

Research on Fire Engineering Post Competency under the Spirit of Craftsmanship

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Abstract

In order to optimize the personnel training program of fire protection engineering, improve the personnel training system of fire protection engineering, fully implement the leading role of "craftsmanship" in the personnel training of colleges and universities, and improve the job competence of fire protection engineering professionals, the article conducted a questionnaire survey on past graduates of fire protection engineering, personnel engaged in fire protection engineering-related work and students studying in fire protection engineering. The article conducted a questionnaire survey on past graduates of fire protection engineering, personnel engaged in fire protection engineering and students studying in fire protection engineering. The article conducted a preliminary study on the construction of fire engineering job competency model under the spirit of craftsmanship through questionnaire survey method and statistical analysis method, and adopted the principal component analysis method to screen the indicators, and carried out maximum variance orthogonal rotation on the screened principal components to extract the characteristic elements of fire engineering job competency, and finally obtained two principal components of fire engineering job competency, namely basic knowledge ability and professional knowledge ability, for the future This will provide reference and borrowing for the construction of fire engineering job competency model and the optimization of fire engineering personnel training program.

Keywords

Fire protection engineering; Job competency; Questionnaire method; Principal component analysis.

1. Introduction

With the rapid development of China's science and technology and economy, the overall security of the country has become particularly important, and fire safety, as a key part of the overall security of the country, is an indispensable guarantee for the country to achieve the goal of two hundred years. The national and social emphasis on the safety of life and property and the expectation of new firefighting technology make the requirements for talents in the field of firefighting engineering increasing, and the modern firefighting talents with compound, practical, high-skilled and innovative ability are more in line with the needs of today's society. In order to optimize and improve the training system of fire protection engineering professionals, the leading role of "craftsmanship" in the training of talents in colleges and universities should be fully implemented. In essence, "craftsmanship" is a kind of professional spirit, which is the embodiment of professional ethics, professional ability and professional quality, and is a kind of professional value orientation and behavior performance of practitioners. The basic connotation of "craftsmanship" includes the content of dedication, excellence, concentration and innovation[1]. As one of the spirits of the times advocated by the state in recent years, craftsmanship is deeply rooted in people's hearts with the characteristics of truthfulness, pragmatism and meticulousness, and it is beneficial to the cultivation of talents in colleges and universities to integrate craftsmanship into the ideological education work of

colleges and universities[2]. In order to better optimize the training plan of fire protection engineering professionals, improve the training system of fire protection engineering professionals, enhance the abilities of fire protection engineering professionals in all aspects, and cultivate fire protection engineering professionals with craftsmanship spirit, the article applies the questionnaire survey method to conduct a preliminary study on the construction of fire protection engineering job competency model under the craftsmanship spirit.

2. Methodology and Content

2.1. Survey Methodology

The questionnaire method is one of the most commonly used research methods in survey research, and it has an extremely wide application in data collection for modern research[3]. It is a method in which the researcher collects reliable information by measuring the problem under study with this controlled measurement. The method saves time, money and manpower; the results are easy to quantify as well as to count and analyze; it is convenient to conduct large-scale surveys and is not affected by changes in the researcher. In order to ensure the objectivity and representativeness of the data, the survey sample was mainly selected from past graduates of fire engineering, people engaged in fire engineering-related industries, and students studying in fire engineering. A total of 200 valid questionnaires were collected from this survey.

2.2. Survey Content

The content of this survey is determined by reading and combing relevant literature and combining the current key concerns of teachers and students in fire protection engineering. The content mainly includes fire protection professional knowledge, enterprise knowledge, organization and coordination ability, communication ability, information collection ability, innovation ability, fire protection drawing design ability, fire protection drawing review ability, fire protection equipment testing ability, fire protection equipment maintenance ability, basic office software use skill, foreign language skill, fire protection design software use skill, etc. Each item corresponds to four options, and the four options are assigned the following values: "very important" (4 points), "important" (3 points), "general" (2 points), "not important" (1 point), "not important" (1 point), "not important" (1 point). "not important" (1 point).

2.3. Questionnaire Reliability

To ensure the reliability of this questionnaire, the reliability of the questionnaire was tested. (Reliability refers to the consistency, stability and reliability of the test results, and is generally expressed in terms of the internal consistency of the test.) The reliability of the questionnaire is tested using Cronbach's alpha reliability coefficient, which is an important technical indicator of the questionnaire. Generally speaking, if the alpha reliability coefficient is above 0.9, the questionnaire has good reliability; if the alpha reliability coefficient is above 0.8, the questionnaire is acceptable; if the alpha reliability coefficient is above 0.7, the questionnaire should be modified; if the alpha reliability coefficient is below 0.7, the questionnaire needs to be redesigned. The alpha reliability coefficient value of this questionnaire is 0.978, which is greater than 0.9, indicating that this questionnaire has high credibility.

3. Statistical Analysis

In this study, the data obtained from the survey were entered into Excel, and SPSS 21.0 statistical software was selected to analyze the data.

3.1. Principal Component Exploratory Analysis

The KOM and Bartlett's sphericity test are methods used in principal component analysis to perform correlation tests between variables. The KMO test and Bartlett's sphericity test are performed on the statistic to be subjected to principal component analysis, and based on the results of the tests, the suitability of the statistic for principal component analysis can be determined[4]. The statistician Kaiser gave the criteria for determining the suitability for principal component (factor) analysis using KOM values: $0.9 < \text{KOM}$, very suitable; $0.8 < \text{KOM} < 0.9$, suitable; $0.7 < \text{KOM} < 0.8$, fair; $0.6 < \text{KOM} < 0.7$, not very suitable; $\text{KOM} < 0.6$, not suitable. After KMO and Bartlett's test, the results of this test showed that a KOM value of 0.908 is very suitable for principal component analysis.

3.2. Principal Component Analysis

Principal component analysis is mainly used for dimensionality reduction of the data set, the original multiple variables have a certain correlation between the data set, through statistical methods, while retaining the basic information of the original data, the original multiple data into a significantly reduced number, no correlation between the new representative variables. In general questionnaires, especially in the production of questionnaires for specific areas, it is often necessary to investigate more than a dozen or even dozens of questions, due to the existence of more or less correlation between different question score indicators, which makes the original research problem is not simple and not easy to interpret. Therefore, the method of principal component analysis is needed to simplify the score indicators of multiple items with certain correlation into a very small number of uncorrelated composite indicators. The more the absolute value of the correlation coefficient between the original variables tends to 1, the better the effect of principal component analysis. The use of principal component analysis greatly reduces the computational volume and complexity of the problem, and is widely used in the research of model construction.

The analysis covered includes fire protection professional knowledge, enterprise knowledge, organization and coordination ability, communication ability, information collection ability, pioneering and innovative ability, fire protection drawing design ability, fire protection drawing audit ability, fire protection equipment testing ability, fire protection equipment maintenance ability, basic office software use skills, foreign language skills, fire protection design software use skills, teamwork spirit, pressure tolerance 15 items Specific content. The principal components of these 15 specific competencies were extracted, and under the requirement of large eigenvalue of 1, a total of 2 principal components meeting the requirement were extracted, and the rest of the principal components had eigenvalues less than 1. These 2 principal component loadings covered a total of 84.924% of the entire factor information, which basically reflected the overall situation of the data.

Using principal component analysis, the specific factors covered by each principal component were analyzed, as shown in Table 1. from Table 1, it can be seen that the first principal component covers seven competency characteristics of fire protection expertise, enterprise knowledge, communication ability, information gathering ability, pioneering and innovative ability, foreign language skills, and teamwork spirit, and the second principal component covers organizational and coordination ability, fire protection drawing design ability, fire protection drawing review ability, fire protection equipment The second principal component covers organizational and coordination ability, fire protection drawing design ability, fire protection drawing review ability, fire protection equipment testing ability, fire protection equipment maintenance ability, basic office software use skill, fire protection design software use skill, and stress tolerance ability.

(Orthogonal rotation method: also known as variance maximum rotation method, is a rotation method that minimizes the number of variables with the highest loadings on each factor, which simplifies the interpretation of the factors.)

Table 1. Table of results of orthogonal rotation method

	Ingredients	
	1	2
Firefighting expertise	.756	.518
Corporate Knowledge	.867	.435
Organizational and coordination skills	.636	.677
Communication skills	.722	.560
Information gathering capability	.665	.576
Pioneering and innovative ability	.690	.638
Fire drawing design capability	.652	.675
Fire plan audit capability	.601	.746
Fire equipment testing capability	.645	.676
Firefighting equipment maintenance capabilities	.656	.682
Basic office software usage skills	.197	.938
Foreign Language Skills	.834	.274
Firefighting equipment maintenance capabilities	.504	.741
Teamwork spirit	.852	.153
Stress tolerance	.230	.863

Extraction method: principal components.

Rotation method: Orthogonal rotation method with Kaiser standardization.

a. The rotation converges after 3 iterations.

3.3. Conclusion

Further analysis revealed that the competency characteristics covered by each principal component were, except for a few, in the same level of entries in the original questionnaire. Under the condition that the connotation of each principal component remains largely unchanged, the factors covered by them are appropriately adjusted, and the adjusted principal components are named as basic knowledge competency and professional knowledge competency. The factors of the principal component of basic knowledge ability include enterprise knowledge, organization and coordination ability, communication ability, information gathering ability, innovation ability, foreign language skill, teamwork spirit, stress tolerance ability, and basic office software skill. The factors of the principal component of professional knowledge ability include fire protection expertise, fire protection drawing design ability, fire protection drawing review ability, fire protection equipment testing ability, fire protection equipment maintenance ability, and fire protection design software using skills. The details are shown in Table 2.

Table 2. Extraction results of fire engineering job competency features

Principal Components	Dependent Variables	Factor correlation coefficient
Basic knowledge and ability	Corporate Knowledge	0.867
	Organizational and coordination skills	0.677
	Communication skills	0.722
	Information gathering capability	0.665
	Pioneering and innovative ability	0.690
	Foreign Language Skills	0.834
	Teamwork spirit	0.852
	Stress tolerance	0.863
	Basic office software usage skills	0.938
Professional knowledge competence	Firefighting expertise	0.756
	Fire drawing design capability	0.675
	Fire plan audit capability	0.746
	Fire equipment testing capability	0.676
	Firefighting equipment maintenance capabilities	0.682
	Firefighting equipment maintenance capabilities	0.741

4. Discussion

As an emerging specialty, fire protection engineering is interdisciplinary and cross-industry, theoretical and practical, with a wide crossover range and many application areas. However, there are certain shortcomings in the current undergraduate teaching system that need to be optimized[5]. Nowadays, the demand for professional and comprehensive talents is also increasing with the introduction of "craftsmanship". The spirit of craftsmanship is reflected in the three aspects of selfless dedication, unswerving professional experience, and down-to-earth pursuit of excellence, which is a comprehensive embodiment of morality, competence, and quality[6]. Since "craftsmanship" was first proposed by Premier Li Keqiang in the Government Work Report in 2016, the Party and the State have started to pay attention to the cultivation of "craftsmanship". Competency theory was proposed by the famous American psychologist Professor David McClelland in the 1970s, and the core content refers to whether a professional can be competent in a specific position, which requires knowledge, skills, abilities, traits or motivations that can better meet the actual job performance[7]. Since then the theory has been continuously improved and developed by scholars at home and abroad, and nowadays the competency theory has been paid full attention to in all walks of life, and many enterprises will focus on considering the job competency of candidates when recruiting talents. In order to optimize and upgrade the training system of fire protection engineering professionals, the study of fire protection engineering job competency under the spirit of craftsmanship can provide reference and reference for the construction of fire protection engineering system, optimization of talent training program and realization of diversified development needs of fire protection engineering in China on the one hand, and improve the quality and promote the development of fire protection engineering related industries on the other hand.

Most of the positions in fire protection engineering need to have two aspects of basic ability and professional ability, so its job competency also mainly includes these two aspects. Job competency will be an important element for enterprises to select talents, and will also effectively improve the quality of fire engineering professionals. Basic competence is what every position should have, and having good basic competence should be what every job seeker has. Professional competence is the common core index of all job competency assessment indexes[8], and the professional competence of fire protection engineering-related positions is mainly reflected in the design and audit ability of fire protection drawings, the testing and maintenance ability of fire protection equipment and the use skills of fire protection design software. Therefore, in the future teaching of fire protection engineering, we can focus on cultivating students' professional ability and having enough professional skills, which will help students to be more competent in fire protection engineering related positions after graduation. At the same time, colleges and universities should focus on cultivating a high level and practical experience of the faculty, only first with a first-class team of teachers first-class students will have a greater chance of being brought out.

At present, there are mainly two types of domestic colleges and universities with fire protection engineering majors, one is the armed police fire academy represented by the Armed Police Academy, which focuses more on "fire fighting and rescue and fire law enforcement" in the curriculum, while the other local colleges and universities mainly combine the characteristics of their respective colleges and focus more on "fire prevention"[9]. Different colleges have different focuses, but schools should all improve their professional abilities while training students' basic abilities well. Secondly, we should pay attention to the curriculum of colleges and universities, professional courses should pay more attention to practice, increase the initiative of students' own hands-on operation, motivate students' independent learning, and improve students' application ability in real operation. At the same time, colleges and universities should take the future employment direction as the leading direction, keep pace with the development of society, keep pace with the times, and construct different professional curriculum systems according to the study of vocational positions and job competency, and the curriculum system is the key link to achieve the goal of talent training. It should also pay attention to the construction of high-level faculty, the construction of practical training room and the development of curriculum resources, so as to cultivate high-quality and practical fire engineering professionals who meet the requirements of the industry and can solve complex engineering problems in their future employment life and contribute to the development of the industry and enterprises in the future.

Before that, there were relatively few previous studies on fire engineering job competency, so this article was used to study it. After testing the credibility of the questionnaire with Cronbach's alpha coefficient, the article divided the fire engineering job competency characteristics into two main components: basic knowledge competence and professional knowledge competence through questionnaire survey and statistical analysis. The results of combining the fire engineering job competency obtained from the article with the craftsmanship embodied by three elements of morality, competence and quality can finally provide reference and borrowing for the construction of future fire engineering job competency model and the optimization of fire engineering personnel training program.

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