highlighting the educational elements of vocational education scale and extension to highlighting the student learning quality of vocational education quality and connotation. This means that the development and practice of vocational education courses need to pay more attention to the cultivation of students' practical operational abilities and professional qualities, in order to meet the demand of society for high-quality technical and skilled talents[1-2].

However, the existing fire and explosion prevention courses in secondary vocational schools often have problems such as outdated content, single teaching methods, and weak practical links, which are difficult to meet the actual needs of enterprises for fire and explosion prevention professionals. In addition, the disconnect between course content and the actual work processes of enterprises also makes it difficult for students to quickly adapt to job positions after graduation, which affects the effectiveness of vocational education and the quality of students' employment[3-4].

Taking the systematic paradigm of work processes as theoretical guidance, combined with the professional talent training objectives, course standards, and typical work tasks of enterprises in the vocational college "Fire and Explosion Prevention" course, the course is developed and practiced, and teaching materials are redesigned. This approach can improve the pertinence and practicality of the curriculum, enabling vocational fire and explosion prevention courses to

better meet the needs of enterprises and cultivate technical talents that better meet market demands[5-7].

2. Typical Work Tasks

Section 1 Typical Work Tasks

Based on the search results, we can identify several typical job tasks that cover the complete occupational work process of fire and explosion prevention related positions in higher vocational schools, including the six steps of "information decision-making planning implementation inspection evaluation"[8-9]. Taking the identification of fire and explosion prevention risks in the main operations of gas stations as an example:

- (1) Information: Collect laws, regulations, and operating procedures related to gas stations, understand the basic situation of the workplace, and be familiar with the process flow and equipment facilities.
- (2) Decision: Based on the collected information, evaluate the fire and explosion prevention risks of gas stations.
- (3) Plan: Develop fire and explosion prevention technical measures, including fire prevention design for buildings and floor plans, and configuration of fire-fighting facilities.
- (4) Implementation: Implement process fire and explosion prevention measures, such as refueling, unloading, etc., and cultivate emergency response capabilities.
- (5) Inspection: Check the implementation of fire and explosion prevention measures.
- (6) Assessment: Evaluate the effectiveness of accident management and emergency response.

3. Summary of Action Areas

Based on the information and table format you provided, we can develop an action area content for fire and explosion prevention, which can be used in teaching and curriculum design by higher vocational schools[10]. The following are the action areas in the field of fire and explosion prevention:

Training on fire and explosion prevention knowledge, operating procedures and production management, equipment inspection and maintenance, emergency response to fire and explosion prevention, formulation and implementation of fire safety regulations, maintenance and management of fire-fighting facilities and equipment, fire inspection and hidden danger rectification, safety evacuation and fire drills, management of flammable and explosive dangerous goods, identification of fire and explosion prevention facilities

These tasks cover the main work contents of the fire and explosion prevention industry, including training, production management, equipment maintenance, emergency management, formulation and implementation of fire safety regulations, maintenance and management of fire-fighting facilities, fire inspection and hazard rectification, safety evacuation and drills, and management of flammable and explosive materials, aiming to ensure production safety and the safety of personnel life and property. See Table 1 for details[11].

4. Analysis of Learning Fields

(1) Transforming learning domains into courses

Conduct research on actual job positions related to fire and explosion prevention, and combine the actual situation of vocational school courses obtained through investigation to reconstruct fire and explosion prevention courses into a new learning domain. The research scope has been determined for the premises, tools, and equipment of higher vocational schools, and these

scopes have been used as the basis for exploring the various connections between the "Fire and Explosion Prevention" course and practical work requirements.

The workload of the course "Fire and Explosion Prevention" mainly focuses on the maintenance and management writing of fire and explosion prevention, and its difficulty and workload are relatively small. Therefore, the course is divided into 4 classes per week, with a total of 36 class hours. To apply these work tasks to the classroom, it is necessary to transform them into actionable processes.

By providing scientific teaching to students in vocational schools, they can continuously develop towards higher levels. Understand the general laws of career development, divide learning and work into four different levels of Difficulty, and provide students with appropriate opportunities to help them transition from beginners to experts, and achieve a smooth transition between simple and complex tasks.

(2) Determine course objectives

To determine the course objectives, the primary task is to understand and know what the corresponding course learning objectives are. In this way, it is necessary to summarize and generalize them according to the typical job tasks, job responsibilities, and project requirements of specific positions, in order to meet the needs of higher vocational schools.

Specifically, the course objectives mainly include: mastering sufficient and solid operating methods for fire and explosion prevention equipment, basic knowledge of fire and explosion prevention and theory, and being able to comprehensively apply relevant knowledge to select equipment according to different application scenarios.

5. Course content and Evaluation

5.1. Select Course content

The Based on the above situation, the corresponding teaching content in the course has been streamlined and optimized, and an analysis and evaluation have been conducted in combination with the existing equipment and specific teaching level of vocational schools. Starting from the perspective of adapting the course to the teaching content, the teaching process has been redesigned, and the learning tools and task requirements corresponding to the course content have been classified accordingly[13-14].

Choosing the most basic job content to assist in developing courses for higher vocational schools is consistent with students' cognitive patterns and the actual work scenarios of enterprises [92]. In order to make the learning requirements in line with the actual work requirements of the enterprise, the various parts of the learning content have been refined, and targeted basic requirements have been proposed, which aim to help students better understand and master the course content

5.2. Course content and Evaluation

In the process of evaluation, it should be carried out from the aspects of the development of the evaluation object, the diversity of evaluation indicators, the diversity of evaluation methods, and the comprehensiveness of the evaluation subject. Evaluation focuses on process evaluation, which evaluates students' learning behavior as a whole to ensure their academic performance in the classroom[14-15].

The main evaluation method is process evaluation, supplemented by outcome evaluation. Its focus is on a comprehensive evaluation of learners' learning motivation, learning process, learning outcomes, and non intellectual factors that play an important role in teaching, with a greater emphasis on students' developmental abilities.

The evaluation scale consists of self-evaluation form, group peer evaluation form, teacher evaluation form, and business evaluation form. Due to the difficulty for vocational school students to objectively evaluate themselves, there are 10% of student evaluations, 20% of team evaluations, 35% of teacher evaluations, and 35% of enterprise evaluations.

1. Self evaluation

The autonomous learning ability of students refers to their comprehensive abilities in terms of their own learning ability, work ability, cognitive ability, and other aspects. When formulating evaluation criteria, emphasis should be placed on incorporating evaluation indices for students' learning progress, such as their pre class learning situation, familiarity with the operation process of fire and explosion prevention equipment, installation and commissioning of fire and explosion prevention systems, and cooperation within the group.

The design part of this self-evaluation takes a comprehensive score of 100 points, and each grading indicator has corresponding different scores, with a focus on scoring for fire and explosion prevention software and hardware operations and comprehensive joint debugging. The former focuses on acquiring methods, while the latter focuses on cultivating skills. Both score indicators are 10 points, as shown in Table 1.

Table 1. School Self-Evaluation

Serial Number	Evaluation Item	Score Value
1	Preparatory work for independently carrying out technical projects	15
2	Clearly list the workflow for fire and explosion prevention	5
3	Master the operation of fire and explosion prevention equipment	10
4	Technical safety in teacher demonstration and student practice	10
5	Connect and debug fire and explosion prevention equipment independently or in groups	10
6	Summarize technological achievements and discuss and exchange ideas with surrounding classmates	10
7	Present the results as a report material and give a speech	10
8	Assist other students with slower progress in completing technical projects	10
9	Participate in the rectification of equipment and cleaning of workstation parts and equipment	20
10	Total	100

6. Conclusion

The manuscript should include a conclusion. Guided by the systematic paradigm of work processes, combined with the professional talent training objectives of the "Fire and Explosion

Prevention" course, develop and practice the course, and redesign teaching materials. The specific conclusion is as follows:

- (1) Taking the identification of fire and explosion prevention risks in the main operations of gas stations as an example, typical job tasks for the complete occupational work process of relevant positions are determined through the implementation of six steps;
- (2) Based on the information and table format you provided, we can develop an action area for fire and explosion prevention;
- (3) Established the content of learning domain analysis, including transforming learning domains into courses, developing action domain content in the field of fire and explosion prevention, determining course objectives, and selecting course content,
- (4) Designed and graded courses on fire and explosion prevention, and provided feedback on previous research findings.

Acknowledgment

This work was supported by a grant from Chongqing Vocational Education Teaching Reform Research Project(grant numbers GZ223105).

References

- [1] G. Spöttl, G. Loose, and M. Becker, Work-process based development of advanced detailed curricula,"in Work-Process Based Development of Advanced Detailed Curricula, Frankfurt am Main: Peter Lang, 2020, pp. 1-10.
- [2] G.Spöttl, G. Loose, and M. Becker, "Detailed curricula based on work-processes: The need for updating the conventional approach for developing curricula in TVET," in Development, Implementation and Evaluation of Curricula in Nursing and Midwifery Education, I. Darmann-Finck and K. Reiber, Eds. Cham: Springer, 2021, pp. 23-40.
- [3] N. Boreham and M. Fischer, "The mutual shaping of work, vocational competence and work-process knowledge," in International Handbook of Education for the Changing World of Work, R. Maclean and D. N. Wilson, Eds. Bonn: Springer, 2009, pp. 1593-1610.
- [4] W.Kruse,"Von der Notwendigkeit des Arbeitsprozesswissens,"in Bildung für eine menschliche Zukunft, J. Schweitzer, Ed. Weinheim, Munich: Juventa, 1986, pp. 188-193.
- [5] H. Hiim,"Ensuring curriculum relevance in vocational education and training: Epistemological perspectives in a curriculum research project," Int. J. Res. Vocat. Educ. Train., vol. 1, no. 4, pp. 1-19, 2017.
- [6] J.Lave and E. Wenger, Situated Learning: Legitimate Peripheral Participation. New York, Cambridge: Cambridge University Press, 1991.
- [7] G. Spöttl and G. Loose, "Transformation and globalization in technical, vocational education and training—which way should TVET take?" Int. J. Vocat. Educ. Train., vol. 2, no. 23, pp. 28-45, 2015.
- [8] K.Schwab, The Fourth Industrial Revolution. Geneva: PENGUIN, 2017.
- [9] M. Becker,"Didaktik und Methodik der schulischen Berufsbildung," in Handbuch Berufsbildung, R. Arnold, A. Lipsmeier, and M. Rohs, Eds. Wiesbaden: Springer Fachmedien, 2020, pp. 367-385.
- [10] L. Reetz and W. Seyd, "Curriculare Strukturen beruflicher Bildung," in Handbuch der Berufsbildung, R. Arnold and A. Lipsmeier, Eds. Opladen: Leske+Budrich, 1995, pp. 203-219.

- [11] I. Darmann-Finck and K. Sahmel, "Curriculumtheorie, Curriculumentwicklung und Curriculumforschung in den Gesundheitsfachberufen," in *PÄDAGOGIK Pflege - Therapie - Gesundheit*, I. Darmann-Finck and K. Sahmel, Eds. Heidelberg: Springer, 2021.
- [12] L. Stenhouse, *An Introduction to Curriculum Research and Development*. London: Heinemann, 1975.
- [13] W. R. Scott, *Institutions and Organizations: Ideas and Interest*, 3rd ed. Los Angeles, CA: Sage, 2008. C. Kricheldorf, *Partizipative Curriculumentwicklung—ein neuer didaktischer Ansatz*, Freiburg: Katholische Fachhochschule, 2006.
- [14] H. L. Dreyfus, S. E. Dreyfus, *Mind Over Machine: The Power of Human Intuition and Experience in the Era of the Computer*. New York: Free Press, 1986.
- [15] G. Spöttl, *Work-process analyses—an essential tool for qualification and curriculum research*, in *Re-engineering dual training—the Malaysian experience*, G. Loose, G. Spöttl, and M. Yusoff, Eds. Frankfurt am Main: Peter Lang, 2008, pp. 105–126