

Research on the Talent Cultivation Model of Field Engineers in Vocational Education

Pianpian Cheng*

Wuhan Technical College of Communications, Wuhan, Hubei, China

**Corresponding Author.*

Abstract: Field engineers serve directly on the front line of production and have the ability to solve practical engineering and technical problems. They are a type of composite application skills talent. The training of field engineers in vocational education is an important measure to build a strong educational country and achieve modernization of education. This article analyzes the problems existing in the training of field engineers in vocational education, such as the unreasonable curriculum structure, weak practical teaching links, and insufficient cooperation between schools and enterprises, and puts forward optimization strategies. Through optimization measures such as improving the multi-dimensional and three-dimensional evaluation system for the whole process quality supervision, the training quality of field engineers in vocational education has been effectively improved, meeting the social demand for high-quality engineering technical talents, and promoting the in-depth integration of vocational education and industrial development.

Keywords: Vocational Education; Field Engineers; Talent Training; School-Enterprise Co-operation; Applied Talents

1. Introduction

In October 2022, the "Notice on Implementing the Special Training Program for Vocational Education Field Engineers" issued by the General Office of the Ministry of Education and four other departments for the first time clearly defined the training positioning of field engineers in vocational education. This move signifies that the training of field engineers has become a national strategy and emphasizes that the training process should rely more on

school-enterprise cooperation platforms and apprenticeships.

Field engineers directly serve in the production line, with the ability to solve practical engineering problems, is a kind of composite application of skilled personnel [1]. Many scholars have begun to adapt to the new trends and changes in industrial change, the country's demand for innovative technical and skilled personnel is more urgent, vocational education field engineers training has become an important initiative to build a strong education and education modernization.

The practical significance of cultivating field engineers in vocational education lies in training technical and skilled talents to adapt to the needs of industrial digitalization and intelligent transformation and upgrading, promoting the high-quality development of vocational education, and accelerating the construction of a strong country in human resources and manufacturing [2-4].

2. The Relevance of Training Field Engineers in Vocational Education

Vocational education focuses on imparting technical knowledge to students and cultivating technical-skilled talents, while general education aims to enhance students' scientific and cultural literacy and cultivate academic talents [5]. Under the framework of apprenticeship system, vocational education implements a special training programme for field engineers through the integration of industry and education, school-enterprise cooperation and the combination of work and study, aiming at solving the problems of low quality of talent cultivation, insufficient supply of talents, and mismatch with the needs of industrial development. This programme is a major initiative of the State to accelerate the development of a strong human resources country and build a strong manufacturing country and is of great strategic significance in

promoting the high-quality development of vocational education.

The core of the implementation of the special training programme for field engineers lies in solving the problems of "who is to be trained, what is to be trained and how to be trained". Through vocational education to deepen the integration of industry and education, school-enterprise cooperation mechanism reform, comprehensively promote the industry and education collaborative education, training to create a large number of artisanal spirits, proficient in operation [6-7]. Knowledge of craftsmanship, management, good collaboration and innovation of field engineers. This not only involves a new field of vocational education and engineering education, but also depends on practical exploration and theoretical innovation for its development.

However, there are some problems in the process of cultivating site engineers in vocational education, such as the lack of a sound organization for running the school and the lack of clear responsibilities for cultivation. Although some vocational colleges have set up colleges of field engineers, they do not play the roles of co-ordination, organization, implementation and supervision, resulting in the colleges being inactive [8]. In addition, communication between schools and enterprises is basically in a spontaneous, short-lived and disorderly state, which affects the training effect.

In order to solve these problems, it is necessary to strengthen thematic research, construct a theoretical system and thickly plant a practical foundation. Starting from the construction of disciplines, cross research on vocational education and engineering education should be strengthened, and the capacity of research and development teams in vocational education should be enhanced. At the same time, attention should be paid to the assessment and rewards for the achievements of masters leading apprentices, and a system for instructing masters' training should be established to make provisions for the basic content, form, duration and assessment of the post-training requirements. Through these measures, the high-quality development of vocational education for the training of field engineers can be promoted, and powerful talents and skills can be provided to support

the comprehensive construction of a modern country and the comprehensive advancement of the great rejuvenation of the Chinese nation.

3. Current Status of Vocational Education for the Training of Field Engineers

In terms of achievements, the training of vocational education field engineers has received strong policy support. Five departments, including the Ministry of Education, issued the Circular on the Special Cultivation Plan for Field Engineers in Vocational Education in October 2022, aiming at the talent-scarce technical positions in digital and intelligent occupational scenarios in key fields to cultivate field engineers with a spirit of craftsmanship. The programme plans to cultivate no less than 200,000 field engineers by 2025 to meet the needs of industrial upgrading and transformation [9]. In addition, the cultivation of field engineers in vocational education is regarded as an important way to cultivate high-quality skilled personnel, and despite some problems, it plays an important role in promoting economic and social development and enhancing national competitiveness. It plays an important role in promoting economic and social development and enhancing national competitiveness.

On the challenge side, despite policy support and demand, in practice, the training of field engineers faces multiple challenges. Some vocational colleges have set up a college for field engineers, but they are often motivated by the aim of raising social awareness rather than being truly committed to training talents. In addition, the co-operation between schools and enterprises is not close, and enterprises are not highly motivated to participate in talent cultivation, which affects the quality and efficiency of the cultivation of field engineers. In addition, with the development of industry and technological progress, field engineers need to possess higher skills and knowledge, which puts higher demands on vocational education.

4. The Current State of Field Engineer Training Faces Multiple Challenges and Opportunities

There are some realistic dilemmas in the process of training field engineers in vocational education. Firstly, students tend to pay more attention to the learning of

theoretical knowledge and lack of practical experience, which leads to difficulties in quickly adapting to the work requirements of enterprises. Secondly, some vocational undergraduate colleges and universities have deficiencies in curriculum resources, such as obsolete experimental equipment and lack of practical training bases, which affect the practical exercise and training quality of students. In addition, teachers in some vocational undergraduate colleges lack industry experience and practice in engineering projects, which makes it difficult to give effective guidance to students in the teaching process.

4.1 Inadequate Curriculum

The curriculum content of some vocational institutions is out of touch with the actual needs of enterprises, with too many theoretical courses and not enough practical courses. Courses are updated slowly and are unable to keep up with the technological development of the industry.

4.2 Weaknesses in Practical Teaching

Practical teaching facilities and equipment are outdated and unable to meet the needs of students' practical operations. Practical teaching instructors lack enterprise working experience and have limited instructing ability.

4.3 Teacher Training to be Strengthened

The proportion of "dual-teacher" teachers in the teaching force is low, and some teachers lack practical experience in enterprises, and do not have a deep enough understanding of the cutting-edge technology of the industry and the actual needs of enterprises.

4.4 Insufficiently Deep School-Enterprise Co-Operation

School-enterprise co-operation is in a single form, the content of co-operation is limited, the participation of enterprises is not high, and it is impossible to realize the real integration of industry and education.

In order to optimize the cultivation of talents, a series of measures need to be taken. Firstly, the practical course curriculum should be strengthened, the proportion of practical courses in the overall course structure should be increased, and the content of practical courses should be enriched so that students can

get sufficient practical exercise. Secondly, teacher training should be promoted to improve teachers' professionalism and teaching level, which can be carried out by regularly organizing teachers to participate in industry seminars and training courses.

The cultivation of vocational education field engineers is a complex social system project that requires the participation of many parties and collaborative promotion. By optimizing the top-level design, strengthening the practical curriculum, promoting teacher training as well as strengthening the cooperation between inside and outside the school, the training quality of vocational education field engineers can be improved for the industrial development, technological innovation and talent cultivation, it should strengthen the cooperation both inside and outside the school, actively seek cooperation with enterprises and industries, and provide more practice opportunities and internship bases for students.

5. Analysis of the Causes of Problems in the Field Engineer Training Model for Vocational Education

The reasons for the problems in the field engineer talent training model of vocational education mainly include a single evaluation subject, the lack of a pluralistic grasp of the practical aspects, and a single evaluation content, the lack of effective measurement of practical knowledge.

Single evaluation subject: The current evaluation system is mainly based on school evaluation, with insufficient participation by other stakeholders such as enterprises and the Government. Although most colleges and universities emphasize the graduation standard of "credits + vocational certificates" and include the attributes and levels of certificate-issuing departments as the responsible subjects of student evaluation, such participation is only limited to summative evaluation. Although most institutions emphasize the "credit + vocational certificate" graduation standard and include the attributes and levels of the certificate-issuing department as the responsible body for student assessment, such participation is limited to summative assessment, and the participation of assessment bodies other than the school in the quality supervision of student development is

obviously insufficient. Enterprises and other stakeholders are less involved in the development of student evaluation standards, resulting in a mismatch between the assessment standards set by the school body around students' knowledge, skills, abilities and character, and the practical knowledge-centered vocational abilities required for real engineering practice. Matching.

Evaluation content is single: the current assessment and evaluation mainly relies on the written evaluation based on theoretical knowledge and academic performance, and the assessment and evaluation of the practical teaching stage is mostly based on written texts such as thesis, report, engineering programme, business plan, industrial design documents or drawings. The assessment and evaluation of the practical teaching stage is mostly based on theses, reports, engineering programmes, business plans, industrial design documents or manuals, drawings and other written texts, and less on the development and output of real products. This shows that the evaluation system adopts more result-based evaluation of theoretical knowledge and practical ability and lacks evaluation of physical results based on practical outputs, especially the lack of process and performance evaluation of students' acquisition of tacit knowledge in practical teaching.

These problems reflect the inadequacy of the evaluation mechanism of the vocational education on-site engineer talent training model, which requires the introduction of more diversified evaluation methods and standards by optimizing the subject and content of evaluation in order to improve the quality and adaptability of talent training.

6. Optimisation Strategies for the Field Engineer Talent Training Model in Vocational Education

The vocational education field engineer training model is optimized from the following strategies.

Strengthen the study and research on the educational theory of field engineers, understand the connotation, quality structure and talent growth law of field engineers, and enhance the scientific knowledge on the nature, goal, content, mode and mechanism of training field engineers. Enhance the scientific

knowledge of the nature, objectives, contents, mode and mechanism of training for field engineers, so as to achieve the scientific formulation of training standards and programmes for field engineers.

Reconstructing a highly targeted curriculum system, including public foundation courses, professional foundation courses, professional core courses and professional elective courses, which is centered on cultivating the craftsmanship, practical skills and innovativeness of field engineers. Curriculum content should be of appropriate width, reasonable depth and focused.

Improve the teaching mode, implement the modern apprenticeship personnel training mode, strengthen on-site teaching and practical teaching, use information technology means, move the factory into the classroom, and vividly reproduce the actual engineering problems and cases in the classroom. We will make use of information technology to bring factories into the classroom, vividly reproduce actual engineering problems and cases in the classroom and cultivate students' engineering-oriented and field-oriented thinking.

Establish a stable school-enterprise alliance, whereby both the school and the enterprise fully discuss the overall vision, broad themes, areas of specialization, breadth and depth of learning objectives, etc. of the teaching programme, and clarify the core issues in the teaching programme and attribution of authority and responsibility and establish a reasonable and effective accountability mechanism.

Jointly formulate learning objectives, school teachers, education administrators and enterprise leaders, engineers and experts should discuss and exchange ideas together to formulate a hierarchical, operable and precise learning objectives, which are deeply aligned and matched with the core vocational competency system of professional knowledge, skills, attitudes and spirit that are sufficient to adapt to the positions of field engineers.

Signing of a tripartite student-school teacher-enterprise master contract, which should include a description of the subject matter of the project covered by the teaching programme, the specific methodology, the implementation period, the basic steps, Evaluation criteria and clear description of the

expected learning outcomes.

Improvement of the multi-dimensional and three-dimensional evaluation system that highlights the quality supervision of the whole process, changing the traditional single homogeneous result-based evaluation method to one that involves diversified subjects, multi-dimensional evaluation content, and evaluation standards that are both educational and vocational in nature, the evaluation system is dynamic in its approach.

Adapting to the orientation to standardize the "dual mentor" team construction standards. The focus of building a "dual mentor" team for field engineers is on talent cultivation, that is, to improve the quality of training for field engineers and adapt to the development of the economy and society as well as the needs of enterprises. Therefore, enterprises should take adaptability as the guide to standardize the construction standards of the "dual mentor" team for field engineers. First, adhere to moral standards. To build a "dual mentor" team for field engineers in the new era, it is necessary to take morality as the standard. On the one hand, the moral cultivation of the "dual mentor" team should be strengthened. Enterprises should take the teacher's ethics and style as the primary criterion for selecting members of the "dual mentor" team and incorporate it into the teacher's ethics and style assessment system. Through supervision and system establishment, improve the moral level of the "dual mentor" team. On the other hand, it is necessary to enhance the "dual mentor" team's professional identity. This means that the "dual mentor" team should deeply understand the importance of vocational education, enhance the sense of responsibility to participate in the cause of vocational education, and promote the high-quality development of vocational education. At the same time, the "dual mentor" team also needs to identify with the professional identity of teachers. Enterprises can encourage members of the "dual mentor" team to actively participate in the cultivation of the craftsman spirit and set up special training and reward funds to improve the enthusiasm of employees and their identification with the identity of teachers. Second, standardize professional standards. To build a "dual mentor" team for field engineers in the new era, it is necessary to take professionalism as the support. To

ensure that the "dual mentor" team is adapted to the development of the economy and society and the needs of enterprises, the professional skills of the team need to be further improved, and improving its adaptability should become the core goal. In this process, enterprises should actively participate in team construction and provide the team with industry, industry development trends, and the latest professional guidance. By in-depth analysis of the current industrial transformation and upgrading of the demand for technical and skilled talents, mining the professional knowledge and skills that the "dual mentor" team should master, and providing professional and effective guidance for standardizing the team's professional standards. Third, improve the evaluation standards. To build a "dual mentor" team for field engineers in the new era, it is necessary to take evaluation as the basis. To improve the teaching ability of the "dual mentor" team, it is necessary to improve the assessment mechanism and stimulate the team's vitality. Enterprises should establish standards for selecting enterprise mentors involved in team construction and build selection standards guided by "skills + teaching". Members involved in team construction should not only have excellent practical skills to support the cultivation of students' professional skills but also have certain teaching abilities or the willingness to improve teaching abilities, so as to be able to understand the learning rules of students and cultivate their professional skills in an orderly manner.

7. Conclusion

The training of vocational education field engineers aims to adapt to the needs of new technologies, new business models and new modes, and the training targets are wide-ranging, including students enrolled in vocational colleges and universities, prospective employees and employees of enterprises. The main body of cultivation is based on enterprises, adopting the joint talent cultivation mode of schools and enterprises, and emphasizing the importance of practical skills and innovation ability. To this end, the following suggestions and outlook are put forward.

Strengthening school-enterprise cooperation: through the joint construction and sharing of

educational resources, a high-level "two-teacher" teaching team can be built to ensure a high level of teaching quality. Vocational colleges and universities should strengthen the mechanism of pre-service training and in-service teacher training and select and send teachers to co-operative enterprises to carry out job practice and technical research. Enterprises should select and send industry leaders, technical personnel and managers to fill the part-time teaching team and participate in apprenticeship training and practical course teaching.

Focus on the cultivation of practical skills and innovation ability: Optimize the talent cultivation programme, reconstruct a highly targeted curriculum system, and emphasize the cultivation of craftsmanship, practical skills and innovation ability. The contents of the courses should be appropriate in width, reasonable in depth and focused, and they should focus on the cultivation of craftsmanship, practical skills and innovation ability of field engineers.

Strengthening the construction of teaching staff: focusing on the special training of field engineers and, in view of the apprenticeship model, hiring technical backbones from enterprises to work with professional teachers in schools to form teacher teaching innovation teams. It has implemented special training for field engineers, promoted the integrated assessment of school and enterprise "dual teacher" teachers, and allowed school and enterprise teachers to receive remuneration in both directions.

optimized team function and promote continuous improvement: take the field engineer training project as a carrier, promote the transformation and application of school teaching achievements to enterprise staff training and the feedback and empowerment of enterprise technical achievements to school professional teaching, so as to realize the team's scientific and educational integration, Continuous Improvement and Long-term Development.

Strengthening thematic research and consolidating the theoretical and practical foundation of field engineer training education: Starting from discipline construction, vocational and technical pedagogy will be extracted from the current second-level disciplines of education, and the first-level

discipline of vocational and technical pedagogy will be established. Under it, a secondary discipline of vocational engineering education will be set up, so as to drive the theoretical foundation of on-site engineer training by discipline construction.

Through the above measures, the quality of training of field engineers in vocational education can be effectively enhanced to meet the social demand for high-quality engineering and technical talents, and to promote the in-depth integration of vocational education and industrial development.

Acknowledgments

Supported by "A Study on the Talent Cultivation Model of Vocational Education for Field Engineers-Taking the Supply Chain Operation Management Major as an Example" (Project No. CJRHZWH2024-71).

References

- [1] Ma Jun. The Ministry of Education and Four Other Departments Issue the "Notice on Implementing the On-site Engineer Special Training Program for Vocational Education". *Auto Maintenance and Repair*, 2022(22): 2-3.
- [2] Gao Fuyu. Research on the Cultivation of High-Skilled Talents in the Field of New Energy Vehicles under the Background of Made in China 2025. *Practical Technology of Automobiles*, 2020, 45(10): 245-247.
- [3] Luo Lin. Discussion on the Training Program for Talents in New Energy Vehicle Technology. *Practical Technology of Automobiles*, 2020, 45(21): 202-204.
- [4] Wang Lisheng. Exploration of the Development Model of Industry-Education Integrated Professional Clusters under the Background of "Dual High": Taking the Construction of New Energy Vehicle Technology Professional Cluster at Shangqiu Vocational and Technical College as an Example. *Journal of Shangqiu Vocational and Technical College*, 2022, 21(4): 54-57.
- [5] Jiang Quan, Liu Tao, Ding Chunli. Demand for New Energy Vehicle Technology Talents and the Integration of School-Enterprise Cultivation: A Case Study of Shaanxi. *Internal Combustion Engine and Parts*, 2020(24): 255-257.
- [6] Feng Jingxiang. Construction of New

- Energy Vehicle Technology Curriculum System under the Background of Deep Industry-Education Integration: Taking Foshan Vocational and Technical College as an Example. *Times Auto*, 2021(22): 61-63.
- [7] Huo Lijuan. The Connotation, Elements, and Operational Logic of the On-site Engineer Special Training Program. *China Vocational and Technical Education*, 2023 (14): 5-11.
- [8] Qin Jing. The Connotation, Logical Rationale, and Path Selection of the "Dual Mentor" Team Construction for Vocational Education Field Engineers. *Education and Career*, 2024 (14): 43-49.
- [9] Liu Fang, Liu Qian, Chen Guang. Discussion on the Curriculum System Reform of Vehicle Engineering Major under the Background of "Double First-Class" Construction. *China Modern Educational Equipment*, 2023 (8): 124-128.