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Research on the Construction and Realization Path of Industrial Workers' Skill Formation System in the Digital Age

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Abstract: With the continuous emergence and wide application of new quality productivity, the skill requirements of industrial workers have been significantly improved. The introduction of new technologies, the automation and intelligent transformation of production processes, as well as the acceleration of product and service innovation, together constitute the power of reshaping the skill structure of the labor force. This paper aims to explore the key issues of the skills formation system of industrial workers in the digital age. Firstly, it analyzes the significance of the formation of industrial workers' skills. Then, it deeply analyzes the problems existing in the process of the formation of industrial workers' skills. Finally, it puts forward the strategy of building high-skilled industrial workers to adapt to the development needs of the new era, aiming to help industrial workers effectively adapt to and lead the changes of modern times, and promote industrial upgrading and sustainable development.

Keywords: Digital age; Industrial workers; Skill formation system

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1. Introduction

The formation of industrial workers' skills has laid a solid foundation for the formation of industrial structures in the digital age. Among them, the government has formulated construction policies for the industrial worker team, focusing on improving the skills of industrial workers, assisting them in their good development, enabling them to participate in society, and improving the social status of industrial workers. The formation system of industrial workers' skills is not only the inevitable demand of industrial transformation in the digital era but also an important factor in improving the quality of residents and the quality of life.

2. The significance of industrial workers' skill formation in the digital age

Skill formation of industrial workers refers to the formation of good abilities, including production and innovation, before and during the work of workers, and also involves the formation of workers' skills and potential abilities. Among them, the production capacity of workers can reflect the production value of their actual work, which is shown by improving labor productivity, while the thinking and innovation ability of industrial workers play a decisive role in their future development [1]. The formation of industrial workers' skills not only has individual significance but also has social and collective significance. With the cooperation of various subjects, it can ensure the improvement of industrial workers' literacy and ability and promote social and economic development.

The digital age is of great significance to the formation of industrial workers' skills. Firstly, the formation of industrial workers' skills has accelerated the transformation of the social industrial structure and laid a solid foundation for the development of the manufacturing industry [2]. Medium and low-end industrial chains dominate society, which not only reduces the interests of enterprises but also affects the living standards of workers. To promote the development of the high-tech industrial system, China needs to pay attention to the establishment of a skills formation system for industrial workers and promote the fine and intelligent development of workers' skills through the penetration of digital elements.

Secondly, the formation of industrial workers' skills can provide security for industrial workers. The development of the digital age has greatly reduced the proportion of labor-intensive industries, and the development of technology-intensive industries is easy to bring about unemployment. In this regard, the training of industrial workers is of great significance. Through the improvement of the skill formation system, the role of the government and enterprises can be brought into play, and the supporting role of the education sector can be better demonstrated to promote the improvement of employment quality.

3. The problems in the formation of skills of industrial workers

3.1. Insufficient skills training

Starting from China's vocational education system, mainly the secondary vocational colleges, higher vocational colleges as the main body, which professional curriculum design, attention to industrial workers training, and the training system have not been perfect. Among them, there are problems in resource allocation. Compared with undergraduate colleges, vocational colleges have insufficient teaching resources and policy support, and the actual curriculum update speed is relatively slow [3].

Additionally, in the vocational teaching of enterprises, they pay more attention to their income and pay little attention to the development of workers. They often adopt the way of detailed division of labor and repetitive labor, and overlook the improvement of workers' ability. In training institutions, there is minimal regard for the all-round development of industrial workers, and at the same time, it is restricted by laws and regulations, and the implementation of practical actions is insufficient [4]. Among them, the linkage between vocational education and enterprises necessitates vocational education to adhere to curriculum objectives, despite disparities in the developmental status of enterprises and the prevailing principle of the survival of the fittest.

In vocational education, discrepancies exist at the conceptual, methodological, and other levels, resulting in incompatibility between college teaching and enterprise operations. This disconnect fosters a gap between cognitive understanding and practical application, leading to the wasteful expenditure of teaching resources and posing challenges in aligning the needs of industrial workers with the exportation of professional talent [5].

3.2. Social cognition and individual factors

In the current social environment, industrial workers are often faced with occupational bias. Occupational bias not only exists in the traditional concept but also the enterprise and social environment. The emergence of this problem leads to the low social status and recognition of industrial workers, and the unfair treatment of industrial workers in the development, which affects the enthusiasm of young people to play the role of industrial workers [6].

Industrial workers are affected by family, economic, and other factors, and lack opportunities for continuous learning. This problem is often manifested in the families of low-income industrial workers, who have to devote most of their time and energy to making a living and lack enough time to improve their skills. Companies do not invest enough in employee training, which significantly reduces the motivation and enthusiasm of employees to learn. This underinvestment can result from a variety of factors, such as unequal allocation of resources, a lack of appreciation of the value of training, or cost-cutting decisions made under economic pressure. Lack of adequate training resources not only limits employees' opportunities to acquire new knowledge and skills but can also lead to feelings of neglect or limited career advancement, which in turn affects their motivation to learn and job satisfaction.

Industrial workers are affected by age, basic education level, and other factors, resulting in their poor ability to learn new skills. In the digital age, with the development of science and technology, many new technologies have been applied to industrial development, which has brought serious challenges to industrial workers. Because of their difficulties in mastering new technologies, they have a poor ability to learn new skills. The emergence of the above problems not only affects the performance of industrial workers but also limits their career development.

3.3. The lack of enterprise investment and incentive mechanism

The formation of industrial workers' skills is influenced by educational institutions and work links, among which vocational education is inseparable from the cooperation between schools and enterprises. However, from the actual situation, schools are keener to participate in cooperation, while enterprises lack the enthusiasm for cooperation according to their interests. Simultaneously, in the integration of theory and practice, there are also related problems, such as the concepts of apprenticeship and work orientation proposed by the academic community, and the setting of specific operational forms, but because front-line teachers still adopt traditional teaching, such as theoretical teaching and teacher main body, resulting in poor actual education effect [7].

In the context of the digital era, although the cooperation between the education industry and related enterprises has achieved certain results, the actual cooperation remains in the form, and the coherence between the skill standards and the teaching content is insufficient. In some industries, the promotion channels for skilled workers may be relatively narrow, lacking clear career development plans and promotion paths. There may be limitations in the skill level recognition mechanism, which makes it difficult for the skill level of industrial workers to be accurately assessed and recognized.

4. The construction strategy of industrial workers' skill formation system in the digital age

4.1. Strengthen the main role of enterprises and innovate the skill incentive system

Firstly, we will implement corporate training responsibilities. In the training activities of industrial workers,

enterprises need to shoulder the responsibility of training industrial workers, constantly improve the vocational skills training system, and provide guarantees for the career development of industrial workers. Enterprises also need to ensure the development of employee training from the perspective of capital, effectively improve the skills of employees, and assist their healthy growth [8]. Enterprises with this development plan not only can cultivate the professional skills of employees but also can make them form a good sense of belonging, and promote the improvement of production efficiency so that enterprises have a stronger market competitiveness.

Secondly, carry out school-enterprise cooperation. Enterprises need to actively integrate into the school-enterprise cooperation activities, through cooperation with vocational colleges, and establish a good cooperative relationship. In the process of school-enterprise cooperation, enterprise artisans can go to vocational colleges for part-time teaching activities, pass on practical experience to students, truly realize the sharing of resources between schools and enterprises, and achieve complementary advantages [9]. The implementation of school-enterprise cooperation activities can not only enable students to gain more practical experience but also help enterprises to integrate into talent training activities, laying a foundation for enterprises to recruit industrial workers in the future.

Thirdly, improve the treatment of skilled personnel. The government and enterprises need to pay attention to the implementation of policies and effectively improve the economic and social benefits of skilled talents. Among them, enterprises can provide higher salaries and career development opportunities for skilled talents, which can build a good working environment and provide protection for industrial workers. The implementation of the above activities can not only attract more talents to integrate into the skilled industries, but also improve the enthusiasm of industrial workers to work and escort the sustainable development of enterprises.

Finally, improve the commendation and incentive policy. Government departments need to introduce relevant policies to provide support for the development of enterprises and encourage industrial workers to actively participate in activities to improve their skills and literacy through commendation and incentive policies. Concurrently, various awards and honors are set to focus on recognizing industrial workers who have made outstanding achievements in certain skill fields, to stimulate their sense of honor and accomplishment. The government also needs to provide material rewards and career development opportunities for industrial workers, to carry out further incentive work to upgrade the skills of industrial workers [10]. The introduction of relevant policies can not only increase workers' enthusiasm for work but also create a good social atmosphere, such as respecting skills and valuing labor.

4.2. Emphasize the supply of skills and build a career education system

Vocational education and training activities focus on serving the regional economy, improving individual income, focusing on teaching practical skills, and giving insufficient thinking time. However, there are obvious differences in general education, which focuses on thinking and neglects practical operation. In the digital era, the development of China's supply-side structural reform and the continuous transformation and upgrading of industries require adjustments in the high-end education system and service employment, among which the organic integration of vocational education and general education has become a future development trend to improve the skill level of industrial workers [5]. It is necessary to focus on the construction of a continuing career education system, which not only serves students but also provides a platform for industrial workers to assist their career development, which includes four stages, as shown in **Figure 1**.

Firstly, career preparation education. This education refers to cognitive training activities that are not

directly related to real careers, but are mainly implemented in general education and involve multiple periods [6]. Among them, primary education is mainly carried out in primary school, and its purpose is to cultivate students' enthusiasm for work, career interest, and participation emotion. Secondary education is mainly carried out in junior middle school, which focuses on cultivating students' vocational cognitive ability and helping them to position themselves [11]. Higher education is mainly carried out at the university stage, which focuses on cultivating students' vocational concepts, encouraging them to find the meaning of work, and cultivating their work attitude.

Secondly, initial vocational education. This education mainly includes two forms: secondary vocational and higher vocational. Secondary vocational education takes employment as the orientation and focuses on cultivating design-oriented operation abilities, such as gardening, machine maintenance, and the like. Relevant skills have low requirements on the cognitive level of education, and it is difficult to replace them with machines. The main skills are learned through apprenticeship [12]. Higher vocational education pays attention to the cultivation of cognitive ability and has high requirements for the apprentice.

Thirdly, transition preparatory education. This type of education mainly serves middle and higher vocational students, helps them realize the educational transition, and strengthens the connection between general education and academic education. The goal of transition preparatory education is to provide students with a high-quality platform to help them realize the transition [13]. For middle and higher vocational students, the implementation of this education can deepen their understanding of general education knowledge, and use the new teaching environment to lay the foundation for their subsequent healthy development.

Lastly, vocational continuing education. The main target of this education is on-the-job, retired, and other industrial workers, focusing on skills training, academic education, and other activities. Vocational continuing education provides flexible learning space for industrial workers, including places for education, work, and life, and combines online and offline education to meet work needs and promote the development of industrial workers, with self-orientation and practical learning as the focus.

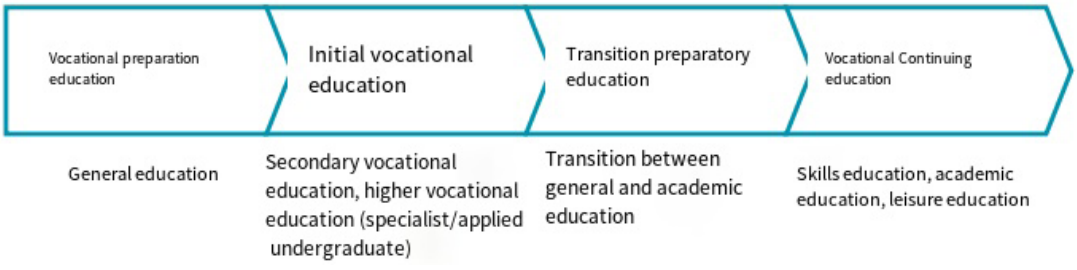

Figure 1. Continuing career education system

4.3. Establish a learning platform and improve skills training paths

With the advent of the digital age, the development of information, big data, and other technologies has expanded the scope of traditional education and enriched the forms of educational communication. The development of adult vocational education also requires the skillful use of new media technologies, the expansion of training paths, and the establishment of a good learning platform for industrial workers with the help of openness and inclusiveness. On the one hand, vocational training institutions need to pay attention to the curriculum setting, combine industrial workers, strengthen the barriers between industrial workers and professional learning, and provide rich educational resources for industrial workers through the construction of

online learning platforms, which are open, flexible, and high-quality sharing, among other benefits [14].

The construction of the learning platform can enable industrial workers to learn knowledge in their spare time and provide convenient conditions for their lifelong learning. On the other hand, vocational training institutions can invite enterprise majors to conduct online courses, lectures, and other activities. They can teach their rich vocational skills to industrial workers, effectively improve the shortcomings of teaching, and assist the development of industrial workers. In the digital age, vocational training institutions can also set up efficient and convenient online learning platforms using micro-courses and MOOCs [15]. Through the flexible application of new media tools, such as WeChat and QQ, the online platform can strengthen the interaction with industrial workers and make vocational teaching more interesting.

In parallel, vocational training institutions need to conduct in-depth cooperation with enterprises and simulate activities through practice, such as production and business. The implementation of these activities can give industrial workers immersive feelings and improve the effect of skill training. In short, the development of the above teaching mode satisfies the development law of the digital age, enables industrial workers to master solid practical literacy in knowledge exploration, and lays the foundation for their subsequent career development.

4.4. Focus on skill evaluation and build a quality evaluation system

In the skills training of industrial workers, vocational qualification evaluation is an important component. However, there are some issues with the current vocational qualification evaluation, specifically in the evaluation standards and methods, evaluation content, evaluation subject and mechanism, social cognition, and participation.

The current vocational qualification evaluation often relies too much on paper-and-pencil tests or a single assessment method, which makes it difficult to fully reflect the actual operation ability and professional quality of industrial workers. The lack of scientificity and objectivity in evaluation standards often leads to unfair and unreasonable evaluation results. The evaluation of vocational qualification mainly relies on experience and subjective evaluation and lacks scientific and reasonable evaluation criteria and objective data support. This makes the evaluation result easy to be interfered with by human factors, thus affecting the fairness and credibility of the evaluation. In the field of vocational education, there exists the problem of incompatibility between academic certificates and vocational qualification certificates. The lack of organic connection and integration between the two leads to the need for repeated learning and assessment when students obtain certificates, which increases the burden on students. At the same time, it also affects the authority and recognition of vocational qualification certificates.

The current vocational qualification evaluation often focuses on the assessment of theoretical knowledge but neglects the evaluation of practical operation ability and professional quality. As a result, there is a big gap between the evaluation results and the actual needs of the industry, which cannot meet the actual needs of the industry for skilled talents. Talent evaluation mainly focuses on academic qualifications and performance and lacks a comprehensive evaluation of employees' comprehensive quality and innovation ability.

The current vocational qualification evaluation mechanism often lacks orderliness and coherence, and there are differences in evaluation standards and methods among different evaluation institutions. This makes it difficult to make horizontal comparisons and longitudinal tracking of evaluation results, and cannot provide effective guidance and support for the career development of industrial workers.

The importance of a vocational qualification certificate, as the certificate of workers' vocational ability level and the passport of market employment, has not been widely recognized by all sectors of society. Due to the cumbersome process and high cost of evaluation, some industrial workers do not participate much in the evaluation of vocational qualifications. Based on this, in order to carry out better vocational qualification evaluation and guarantee the career development of industrial workers, an output-oriented quality evaluation system is designed, as shown in **Figure 2**.

Firstly, in the quality assessment system, skill evaluation standards are the starting point, involving national, industrial, and enterprise standards. Among them, the basic standards are binding, while the special standards show the incentive to exceed the average level. These standards take laws and regulations as the basis and provide a regular inspection and review system. Among them, effective skill evaluation standards can make employers and workers understand all kinds of information, and help to improve the quality of work.

Secondly, in the realization of skill standards, input quality and process quality are important guarantees. Among these, input quality refers to the curriculum resources available to students, which follow the standard concept, including teaching tasks and advanced teaching facilities. Process quality refers to the standardization of teaching activities and the comprehensive ability level. The training activities of industrial workers need to take the national standards as the basis, mainly including salary, position, and subsidies, while the practical training links need to focus on cultivating the professional quality of industrial workers.

Thirdly, skill evaluation needs to pay attention to the quality of output and development, to improve the effectiveness of skill standards. Amid them, efficient output refers to the evaluation of learning results and certification status, such as grades, certificates, and so on, to objectively evaluate whether the training program is efficient. Effectiveness refers to the competitiveness of industrial workers to obtain skill certificates, such as whether the skill certificates are recognized by the employer, and whether the employer can provide the corresponding salary, and rank, among others. Through the formulation of the unified vocational certificate system, the government makes enterprises and workers follow it.

Finally, pay attention to the development of third-party evaluation and transform government functions. The government or organization takes the lead and supervises the formulation of skills evaluation criteria so that the evaluation has binding and general characteristics. However, in the actual evaluation, it is difficult to exceed the average level of evaluation. Therefore, government departments need to change their functions in time, optimize the evaluation of industrial workers' skills, and implement government control, college teaching, and social evaluation. In this process, the development of third-party evaluation needs to integrate quality control methods such as job site evaluation, benchmarking, and self-assessment, to make skill evaluation more transparent and accurate, and ensure the healthy growth of industrial workers.

Figure 2. Output-oriented quality assessment system

5. Conclusion

The formation of industrial workers' skills plays an irreplaceable role in promoting social and economic development, improving labor productivity, and promoting the individual development of industrial workers. Especially in the digital age, the refined and intelligent development of industrial workers' skills has become an inevitable requirement of modern times. However, the current skill formation system of industrial workers faces many challenges, including imperfect skill training, social cognition, and personal factors, insufficient investment of enterprises, and lack of incentive mechanisms. These problems not only affect the upgrading of industrial workers' skills but also restrict the optimization and upgrading of industrial structures. Therefore, it is a systematic project to build a skills-forming system for industrial workers in the digital age, which requires the joint efforts of the government, enterprises, educational institutions, and all sectors of society. By improving the skill training system, raising social awareness, increasing enterprise investment, and strengthening skill evaluation and other measures, we can effectively promote the formation and upgrading of industrial workers' skills, and provide a solid talent guarantee for industrial development in the digital era. Simultaneously, it will also help improve the social status and quality of life of industrial workers, and promote overall social and economic progress.

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References

[1] Liu Y, Lan J, 2024, Algorithmic Rationality and Algorithmic Power in the Digital Age: Rethinking the Situation of People in Algorithmic Power. Inner Mongolia Social Sciences, 45(1): 107–114.

[2] Meng X, 2020, Of the Digital Age, Capitalist New Change. Journal of Social Science Research, 2020(6): 10. https://doi.org/10.3969/j.iSSN.1000-4769.2020.06.009

[3] Xu G, 2023, Reveal the Formation Mechanism of Artisan Spirit of Industrial Workers and Explore the Way of Cultivating Artisan Spirit of Vocational Colleges—Review on the Path and Strategy of Cultivating Artisan Spirit of Future Industrial Workers. Vocational Education Forum, 39(12): F0002.

[4] Chen W, Chen S, Lan H, 2023, Sleep Rhythm and Generation Mechanism of Young Industrial Workers from the

Perspective of Time and Space: Based on Interviews with 20 Industrial Workers in Chongqing. Chinese Youth Research, 2023(7): 5–14.

[5] Ma J, Chen L, 2024, The Role and Path of Vocational Education in Promoting the Cultivation of Artisan Spirit of Future Industrial Workers—An Analysis of the Research on the Cultivation Path and Strategy of Future Industrial Workers' Artisan Spirit. Vocational and Technical Education, 45(12): 68–71. https://doi.org/10.3969/j.iSSN.1008-3219.2024.12.013

[6] Lin J, 2024, New Trend of employment and career development of Industrial Workers. People's Forum, 2024(12): 35–37.

[7] Zhao X, 2024, Vocational Qualification Certificate System Serving the Construction of Skilled Society: Historical Context, Internal Logic and Practical Logic. Journal of East China Normal University (Educational Science Edition), 2024(4): 88–96.

[8] Cui X, 2023, The Mechanism, Practical Challenges and Case Experience of Lifelong Vocational Skills Improvement of Industrial Workers. Vocational and Technical Education, 44(19): 19–25.

[9] Qiu T, 2023, Skill Cultivation of Modern Industrial Workers: Development Path, Dilemma and Outlet—Based on the Observation of Apprenticeship Practice in a Manufacturing Enterprise. China Vocational and Technical Education, 2023(16): 89–96.

[10] Su H, Ren L, Feng T, et al., 2023, The Status Quo of Scientific Literacy of Industrial Workers in China and Measures to Improve it: An Empirical Study Based on the 12th Chinese Citizens' Scientific Literacy Sample Survey. Science Popularization Research, 2023(3): 31–39, 111.

[11] Fan S, Deng Y, 2023, Construction Path of Vocational Awareness Education Carrier for New Generation Industrial Workers from the Perspective of New Media. China Adult Education, 2023(15): 28–32.

[12] Qiu T, 2023, Practice Path of Workers' Vocational Skills Training Under Industrial Agglomeration: Based on Field Experience in N District of L City, Zhejiang Province. Vocational and Technical Education, 44(18): 61–67.

[13] Zheng W, Zhang T, 2023, From New Social Movement to Radical Pluralistic Democracy: A Review of the Political Philosophy of Laclau and Murphy. Science and Technology Management Studies, 43(21): I0023.

[14] Yang S, 2023, "Green" Industry Grows on "White Land"—Dongying Strives to Build the Whole Industrial Chain Ecosystem of Offshore Wind Power. Outlook, 2023(35): 64.

[15] Wang W, Xu J, 2024, Skilled Workers to Participate in the Dual Action of Technology Innovation and its Logic, Based on the Analysis of Printing Technology Evolution in Modern China Sociology. Exploration and Contention, 2024(6): 118–127 + 179.