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A Literature Review on the Cultivation of Vocational Undergraduate Talents in China: Essential Differences and Compatibility Requirements

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Abstract: As a key initiative in China's efforts to build a modern vocational education system, the positioning and model of talent cultivation in undergraduate-level vocational education (vocational undergraduate) have become an important issue. Based on a systematic literature review, this paper aims to clarify the essential differences between vocational undergraduate talent cultivation and regular undergraduate and higher vocational education, and to analyze its key compatibility requirements. The study finds that vocational undergraduate education inherently possesses dual characteristics of "vocational" and "higher education," following the logic of the work system, and aims to cultivate high-level technical and skilled talents who can engage in technological integration and innovation as "domain implementers." This stands in sharp contrast to the discipline-oriented knowledge of regular undergraduate education and the skill-oriented operation of higher vocational education. The successful implementation of vocational undergraduate talent cultivation requires meeting three compatibility requirements: alignment with industrial development needs, adaptation to learners' individual sustainable development, and integration with the modern vocational education system. Practical approaches include clarifying cultivation positioning based on technical logic, innovating industry-education integration models, building competency-oriented curriculum systems, and developing a "dual-qualified" faculty team. Despite challenges such as social recognition and the depth of industry-education integration, the future development of vocational undergraduate education requires strengthening its distinctive characteristics, deepening school-enterprise cooperation, advancing digital transformation, and improving the vocational education system. The conclusion of this paper argues that vocational undergraduate talent cultivation is a systematic project, and its high-quality development is crucial to supporting national strategies and socio-economic development.

Keywords: Vocational undergraduate education; Talent cultivation; Essential differences; Adaptability requirements; Industry-education integration

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1. Introduction

With the continuous improvement of China's modern vocational education system, undergraduate-level vocational education (hereinafter referred to as "vocational undergraduate") has become a hot topic in higher education as an important breakthrough in the typological development of vocational education. Since the pilot program for undergraduate-level vocational education was launched in 2019, vocational undergraduate education has made significant progress in theoretical research and practical exploration [1]. As an emerging type of education, vocational undergraduate education still faces numerous controversies and challenges in terms of talent cultivation positioning, models, and pathways. Based on existing literature, this paper systematically combs through the essential differences between vocational undergraduate talent cultivation and regular undergraduate and vocational college education, and conducts an in-depth analysis of the compatibility requirements for vocational undergraduate talent cultivation, aiming to provide references for the theoretical research and practical development of vocational undergraduate education.

2. The essential attributes and positioning of vocational undergraduate talent cultivation

2.1. The type attributes and hierarchical characteristics of vocational undergraduate education

Vocational undergraduate education possesses dual attributes of "vocational orientation" and "higher education quality" [2]. As a vocational education category, it adheres to the principles and characteristics of vocational training. At the same time, as a vital component of higher education, it embodies the fundamental features of undergraduate programs [3]. This dual nature requires vocational undergraduate education to balance the practical aspects of vocational training with the academic rigor of higher education, achieving an organic integration of "type" and "level."

Vocational undergraduate education fundamentally differs from applied undergraduate education in its talent cultivation orientation. Applied undergraduate education follows disciplinary logic to develop engineering professionals, while vocational undergraduate education follows the logic of the work system to cultivate technical professionals [4]. Vocational undergraduate talents must not only master solid theoretical knowledge but also possess advanced technical skills and strong technical application capabilities [5].

2.2. The essential differences in talent cultivation between vocational undergraduate programs, regular undergraduate programs, and higher vocational specialized programs

2.2.1. Differences from regular undergraduate education

General undergraduate education emphasizes systematic and comprehensive disciplinary knowledge, primarily aimed at cultivating academic talents, while vocational undergraduate education focuses on the application and practicality of technical knowledge, with the main goal of developing skilled professionals [6]. In terms of knowledge systems, general undergraduate education centers on disciplinary knowledge, whereas vocational undergraduate education prioritizes technical knowledge. Regarding competency requirements, general undergraduate education emphasizes theoretical analysis and scientific research capabilities, while vocational undergraduate education highlights technical application and practical innovation skills [7].

2.2.2. Differences from higher vocational education

Vocational undergraduate education represents an advanced stage of higher vocational education. While both

fall under the vocational education system, they differ significantly in their talent development objectives. Higher vocational education primarily cultivates technical improvers, whereas vocational undergraduate education focuses on developing domain implementers [7]. Specifically, higher vocational graduates excel in technical execution, while vocational undergraduates specialize in technological integration and innovation [8]. In terms of knowledge depth and breadth, vocational undergraduate education requires systematic mastery of technical theories, coupled with enhanced R&D capabilities and process design proficiency [9].

From the perspective of technical essence, there are distinct technical logic differences in talent cultivation positioning across vocational education levels. Based on Brian Arthur's theory of technical essence, secondary vocational education cultivates practical technicians, higher vocational education develops technical improvers, vocational undergraduate education trains domain implementers, vocational master's education fosters domain planners, and vocational doctoral education nurtures domain innovators [7]. This technical stratification determines the positioning differences in talent cultivation across vocational education levels and provides a theoretical basis for vocational undergraduate education.

3. Compatibility requirements for vocational undergraduate talent cultivation

3.1. Compatibility with industrial development

The cultivation of vocational undergraduate talents must closely align with industrial development needs to enhance their capacity for serving industrial advancement [6]. With the deepening of industrial transformation and upgrading, as well as the advancement of new technological revolutions, the demand for high-level technical and skilled professionals has become increasingly urgent. Vocational undergraduate education should target high-end industries and advanced sectors, aiming to cultivate high-quality technical and skilled talents who can meet the requirements of new technologies, processes, and standards [10].

The alignment between vocational undergraduate education and industrial development is reflected in three key aspects: First, the alignment of program offerings with industry demands, requiring dynamic adjustments to academic structures based on evolving industry trends. Second, the alignment of curriculum content with job requirements necessitates the integration of new technologies, processes, and standards into teaching materials. Third, the alignment of training processes with production workflows, which demands deeper industry-education collaboration and school-enterprise partnerships to achieve seamless integration between talent development and industrial needs [2].

3.2. Compatibility with individual development

Vocational undergraduate education should not only meet industry demands but also cater to learners' individual development needs [2]. It must prioritize students' holistic and sustainable growth, cultivating high-caliber professionals who master advanced technical skills while demonstrating strong professional ethics and innovative capabilities [3].

The alignment between vocational undergraduate education and individual development requires prioritizing students' career growth and lifelong development. On one hand, it should emphasize cultivating technical skills to equip students with job competencies. On the other hand, it should focus on nurturing professional ethics and innovative thinking to lay the foundation for career advancement and job transitions [6]. Additionally, it must accommodate students' academic aspirations by providing pathways for those seeking further education [11].

3.3. Compatibility with the construction of the education system

The cultivation of vocational undergraduate talents must align with the requirements of the modern vocational education system construction, achieving seamless integration across secondary vocational education, higher vocational education, vocational undergraduate programs, and even professional master's education [1]. Vocational undergraduate education serves as a crucial bridge in the modern vocational education system, not only effectively connecting with higher vocational education but also laying the foundation for vocational graduate education [7].

The compatibility requirements for vocational undergraduate talent cultivation and education system construction necessitate the establishment of a vertically integrated and horizontally interconnected talent development mechanism. Vertically, it is essential to refine the seamless transition system from secondary to higher education, ensuring continuity and progression in talent development. Horizontally, efforts should focus on bridging vocational and general education, implementing credit transfer mechanisms and qualification framework systems to broaden career advancement pathways [12].

4. Practical approaches to cultivating talents in vocational undergraduate programs

4.1. Talent development orientation based on technical logic

According to the theory of technical essence, vocational undergraduate education should position itself as a "domain architect"—cultivating high-level technical professionals capable of engaging in design, standardization, and engineering activities [7]. This positioning requires graduates to demonstrate three core competencies: (1) mastery of systematic and comprehensive technical theories; (2) the ability to translate technical knowledge into practical solutions; (3) the capability to resolve complex technical challenges in frontline production environments [5].

Based on this positioning, the cultivation of vocational undergraduate talents should focus on enhancing both technical and theoretical literacy and practical abilities. In terms of theoretical teaching, efforts should be made to strengthen technical discipline development and establish a theoretical teaching system centered on technical knowledge. For practical teaching, industry-education integration should be deepened by building collaborative platforms between schools and enterprises, thereby improving students' technical application skills and practical innovation capabilities [13].

4.2. Innovation in talent cultivation models through industry-education integration

Industry-education integration serves as the fundamental pathway for cultivating talent in vocational undergraduate programs [14]. Vocational undergraduate institutions should innovate their industry-education collaboration mechanisms by jointly establishing industry-academia partnerships, such as industrial colleges and collaborative innovation centers, to achieve deep alignment between talent development and industrial demands [15]. By integrating enterprises and research into education, real-world projects and cutting-edge technologies from industries can be incorporated into the teaching process, enabling students to learn and grow in authentic professional environments [16].

In the construction of platforms such as modern industrial colleges, it is important to establish a governance mechanism of "consultation, co-construction, and sharing," clarify the rights and obligations of both schools and enterprises, and achieve resource sharing and mutual benefit [17]. At the same time, it is necessary to actively explore the China-characteristic apprenticeship system, promote dual-subject education by schools and

enterprises, and enhance the relevance and effectiveness of talent cultivation [18].

4.3. Building a curriculum system oriented by professional competence

Courses serve as the core vehicle for cultivating talent in vocational undergraduate education [5]. The curriculum system for vocational undergraduate programs should be competency-oriented, aligning with occupational standards and job requirements to establish a course structure grounded in technical knowledge systems [19]. These courses should encompass technical disciplines, competency-based courses, and project-based courses, forming a curriculum system that integrates theory with practice and balances knowledge with skills.

In terms of curriculum content, it is essential to incorporate new technologies, processes, and standards into teaching materials in a timely manner to maintain the relevance and forward-looking nature of the curriculum [20]. Regarding curriculum implementation, efforts should be made to advance project-based and modular teaching reforms, strengthen practical teaching components, and enhance students' technical application skills and job competencies [21].

4.4. Building a high-level team of "dual-qualified" teachers

Teachers are a key element in cultivating talent for vocational undergraduate programs [22]. Vocational undergraduate institutions should build a high-level "dual-qualified" faculty team, combining solid theoretical foundations with rich practical experience [23]. By optimizing the faculty structure through internal training and external recruitment, institutions can enhance teachers' professional competence and teaching capabilities [24].

Under the framework of school-enterprise collaborative education, it is essential to establish and improve the teacher enterprise practice system. This involves encouraging teachers to undertake rotational assignments in enterprises, participate in technology R&D and services, and enhance their practical skills [25]. Additionally, enterprises should actively recruit engineers and skilled technicians as part-time instructors to form a combined full-time and part-time faculty team [26].

5. Challenges and prospects of vocational undergraduate talent cultivation

5.1. Major challenges faced

The cultivation of vocational undergraduate talents still faces multiple challenges. Firstly, social recognition remains low, as traditional cultural concepts hinder the enhancement of vocational undergraduate education's societal acceptance [27]. Secondly, the integration of industry and education lacks depth, with school-enterprise cooperation remaining superficial and failing to achieve genuine collaborative talent development [14]. Thirdly, faculty development lags behind, lacking dual-qualified teachers proficient in both theory and practice [22]. Lastly, the boundaries between vocational undergraduate programs and regular undergraduate or vocational college programs remain blurred, resulting in insufficiently distinctive talent cultivation characteristics [8].

Furthermore, vocational undergraduate education faces systemic challenges, including incomplete institutional frameworks and inadequate regulatory mechanisms. Within the modern vocational education system, the transition mechanisms between vocational undergraduate programs and secondary vocational education, as well as higher vocational colleges, remain underdeveloped, while integration channels with general education remain insufficiently smooth [28]. At the institutional level, standardization systems and evaluation mechanisms for vocational undergraduate education still require further refinement [11].

5.2. Future development directions

The future development of vocational undergraduate education should focus on four key directions: First, strengthening distinctive characteristics by clarifying the positioning and features of vocational undergraduate programs to prevent "academic drift" [29]. Second, deepening industry-education integration through innovative school-enterprise collaboration mechanisms to enhance the relevance and adaptability of talent cultivation [15]. Third, advancing digital transformation by integrating digital technologies throughout the talent development process to nurture high-quality technical professionals for the digital economy [30]. Fourth, improving the modern vocational education system by establishing a cohesive talent development mechanism that connects secondary, higher, and undergraduate education while bridging vocational and general education [31].

Under the background of building a strong education nation, vocational undergraduate education should closely align with national strategic needs, serve industrial transformation and upgrading, and cultivate more high-quality technical and skilled talents, master craftsmen, and national craftsmen [32]. At the same time, it should actively participate in global vocational education governance, promote the experience and model of China's vocational undergraduate education, and enhance international influence [1].

6. Conclusion

The cultivation of vocational undergraduate talents constitutes a systematic endeavor, requiring comprehensive design and reform across multiple dimensions, including educational philosophy, positioning, models, and pathways. As a pivotal advancement in the typological development of vocational education, vocational undergraduate programs distinguish themselves from both the academic-oriented approach of general undergraduate education and the skill-focused orientation of higher vocational education. Instead, they emphasize practical application and innovation in technology, aiming to develop high-level technical and skilled professionals.

The cultivation of vocational undergraduate talents should further clarify its positioning, highlight distinctive features, deepen industry-education integration, innovate training models, refine the system structure, and enhance adaptability to provide robust talent support for economic and social development. Meanwhile, it is essential to strengthen theoretical research, summarize practical experience, continuously improve the theoretical framework and practical models of vocational undergraduate education, and promote its high-quality development.

The exploration of vocational undergraduate talent cultivation is still in its infancy. It requires the joint efforts of the government, schools, and industry enterprises to continuously improve the institutional environment, innovate training models, and optimize resource allocation. Only then can the distinctive characteristics of vocational undergraduate education and its talent cultivation goals be truly realized, contributing positively to the construction of a modern vocational education system and the development of a strong educational nation.

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Disclosure statement

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