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Research on the Practice of the Long-Term Digital Evaluation for Chemistry Students and Field Engineer Training Path based on Intelligent Teaching

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Abstract: This study takes the long-term training of chemical field engineers under the framework of digital competence in higher vocational colleges as the research object. The study combines domestic and foreign, macro and micro, qualitative and quantitative, in the investigation and problem analysis of the current situation of applied talent training in higher vocational colleges in China. Based on the successful experience of applied talent training locally and abroad, the study tries to build a talent training system with the core goal of long-term training of field engineers with the guidance of the government, colleges, and enterprises, by exploring the implementation path and reform strategy of the long-term training of field engineers.

Keywords: Competency; Field engineer; Talent classification theory; Nine-grid training method

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1. The significance of the project

To cope with the new challenges posed by the rapid development of advanced technology in the industry, the state has put forward clear requirements for the talent training of higher vocational colleges. For example, in 2022, the Ministry of Education and other five departments issued a notice and decided to jointly implement the special training plan for field engineers in vocational education. By 2025, a total of no less than 500 vocational colleges and 1,000 enterprises will participate in the project implementation to train no less than 200,000 field engineers in total [1]. The notice makes it clear that the special training plan is aimed at technical positions in short supply of talents under the digital and intelligent career scenarios in key fields, selecting and releasing the job needs of production enterprises, connecting and matching vocational education resources, taking the apprenticeship system with Chinese characteristics as the main training form, exploring and forming the training standards for on-site engineers in practice, building several on-site engineer colleges, and cultivating

a large number of craftsmen with the spirit. This can help the engineer understand the process, allowing good management and cooperation, thus bringing innovations [2].

However, China's chemical field engineer training is currently insufficient, especially in higher vocational colleges [3]. In the face of economic and social development, the responses to the new requirements are not very timely, many higher vocational colleges still have obsolete personnel training models, the personnel training system is incomplete, and social needs are out of touch. Therefore, a training system with field engineer training should be constructed according to the ideas of the new era in the current higher vocational education, by exploring the path and method of new professional personnel training [4].

The average number of students in the national higher vocational colleges in 2021 is around 9,300. Among them, the total number of students in dual-education colleges and universities has reached more than 13,600, and the total number of students in non-dual education colleges and universities has reached about 8,600 [5]. Compared with the data three years ago, the overall number of students in higher vocational colleges has increased significantly. Under the background of national development strategies such as building a well-off society in an all-round way and Made in China 2025, higher vocational education focuses on the training of field engineers to help transform a professional country into a professional power by featuring innovative development and characteristic development, which has become a new topic for vocational education research [6].

2. Analysis of the current situation

In the context of the digital transformation of vocational education, it is difficult for most vocational schools to quickly respond to the digitization of vocational education curriculum, digitization of skills, and digitization of management construction, which makes it difficult for the training of field engineers in schools to have the ability to solve complex on-site engineering problems in the first time. In the process of training, the emphasis is placed on the individual's job role, while the post-modern career focuses on the individual's role reshaping in the face of changing social situations.

At present, the training of field engineers in vocational education is in the pilot stage and it still takes some time to formulate the standards for the training of field engineers [7]. Second, the current field engineer training lacks the corresponding quality evaluation standards, resulting in the inability to form a perfect closed loop of talent training on the main body of evaluation responsibility, evaluation methods, and the consequences of non-evaluation, so no consensus has been reached. Third, from the perspective of the management of training standards, the lack of a certain supervision system. On-site engineers should conscientiously implement the elimination mechanism in the training process to achieve dynamic and merit-based supplementation, but what kind of elimination, what kind of reward, and who will supervise has not yet been determined.

3. The specific reform content, reform objectives, and key problems to be solved

3.1. Reform contents and objectives

This study takes the long-term training of chemical field engineers under the framework of digital competence in higher vocational colleges as the research object, combines domestic and foreign, macro and micro, qualitative and quantitative, and investigates and analyzes the current situation and problems of applied talents training in higher vocational colleges in China to draw on the successful experience of applied talents training local and abroad. The study attempts to build a talent training system with the core goal of the long-term training of field engineers with the guidance of the government, universities, and enterprises and explores the implementation path and reform strategy of the long-term training of field engineers [8]. Under the framework of

digital competency, the reform content of the practice path of the long-term training model for field engineers in the chemical industry is explored from the following key aspects when analyzing the theory of talent classification.

3.2. Update and integration of core course content

The classification characteristics of talents in chemical enterprises are standardized according to enterprises, and the talent classification is carried out at 9 levels through potential and performance [9]. The modular construction of professional core courses, from simple to difficult, combining theory and practice, should incorporate the latest chemical technology and digital tools, such as artificial intelligence and big data analysis, to ensure that students can master cutting-edge technologies in the industry.

3.3. Reform of the evaluation system

According to the nine-grid training method in the theory of talent classification, it is necessary to improve the detailed evaluation means, covering the whole process assessment of performance, ability, potential, and so on, from nine aspects. These areas include innovative thinking, business ability, communication and collaboration, leadership, responsibility, teamwork, learning ability, execution, and self-management. Each aspect has certain scoring criteria, which are divided into three levels, namely excellent, qualified and to be improved. In the evaluation process, it is necessary to combine the specific curriculum and practice situation for scoring [10]. This method is flexibly applied according to different working environments, job requirements, and personal abilities.

3.4. Innovation of teaching methods

The project teaching method involves using practical chemical cases to teach and improve students' ability to solve complex engineering problems. Through virtual reality and simulation software, simulate the chemical field operating environment to enhance students' practical experience. At the same time, the use of big data statistics of students' personal development performance visualizes the development curve of students.

3.5. School-enterprise cooperation and work-study combination

The job needs of enterprises can be fully met by jointly developing talent evaluation methods with enterprises; Enterprises not only participate in the development of core courses, but also participate in the formulation of students' evaluation methods, coupled as a long-term development mechanism, and lay a good foundation for students' lifelong learning and development.

4. Key issues to be solved

4.1. The evaluation methods of students in higher vocational colleges are too simple

At present, the evaluation methods of students in higher vocational colleges are too simple, mainly for examination or process assessment. The scope of the current evaluation is relatively limited, and there is no practical evaluation method for students' potential, ability, communication ability, and leadership ability. This paper will combine the talent training method, refer to the evaluation methods of the top 500 enterprises for talents, integrate them into the core professional courses of students, and standardize the evaluation methods of enterprises for talents, to lay a solid foundation for training qualified and efficient field engineers. It also provides a platform and sustainable development framework for students' personality development and innovative spirit training. It is necessary to integrate digital, visualization, and other intelligent technologies to

build a student evaluation system [11].

4.2. The core curriculum content and objectives need to be improved

Most of the teaching models of higher vocational colleges are still teacher-based, and some are also project-based teaching and student-oriented teaching models. However, the teaching goal is still to master textbook knowledge, which does not involve much ability improvement, innovative thinking, and critical thinking, and the main content is only learning textbook knowledge. The field engineer is required to be in charge of the field technology. Hence, they should have compound talents to creatively solve the technology application problems with science and technology in the front-line positions of production, engineering, management, and service. The knowledge structure of the textbook cannot meet this standard [12]. It is necessary to use digital and other intelligent means to improve the course objectives and contents, and use the equipment of the training room to build the teaching mode of "people + platform + content + environment + application."

4.3. The training level positioning needs to be improved

The training of field engineers in higher vocational colleges should cultivate innovative technical skills and talents with the quality of field engineers, rather than general assembly line workers locked in a certain position. Therefore, the training level of chemical field engineering students needs to be improved.

4.4. Lack of lifelong learning concept

In February 2019, the CPC Central Committee and The State Council issued China's Education Modernization 2035, which proposed that "building a modern education system serving lifelong learning for the whole people" is one of the main development goals in 2035. However, at present, some students in higher vocational colleges lack the concept of lifelong education, enthusiasm for learning, and attention. The talent training method should be used to clarify the position of the students to give the direction and goal of life [13].

5. Features and innovations

5.1. The research perspective is novel

Based on the digital teaching and evaluation of talent classification theory, this study explores the construction of a long-term talent training system for chemical field engineers under the framework of digital competency in higher vocational colleges after analyzing the current situation of field engineer training and drawing lessons from talent training experience local and abroad. In the construction of ideas, the method of talent training is used to clarify the evaluation means and improvement strategies of chemical field engineers. The core courses adopt the digital teaching model and evaluation model of "people + platform + content + environment + application", and the closed-loop ecological chain of the talent training system is carried out. Thus, a complete talent training system model based on digital chemical field engineers is constructed, and a theoretical framework of localization is constructed [14].

5.2. The views and conclusions are innovative

Through research, this study coordinated and unified the positioning of enterprise talents and school training and the development of enterprise talents and school students. This study deeply explored the latest trend of high-quality technical skills training locally and abroad and proposed a new idea to adapt to the long-term training system of digital chemical field engineers in higher vocational colleges.

5.3. Innovative research ideas

Many enterprises use the nine-grid method or similar model for talent training. School students are the main force of the future enterprise, so the enterprise talent training method should be adopted. The research method of this paper is to directly adopt the talent training method of top 500 enterprises, through the improvement of the core course objectives of the chemical industry, the integration of the nine-grid talent training method, the improvement of the student evaluation method, the use of digital, visualization and other technical means to integrate the teaching and evaluation method [15].

4. Summary

The nine-grid talent training method is a human resource management tool, mainly used to evaluate and classify talents within an enterprise. It is based on two core dimensions, which are performance and potential. Performance usually refers to an employee's performance and results at work, including aspects such as competence, attitude, outcome contribution, and behavior. Potential refers to an employee's potential for future development, including growth potential, promotion potential, and the ability to take on more important roles. These two dimensions are each divided into three levels, forming a 3x3 matrix with nine grids. Each grid represents a different talent category, and employees are assigned to corresponding grids based on their evaluation results on the two dimensions of performance and potential. Such a classification helps companies identify different types of talent, to formulate corresponding talent development and management strategies. Employees are divided into nine categories according to their positions in the nine-grid classification, such as high-performing talents with high potential, high-performing talents with low potential, and so on. Then, according to the different categories of talents, corresponding talent development, training, and incentive strategies are formulated.

Disclosure statement

The authors declare no conflict of interest.

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