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A Practical Study on the Construction of "Dual-Qualified" Teacher Teams in Vocational Undergraduate Education Empowered by Digital Technology

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Abstract: While the digital transformation brings new development opportunities to the field of vocational education, it also makes it face unprecedented challenges. In order to adapt to the trend of digital transformation, vocational undergraduate colleges need to improve their school-running level and promote educational reform by building "dual-qualified" teacher teams. Based on this, the author first analyzes the construction requirements of "dual-qualified" teacher teams and the common problems in specific operations, such as the weak practical teaching ability of full-time teachers, the imperfect teacher growth mechanism, and the insufficient in-depth school-enterprise cooperation. Then, aiming at the actual problems, it discusses the advantages and practical paths of building "dual-qualified" teacher teams in vocational undergraduate education empowered by digital technology, aiming to provide suggestions for the high-quality development of vocational education.

Keywords: Digital technology empowerment; Vocational undergraduate education; "Dual-qualified" teachers; Teacher team construction

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1. Introduction

With the advent of the digital era, the reform of vocational education continues to advance. How to enable digital technology to empower the construction of "dual-qualified" teacher teams and improve the level of teacher team construction has become a key issue that vocational undergraduate colleges need to focus on in their development. Building a "dual-qualified" teacher team that masters digital teaching skills and actively adapts to the trend of digital transformation conforms to the development needs of contemporary vocational education and is the response of vocational undergraduate colleges to changes in the environment and the times. The empowerment of digital technology in the construction of "dual-qualified" teacher teams in vocational

undergraduate education can improve teachers' digital literacy, promote the integration of industry and education, optimize the structure of teacher teams, and promote the innovation of teaching models, which has practical significance in many aspects for the development of vocational education.

2. Requirements for the construction of a "dual-qualification" teaching team

As a key force driving the digital transformation of vocational education, the level of teacher team construction largely determines the development level of vocational undergraduate education [1]. In response to the development trends of vocational education and its digital transformation, vocational undergraduate education needs to strengthen the construction of a "dual-qualification" teaching team, which should meet the following two requirements: First, balancing the improvement of teachers' knowledge systems and practical abilities. "Dual-qualification" teachers must possess solid professional theoretical knowledge, master the basic theories of their teaching disciplines, have a sound professional knowledge system, and understand cutting-edge industry developments. This ensures that they can explain knowledge in a simple and in-depth manner in the classroom and guide students to build a comprehensive knowledge framework [2]. At the same time, teachers should have rich industry practical experience and proficient professional skills. For example, teachers in mechanical manufacturing need to master knowledge such as mechanical principles and design theories, as well as skills in machine tool operation and mold design and manufacturing, so as to provide effective guidance for students' practical training activities. Second, creating conditions for teachers' continuous learning and self-improvement. At present, industries are developing rapidly, with new technologies, processes, and methods emerging constantly. This requires "dual-qualification" teachers to maintain an attitude of lifelong learning, continuously pay attention to industry dynamics, and actively participate in various training programs, academic seminars, and enterprise practice activities to keep their knowledge and ability structures up-to-date [3]. Through regular on-the-job training in enterprises, teachers can timely understand the latest production processes, technical standards, and management models in the industry, and then integrate this new knowledge and skills into teaching models to strengthen the connection between curriculum teaching and industry development. The construction of a "dual-qualification" teaching team should provide teachers with diversified learning platforms to promote their professional development [4].

3. Existing problems in the construction of "dual-qualification" teaching teams in current vocational undergraduate colleges

3.1. Weak practical teaching ability of teachers, affecting the improvement of teaching quality

The weakness of teachers' practical teaching ability is mainly reflected in their lack of front-line work experience in enterprises and insufficient understanding of enterprise requirements and industry development trends. Most teachers in vocational undergraduate colleges start teaching directly after graduating from universities. Although they have a solid foundation in professional theoretical knowledge, they lack practical experience, leading to insufficient understanding of real workplace environments and enterprise operations. This results in a disconnect between theory and practice, making it difficult for them to teach highly practical courses. Meanwhile, various fields have developed rapidly in recent years, and the update of relevant disciplinary knowledge has accelerated. This requires teachers to promptly enrich their practical experience to ensure the forward-looking nature of teaching content and the connection between talent training models and industry development. In fact, the

construction mechanism of "dual-qualification" teaching teams in many vocational undergraduate colleges is still inadequate, failing to fully meet the needs of teachers' practical ability development [5].

3.2. Imperfect teacher growth mechanism and lack of systematicness in training

Generally speaking, the teacher growth files in vocational undergraduate colleges are constructed around explicit indicators such as teaching competitions, research achievements, and teaching workload, while lacking implicit indicators related to practical teaching ability. Teachers in vocational undergraduate colleges face dual pressures of teaching and research, and are often busy with work. When time and energy conflict with educational work, they tend to focus on cultivating professional abilities related to explicit indicators, such as research achievements and research capabilities, to gain promotion and development opportunities. Colleges lack training programs for teachers' practical teaching ability, and the imperfection of the teacher growth mechanism is detrimental to the construction of "dual-qualification" teaching teams [6]. Some vocational undergraduate colleges organize temporary project training, arranging teachers to participate in rotations without adopting corresponding systematic supervision measures to form a systematic and comprehensive training mechanism for practical teaching ability, which hinders the development of teachers into "dual-qualification" teachers.

3.3. School-enterprise cooperation has limitations, restricting the exertion of part-time teachers' experience advantages

In the construction of the "dual-qualification" teacher team in vocational undergraduate colleges, school-enterprise cooperation is a key measure to adjust the structure of the teaching staff and improve the overall practical teaching ability of teachers. School-enterprise cooperation can provide the necessary platforms and channels for teachers to develop their practical teaching abilities, opening up the path for them to grow into excellent "dual-qualification" teachers. However, the current school-enterprise cooperation model still has certain limitations in the cultivation of the "dual-qualification" teacher team, resulting in the failure to give full play to the resource advantages of enterprises. For example, hiring part-time teachers from cooperative enterprises to teach in schools is an important means for vocational undergraduate colleges to adjust the structure of their teaching staff. However, the lack of detailed employment standards and the immature cooperative education model between full-time and part-time teachers have reduced the adaptability of part-time teachers to teaching positions. Part-time teachers from enterprises often have rich practical experience and master cutting-edge technologies, but their theoretical foundation is not solid enough, making it impossible to integrate theory with practice in teaching implementation. Moreover, they have obvious shortcomings in teaching evaluation and teaching design. Suppose vocational undergraduate colleges cannot effectively integrate the strengths of part-time and full-time teachers. In that case, it will be difficult for the experience of part-time teachers to be transformed into teaching resources [7].

3.4. The imperfect teacher assessment system affects their work enthusiasm

Currently, the teacher assessment system in vocational undergraduate colleges is usually built based on teacher titles, with corresponding assessment indicators set for different titles such as professors, associate professors, lecturers, and teaching assistants. Furthermore, colleges and universities also refer to the assessment results when arranging teacher promotions [8]. For "dual-qualification" teachers, there is a lack of detailed and clear assessment standards and incentive mechanisms, leading to slow progress in the construction of the "dual-qualification" teacher team. Some teachers fall into the misunderstanding that "the importance of theoretical knowledge teaching is higher than that of practical teaching" and do not attach sufficient importance to the

cultivation of practical teaching ability. In addition, the lack of incentive mechanisms can easily reduce teachers' enthusiasm to grow into "dual-qualification" teachers. Vocational undergraduate colleges should improve the teacher evaluation and incentive mechanism from the perspective of the integration of industry and education, and fully mobilize teachers' internal motivation to participate in the construction of the "dual-qualification" teaching team through a more scientific and reasonable assessment and evaluation system.

4. Advantages of digital technology empowering the cultivation of "dual-qualification" teacher teams in vocational undergraduate colleges

4.1. Improving teachers' digital literacy and accelerating their professional development

After entering the digital era, vocational education and digital technology have been continuously integrated, realizing changes in development methods and educational concepts. In this context, cultivating the "dual-qualification" teacher team in vocational undergraduate colleges should attach importance to the empowerment of digital technology and rely on various digital technologies to improve the cultivation effect. Compared with traditional training methods, digital technology can provide online training resources according to teachers' actual situations, such as training on information processing, courseware production, and the application of digital teaching tools, thereby meeting the differentiated needs of teachers. Online training has no restrictions on the number of participants, allowing teachers to independently arrange study time and locations and choose learning content according to their specific situations. It plays a very important role in helping teachers consolidate their theoretical knowledge and enhance their professional skills. Moreover, digital platforms have expanded communication channels for users, enabling teachers to interact online with scholars and experts at home and abroad to discuss issues related to vocational education development and scientific research, which helps teachers break through bottlenecks in teaching and scientific research and improve their professional literacy [9].

4.2. Deepening the integration of industry and education and enhancing teachers' practical teaching ability

The digital platform for integrating industry and education can further address issues such as high information exchange costs and spatial barriers in specific operations, and deepen the communication and cooperation between schools and enterprises in both depth and breadth. Relying on the platform, teachers can collect industry information, strengthen their understanding of the cutting-edge developments in the industry, and integrate relevant content into teaching models. This helps align teaching content with job positions and industry needs. For example, in response to industry development trends, advanced technologies such as virtual reality and artificial intelligence can be used to build teaching scenarios that include real work situations, allowing students to conduct independent exploration based on different scenarios and thereby enhancing the practicality of teaching. At the same time, the platform also facilitates interactive communication between teachers and enterprise experts, enabling in-depth discussions on issues related to disciplinary development, teaching implementation, and technological innovation. These communication activities play an important role in promoting teachers' understanding of disciplinary development and improving their practical teaching ability [10].

4.3. Coordinating the management of educational resources and promoting the optimization of the teaching staff structure

In the process of building a "dual-qualification" teaching staff, vocational undergraduate colleges can use

digital technologies to develop online courses and build digital educational resource databases, realizing the coordinated management of educational resources. This allows teachers to conveniently update and use teaching content and cases, as well as share and learn from experiences. In this way, the problem of repeated course construction can be more effectively avoided, and the development and application of high-quality educational resources can be promoted. In addition, colleges can use big data technology to collect and analyze information on industry development prospects, predict the demand for teachers in a certain major or discipline in the next few years based on the data analysis results, and then make corresponding adjustments to the construction of the "dual-qualification" teaching staff. Moreover, the analysis results of industry development prospects also provide a basis for teachers' knowledge reserves and ability training, and can guide teachers to strengthen self-learning and growth [11].

4.4. Innovating educational models and improving teaching quality

Innovation in educational models is an important engine for promoting the improvement of vocational education quality. In recent years, new teaching models that have been widely favored by teachers and students, such as artificial intelligence-assisted teaching, flipped classrooms, blended teaching, and case teaching, are all closely related to the development of digital technologies [12]. After teachers optimize and innovate these models through digital technologies and apply them individually in daily teaching, they can create better conditions for students to explore and internalize knowledge, achieving a significant improvement in teaching quality. For example, big data can be used to strengthen the analysis of students' learning situations, optimize the construction of flipped classrooms, and provide students with learning resources and teaching services based on more accurate analysis results of their learning situations.

5. Practical paths for building a "dual-qualified" teacher team in vocational undergraduate education empowered by digital technology

5.1. Strengthening foundations: cultivating digital literacy and enhancing teaching capabilities

5.1.1. Accelerating the development of teachers' digital literacy

This requires teachers to strengthen their study of relevant policy documents, understand the composition of teachers' digital literacy, cultivate a positive digital awareness and attitude, and enhance their subjective willingness to acquire learning resources, design and practice teaching, and conduct teaching research and exploration through digital technologies. In this way, a strong motivation for cultivating digital literacy can be formed. Furthermore, teachers should adhere to correct value orientations and political directions, take the integration of "all-round education for all students in all processes" and digital teaching as a starting point, and explore new ways and methods to promote students' all-round development in morality, intelligence, physical fitness, aesthetics, and labor through digital teaching. By learning theoretical knowledge and engaging in educational practice, teachers can deepen their understanding of digital literacy and digital teaching concepts, and through various beneficial explorations, effectively improve their own digital literacy.

5.1.2. Enhancing the capability of digital teaching

On one hand, teachers need to develop the ability to use digital technologies to optimize teaching models so as to meet students' diverse learning needs. Considering the inherent differences in students' learning preferences and zone of proximal development, teachers should conduct academic situation analysis through big data to

accurately grasp students' learning dynamics, provide services tailored to their personalized development needs, and truly implement the principle of "teaching students in accordance with their aptitude." Big data can conduct comprehensive and in-depth analysis of the massive data generated during students' learning processes, helping teachers accurately understand the academic situation, such as which knowledge points students have not mastered solidly and what their strengths and weaknesses are in the learning process. Based on accurate data analysis results, developing targeted teaching resources, designing teaching processes, and providing customized teaching services will help improve students' learning quality. On the other hand, teachers should cultivate the ability to carry out online teaching, blended teaching, and diversified teaching evaluation, so as to adapt to the trend of educational reform and accelerate the innovation of teaching models. These advanced teaching models break the limitations of time and space, enabling students to access high-quality educational resources and complete learning tasks anytime and anywhere. Teachers need to master the usage skills of online teaching platforms proficiently, carefully design online courses, and provide students with rich and diverse learning experiences through live broadcasting, recorded lectures, online interactions, and other forms, while ensuring that online teaching and offline teaching are connected and mutually reinforcing [13].

5.1.3. Improving teachers' human-machine collaboration ability

In the digital era, for "dual-qualified" teachers, human-machine interaction and collaboration ability are an essential part of their professional competence. In the process of cultivating the "dual-qualified" teacher team, it is necessary not only to include the cultivation of this ability in teacher training but also to attach importance to the application of human-machine collaboration in daily teaching, thereby changing teachers' knowledge and ability structure and enhancing the enabling role of digital technology in vocational education. Firstly, it is necessary to build a human-machine interaction platform to support real-time sharing and efficient exchange of information. A digital human-machine interaction platform can serve as a channel for transmitting knowledge and information, providing technical support for the storage, transmission, sharing, transformation, and decomposition of knowledge and skills. Teachers should master the application skills of the platform proficiently, strengthen their specialized abilities, improve their knowledge structure, and actively develop new platform functions and explore new application methods in practice, so as to build a "tripartite" interaction pattern involving students, digital mechanical terminals, and teachers.

Secondly, based on the human-machine collaboration function of the platform, it is necessary to realize the effective transmission of professional knowledge, skills, and experience between teachers and students, and then form a new education ecosystem with harmonious human-machine coexistence, providing better conditions for students to learn professional knowledge and exercise professional abilities. Teachers should view changes in the education ecosystem from the perspective of integration of industry and education, continuously optimize the interaction process between digital mechanical terminals and students, and provide support and help at appropriate times to promote smoother interaction between the two.

5.2. Improving quality: enhancing professional sci-tech innovation capabilities and deepening industry-education integration

5.2.1. Enhancing professional practical capabilities

The development of a "dual-qualification" teaching team should adopt the advanced approach of "bringing in and going out" to promote a two-way flow of talents between vocational undergraduate colleges and enterprises. For example, through various means such as project cooperation, research project studies, and part-time

teaching, skilled craftsmen, technical personnel, and managers from enterprises can be invited to vocational undergraduate colleges to pass on their skills and experience. These frontline workers not only possess solid professional knowledge but also have rich practical experience and superb skills. When they enter classrooms and training bases, they teach students real-world work cases, technologies, and operational methods, which can strengthen the connection between talent cultivation and actual production. Meanwhile, "going out" is also crucial for building the "dual-qualification" teaching team. Vocational undergraduate colleges should select professional teachers to participate in industry-university-research training at enterprise practice bases, as well as provincial and national "dual-qualification" teacher training bases. This encourages teachers to improve their practical skills through part-time positions and research and development projects. In addition, the development of the "dual-qualification" teaching team should rely on industrial colleges and take the on-site engineer training program as a starting point. It is necessary to strengthen teachers' learning of new standards, new processes, and new technologies, and encourage them to incorporate these into talent cultivation models as important supplements [14].

5.2.2. Enhancing sci-tech innovation service capabilities

To further consolidate the foundation of vocational undergraduate education reform through the development of the "dual-qualification" teaching team, efforts can be made from the following four aspects to enhance teachers' sci-tech innovation service capabilities: Firstly, strengthen cooperation between government, industry associations, enterprises, and colleges, and expand the scope of such cooperation. For instance, introduce research projects in line with the trend of digital transformation. By relying on these research projects to help enterprises solve technical problems in their development, teachers can cultivate their technical research and development capabilities and gain a better understanding of industrial development trends. Secondly, encourage teachers to take on temporary or follow-up posts at the frontline of enterprises, allowing them to "learn by doing and do by learning." Teachers can use their knowledge and technical advantages to solve production problems for enterprises, and transform typical cases into teaching projects, thereby promoting mutual improvement between teaching and research. Thirdly, the teacher appointment and assessment mechanism must be dynamically adjusted. Guide and encourage "dual-qualification" teachers to participate in scientific research and innovation activities, prompting them to continuously enrich their disciplinary knowledge and improve their teaching level. Fourthly, focus on new productive forces, cultivate teachers' digital literacy, and enhance their innovative capabilities in digital production and teaching. For example, teachers should be encouraged to participate in school-enterprise joint research and development projects, proactively understand and solve digital transformation challenges in the development of new productive forces, and promote the resulting scientific and technological innovation achievements to the industrial chain.

5.3. Innovation: developing training mechanisms and innovating professional development

5.3.1. Strengthening the supply of digital training

In the process of empowering the cultivation of "dual-qualified" teacher teams in vocational undergraduate colleges through digital technology, it is necessary to strengthen the supply of digital training resources, which includes the development of training resources and the enrichment of training content. For example, establishing educational digital training packages to realize the sharing of teacher training resources, intelligent recommendation, evaluation, and management, so as to provide convenience for teachers to learn new concepts,

technologies, and models; incorporating new teaching concepts, skills related to "dual-qualified" teachers, as well as cutting-edge disciplinary knowledge and skills into the training scope to enrich the training content; formulating a reasonable annual training plan according to the development of the "dual-qualified" teacher team in the college, and conducting full-coverage, systematic, and precise digital teaching ability training [15]. In addition, the effective implementation of teacher team training activities is inseparable from the innovation of training models. Vocational undergraduate colleges should promote the digitization of training models, such as building digital learning platforms, setting up special research sections for digital teaching models on these platforms to promote the co-construction and sharing of digital teaching resources; adopting a grid-based teaching training system to realize the construction layout and overall deployment at the "national-provincial-college" level, so as to promote the overall improvement of educational digital teaching and practical teaching levels.

5.3.2. Improving digital training evaluation

The empowerment of digital technology should not only be reflected in teaching innovation and teacher training but also in the evaluation of the construction of "dual-qualified" teacher teams, so as to provide a reliable basis for the subsequent teacher training work. Firstly, it is necessary to rely on big data to build an evaluation model for teacher training and cultivation effects, to accurately diagnose and analyze the development of "dual-qualified" teachers; secondly, it is necessary to construct an evaluation model for the teacher team management mode to conduct dynamic analysis of teacher management work; finally, it is necessary to improve the accuracy and dynamics of teacher evaluation, evaluate and predict the actual situation of teachers' mastery of digital technology, and based on this, provide teachers with learning platforms and organize them to carry out reflective, personalized, and autonomous learning. A sound digital training evaluation system can comprehensively improve teachers' digital teaching ability and significantly enhance the quality and effectiveness of vocational undergraduate education. For the cultivation of "dual-qualified" teacher teams in vocational undergraduate colleges, digital training evaluation should be carried out through the above three measures, so as to accurately and comprehensively assess teachers' knowledge, skills, and attitudes in digital teaching, and provide the necessary policy support and training resources for them to improve their digital literacy and grow into qualified "dual-qualified" teachers.

5.4. Governance: Improve the institutional system and promote digital-intelligent governance

The digital-intelligent governance of the "dual-qualification" teacher team is first reflected in the construction of information platforms. With the support of an information management platform, teachers can conveniently use information technology for teaching implementation and industrial development information collection, thereby deepening the integration of industry and education and improving the quality of talent training. In cultivating "dual-qualification" teachers in vocational undergraduate colleges, it is necessary to build digital collaborative platforms such as "industry-education integration communities" and "city-level industry-education consortia" against the background of the "digital-intelligent" era. These platforms will integrate teacher training resources from enterprises, industrial parks, industries, and governments to establish a multi-stakeholder collaborative training model and accelerate teachers' professional development. Secondly, the digital-intelligent governance of the "dual-qualification" teacher team should focus on standardization and institutional construction. For example, colleges and universities should establish multi-department collaborative digital teaching research

organizations, improve management and support systems for digital teaching, and clarify methods for identifying and assessing digital teaching capabilities. Through clear and improved standards, teachers can be guided to enhance their enthusiasm for independent learning, participation in research projects, and training activities. Finally, the digital-intelligent governance of the "dual-qualification" teacher team should be reflected in the digitization of the governance system, realizing the two-way empowerment of governance systems and information technology to improve the rationality of resource allocation. For instance, building a service platform for the "dual-qualification" teacher team with multiple modules for data processing, opinion exchange, training promotion, and resource sharing.

6. Conclusion

In summary, vocational undergraduate colleges should attach importance to the construction of the "dual-qualification" teacher team in their development and empower it with digital technology, so as to build a team of "dual-qualification" teachers who master digital teaching skills and actively adapt to the trend of digital transformation. However, in practice, there are still problems such as weak practical teaching ability of full-time teachers, imperfect teacher growth mechanisms, and insufficient in-depth school-enterprise cooperation. The construction of the "dual-qualification" teacher team in vocational undergraduate colleges should address these problems by strengthening digital technology empowerment, and accelerate teachers' professional development through effective measures of strengthening foundations, improving quality, promoting innovation, and enhancing governance.

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