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Research on the Mechanism and Path of the Cluster Linkage of Higher Vocational Colleges Going Global and Cross - border School - enterprise Cooperation: Taking Angola - China Engineering and Technology College as an Example

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Abstract

A single higher vocational college going global to Africa faces multiple structural dilemmas, and the cluster linkage of multiple colleges has become a new paradigm for vocational education going global. Taking Angola - China Engineering and Technology College as an example, this paper systematically analyzes the operating mechanism and practical path of the cluster linkage of multiple colleges going global and cross - border school - enterprise cooperation. The research finds that cross - school collaboration, school - enterprise linkage, and communication and coordination are important mechanisms for the cluster of multiple colleges going global. Building a multi - school collaborative system, deepening the integration of industry and education, strengthening cross - cultural adaptation, and improving a multi - dimensional guarantee system can effectively solve the shortcomings of a single college going global, and achieve a systematic layout and sustainable development of vocational education going global. The cluster linkage of multiple colleges can accurately meet the local talent needs of Chinese - funded enterprises in Africa, providing replicable experience for China - Africa vocational education cooperation and vocational education serving the "Belt and Road" Initiative.

Keywords

Vocational Education Going Global; School - Enterprise Cooperation; Cluster Linkage; Higher Vocational Colleges; Angola

1. Introduction

Against the backdrop of the in - depth advancement of the Belt and Road Initiative

and the reconstruction of the global industrial chain, the internationalization of vocational education has become an important means to serve the national strategy and support the overseas layout of Chinese - funded enterprises. In January 2024, the Outline of the Plan for Building a Strong Education Country (2024 - 2035) issued by the Communist Party of China Central Committee and the State Council clearly proposed to "improve the international cooperation mechanism of industry - education integration and school - enterprise collaboration in vocational education and deepen the development of brands such as Luban Workshops", elevating the opening - up of vocational education to the level of national strategy.Africa, as an important direction of the Belt and Road Initiative and a key region for building a community with a shared future for mankind, has an especially urgent demand for vocational education. Currently, African countries generally face the dilemma of a skills deficit, with a large gap in skilled talents. The continuous expansion of the investment scale of Chinese - funded enterprises in Africa has exacerbated the supply - demand contradiction of local skilled talents. Against this background, vocational education cooperation between China and Africa has been entrusted with the strategic mission of solving the skills dilemma in Africa and promoting the reconstruction of the human capital system in the Global South, and is now facing unprecedented development opportunities.

Cross - border school - enterprise cooperation is the core path for the internationalization of vocational education. Chinese higher vocational colleges have crossed national borders to form a collaborative education community with Chinese-funded enterprises investing and operating in Africa and local educational institutions in the host countries. This has achieved the transnational connection of the education chain, talent chain, and industrial chain, effectively alleviating the "labor shortage" of Chinese-funded enterprises and the "employment difficulty" of African youth, and promoting the internationalization of the integration of industry and education.

Looking back at the practical process of China's vocational education going global, in the early days, it was mostly carried out by single schools. Although this model has advantages such as high decision - making efficiency and flexible actions, it has exposed structural shortcomings when facing the complex educational environment in Africa. The resource endowment of a single school is limited, making it difficult to meet the diversified talent needs of Chinese - funded enterprises. The cost of independently dealing with cross - cultural differences and policy barriers is high, and the risk - resistance ability is insufficient. School - enterprise cooperation mostly stays at the level of practical training or short - term training, lacking a long - term collaborative mechanism, and its sustainability is severely tested.

To overcome the bottlenecks of single - school going global, in recent years, domestic higher vocational colleges have tried to "go out" through multi - school cooperation, forming a cluster - linkage of multiple entities including the

government, industries, enterprises, and colleges. Through resource sharing, risk sharing, and win - win interests, they have achieved a leap from "single - point breakthrough" to "systematic layout". This experience and practice is in line with the national policy orientation and also conforms to the development requirements of vocational education during the "15th Five-Year Plan" period, which are "scale and structure optimization and deepening of international cooperation".

2. Review of Existing Research

The cooperation in vocational education between China and Africa has a history of over a hundred years. Looking at the existing research, it mainly covers the following three aspects:

2.1. The History and Current Situation of China-Africa Vocational Education Cooperation

Since the establishment of the "China-Africa Cooperation Forum" in 2000, China-Africa vocational education cooperation has been advancing at a rapid pace, forming a multi-level, multi-field, multi-form, and multi-party cooperation pattern[1]. From a macro perspective, currently, Africa is facing multiple development challenges such as sluggish economic transformation and intensified pressure from technological revolution on skill iteration. China-Africa vocational education cooperation has become an important force driving African industrialization and China-Africa cooperation [2]. Strengthening bilateral and multilateral vocational education cooperation, vocational education is being developed into an international public good [3]. This has significant value in enhancing political mutual trust and deepening cultural exchanges [4]. The large-scale overseas expansion of China's vocational education to cultivate local technical and skilled talents in Africa holds unique potential. However, the existing conditions of African local industries, the quality of education, and the challenges faced by China's own vocational education constitute the key bottlenecks for the improvement of internationalization levels [5]. In terms of the practical implementation, the construction experience of the African Lu Ban Workshops, such as the optimization of the layout from points to areas, the alignment of professional settings with industrial demands, and the diversification of service functions, has pointed out the direction for the continuous deepening of China-Africa vocational education cooperation [6]. It has achieved remarkable results in talent cultivation, teacher training, vocational education system alignment, and economic, trade and cultural exchanges. However, it still faces problems such as a shortage of frontline teachers, reliance on China for funds, and insufficient localization of teaching resources [7]. Chinese vocational education is entering Africa, and cultivating high-quality technical and skilled talents is a "soft" pillar for Africa's industrialization development [8]. The practice in Zhejiang Province has formed

three models: school-enterprise cooperation, vocational education alliance, and international cooperation [9]; After many years of development, China-Africa vocational education cooperation has formed a practical pattern of project-based operation, collaborative development, and diversified participation. However, efforts are still needed to build a China-Africa vocational education community through paths such as strengthening cooperation concepts, innovating practice approaches, deepening content construction, and establishing a collaborative framework [10].

2.2. Single-school Outbound Expansion and Clustered Multi-school Outbound Expansion

Universities across China have carried out a series of explorations based on local conditions, achieving remarkable results. In terms of single-school outbound expansion, Weifang Vocational College has explored the model of China-Africa vocational education cooperation through assistance in Africa [11]; The China-Africa (Benin) Vocational Education College has improved its operation and management mechanism, jointly built an international teaching staff team, and focused on students' experiential learning, achieving outstanding educational performance [12]; Henghua Vocational College has explored the combination of market and education, taking a sustainable development path that is neither industrialized nor administrative [13]; Lu Ban Workshop continuously optimizes the spatial distribution of its educational operations in Africa, providing a basis for decision-making on cross-border educational layout [14]. Ningbo Vocational and Technical College enhances its internationalization level by expanding, accelerating and deepening the collaboration between China and Africa in vocational education [15]. AVIC International Complete Equipment Company has established a four-stage integrated development model featuring "in-depth research, efficient implementation, lean operation, and diversified empowerment" [16]. In terms of multi-university cluster collaboration, Chongqing City Management Vocational College took the lead in jointly launching the China-Africa vocational education cooperation project with 7 vocational colleges in Chongqing, developing internationalized shared English-language course resources[17]; The Mongolian Mechanical and Electrical Vocational and Technical College has established an international platform, coordinated professional output standards, and constructed resources to carry out teacher training, thereby forming an international cooperation model for equipment manufacturing-related majors and a relatively complete professional construction solution [18]; Fujian Shipbuilding and Transportation Vocational College has established various vocational education cooperation training platforms, explored a technical and skill-oriented talent cultivation mechanism for cross-border training and mobility [19]. Zhengzhou Information Technology College has collaborated with Kampala International

University in Uganda to establish a SMART learning support service system. Through digital empowerment, they have reconstructed key scenarios, restructured operation models, and reshaped value concepts, thus opening up a new path for China-Africa vocational education cooperation [20].

2.3. Cross-border School-Enterprise Cooperation and Multi-Party Collaborative Participation

Cross-border school-enterprise cooperation is the core realization form of China-Africa vocational education cooperation. Its essence lies in promoting cross-border connections between the education chain, talent chain and industry chain. Currently, China-Africa vocational education cooperation has formed three practical types: government-led cooperation, institution-led cooperation and enterprise-driven cooperation. It presents characteristics such as respecting sovereignty, adapting to the economy, policy guidance and mutual benefit and cooperation [21]. Chinese enterprises in Africa—such as those operating in Ethiopia—face a mismatch between their talent demands and the talent cultivation mechanisms of local vocational colleges, and local employees often lack adequate technical competencies [22]. Chinese enterprises investing in Africa have participated in the cooperation in vocational education and training between China and Africa. This not only helps African countries alleviate the problem of youth unemployment from the supply and demand perspectives, but also promotes economic and trade exchanges as well as cultural and people-to-people interactions between China and Africa [23]. The power industry colleges have formed a new model of "government guidance, industry leadership, enterprise construction, and college education" for overseas expansion under the organization of the China Electricity Council [24]; Although African Lu Ban Workshops have played a continuous role in supporting African vocational education development and international production capacity cooperation, they need to strengthen top-level design, optimize organizational structure and strengthen legal thinking [25].

2.4. Research Review

Overall, based on the existing research, the academic community has accumulated rich theoretical achievements and experience materials in terms of the strategic value, practical models and operational mechanisms of China-Africa vocational education cooperation. However, there are still some shortcomings: Most of the existing studies focus on the case analysis of single schools going global or a single project (such as the Lu Ban Workshop), lacking systematic exploration of the organizational forms and operational mechanisms of multi-school collaboration, cluster linkage and cross-border school-enterprise cooperation; Although the existing literature involves multi-party collaboration of "government - industry - enterprise - school", it does not pay sufficient attention to the mechanism of

resource integration and risk sharing between leading schools and participating schools; The transformation process from "single school going global" to "cluster linkage" and its driving factors have not yet formed a complete explanatory framework. This study takes Anzhong Engineering Technology College as a typical case, focusing on the paradigm shift from "single school going global" to "cluster linkage", systematically analyzing the core mechanisms and practical paths of multi-school collaboration and cross-border school-enterprise cooperation, striving to reveal the generation logic and organizational advantages of multi-school cluster linkage, and making up for the fragmented limitations of single-school going-global research, deepening the theoretical understanding of cross-border school-enterprise cooperation mechanisms, and providing practical references for the service of vocational college cluster linkage for Chinese enterprises and promoting China-Africa cooperation.

3. Anzhong College of Engineering and Technology: A Case of Multi-School Cluster Linkage and Cross-border School-Enterprise Cooperation

Anzhong College of Engineering and Technology (referred to as "Anzhong College") is led by Wenzhou Vocational and Technical College and jointly established in collaboration with four domestic higher vocational colleges—Shanghai Donghai Vocational and Technical College, Baotou Vocational and Technical College, Xuchang Vocational and Technical College, and Guizhou Industrial Vocational and Technical College—as well as Chinese-funded enterprises both at home and abroad, including China Yalong Intelligent Equipment Group Co., Ltd. (referred to as "Yalong Group", a private enterprise from Zhejiang Province) and Zhongding International Engineering Co., Ltd. (referred to as "Zhongding International"， a Jiangxi state-owned enterprise undertaking construction projects for China's Ministry of Commerce in Angola). It was also jointly established in cooperation with the Angolan Chinese Chamber of Commerce and other Chinese communities in Angola, as well as the Angolan Huambo Vocational Skills Training Center (built with assistance from China's Ministry of Commerce and constructed by Zhongding International). The project will be officially launched in the province of Huambo, Angola in January 2025. The project brings together five Chinese vocational colleges and leading enterprises in the industry, precisely matching the talent cultivation needs of local industries in Angola, and has been selected for the third batch of "Future Africa - China-Africa Vocational Education Characteristic Cooperation Project" and Zhejiang Province's "Belt and Road 'Silk Road College'".

Anzhong College innovates the "Chinese vocational education standards + local African demands" model of education, pioneers the "1.5+1.5" segmented joint training approach (one and a half years of study in Angola and one and a half years of further study in China) and local employment dual-track path, implements the

"Chinese lecturers + Anzhong teaching assistants" dual-teacher collaboration, builds the "enterprise sets the questions, college solves the problems, students break the problems" practical education mechanism, The first batch of students attracted more than 300 Angolan youth to apply, offering majors such as mechatronics, electrical automation, and industrial robotics, which are in short supply in the local area. Five higher vocational colleges regularly take turns to send outstanding teachers to Angola for course teaching and technical guidance. The transformation process of Anzhong College from single-school signing to multi-school co-construction and from memorandum to substantive operation provides a replicable experience sample for solving the problems of resource integration, collaborative governance and cultural adaptation in cross-border school-enterprise cooperation.

4. Building a multi-school cluster linkage and cross-border school-enterprise cooperation mechanism

The mechanism is the cornerstone for ensuring the long-term operation of multi-subject cooperation. In the process of multi-school cluster linkage going overseas, Anzhong College has focused on three dimensions: cross-school coordination, school-enterprise linkage and communication coordination to build the core mechanism that supports the orderly operation of cross-border school-enterprise cooperation.

4.1. Cross-school collaboration mechanism

In contrast to the traditional model of a single school going overseas independently, Anzhong College has established a multi-school collaboration mechanism, based on the principles of clear rights and responsibilities, coordinated linkage, and complementary advantages, to address the practical predicament of limited resources, narrow professional coverage, and weak risk resistance capacity of a single vocational college. Wenzhou Polytechnic, leveraging its advantages as a "double high" institution, its experience in China-Africa vocational education cooperation, and its geographical advantages as a hometown of overseas Chinese, takes overall control of core tasks such as the overall planning of the project, the formulation of educational standards, the connection of external cooperation, the overall dispatch of teachers and the overall quality control, and assumes the main responsibility for the top-level design, resource integration, risk coordination and brand building of the project. Take the lead in signing co-construction cooperation agreements, unify cross-border talent cultivation standards, teaching management norms and overseas education operation systems, ensure unified cooperation pace, unified standards and unified goals, and avoid management chaos and resource consumption problems in multi-subject collaboration. The other four higher vocational colleges, based on their respective professional characteristics, teaching

staff advantages and educational strengths, will take turns to send key teachers to Angola to carry out offline teaching, practical training guidance and course construction work, and share the pressure of overseas teaching. The schools defined the boundaries of rights and responsibilities through the co-construction agreement, which not only guaranteed the overall dominance of the leading school but also fully released the professional energy of the participating schools, achieving the aggregation of resources and the superposition of advantages of multiple schools and building a sustainable and standardized cluster-linked overseas coordinated operation system.

4.2. University-enterprise linkage mechanism

Based on the urgent need for local talents of Chinese-funded enterprises in Angola, Anzhong College builds a cross-border school-enterprise linkage mechanism featuring precise demand matching, deep integration of industry and education, and mutual empowerment between schools and enterprises. Many Chinese-funded enterprises in Angola are trapped in a shortage of local skilled workers. The skills of local employees are difficult to meet the demands of production and construction, and the lagging cultivation of local talents has become the core bottleneck restricting the development of enterprises. In response to this real pain point, Anzhong College has leveraged its vocational education advantages to provide targeted training of local technical and skilled talents for enterprises, as well as intellectual services such as employee skills improvement training and technical consultation. Cross-border collaboration with Chinese-funded enterprises builds a long-term cooperative vehicle of resource co-construction and benefit sharing, and creates a cross-border industry-education integration education ecosystem. Enterprises provide real production equipment, industry technical standards and enterprise mentor resources, assist in building overseas training bases, and promote the deep integration of teaching and production. By relying on the "1.5+1.5" segmented training model, schools and enterprises have achieved co-cultivation of talents and direct employment, effectively reducing the cost of talent introduction and training for enterprises and helping them solve the problem of employment. Colleges and universities leverage the overseas industrial resources of enterprises to solidify the practical foundation of internationalized education, enhance the adaptability and effectiveness of vocational education going global, and form a win-win situation for enterprises to improve quality and efficiency, colleges and universities to empower and upgrade, and young people to increase employment and income.

4.3. Communication and coordination mechanisms

Cross-border school-enterprise cooperation involves multi-subject, multi-regional and multi-level collaboration between China and foreign countries. Communication

barriers, information misalignment and poor coordination are key problems that restrict the implementation of cooperation. Anzhong College focuses on building a three-dimensional, regular cross-subject communication and coordination mechanism covering the five participating institutions, the governments of China and Angola, Chinese-funded enterprises in Angola, and Angolan Chinese communities to break down barriers to cross-border cooperation through multi-party collaboration. Anzhong College connects vertically with the Ministry of Commerce of China, local education authorities, Angolan education authorities and local administrative departments of Huambo Province to seek support in terms of policies, funds and other aspects to ensure the operation of the project. Horizontally link up with five co-built higher vocational colleges to build a regular communication and coordination network as well as multi-party collaboration; Regularly connect with Chinese-funded enterprises, chambers of commerce and overseas Chinese communities in Anhui, and promptly resolve issues such as cultural fit, territorial connection and social integration in cross-border education. For all kinds of problems in cross-border school-enterprise cooperation, establish a problem ledger, division of labor and handling, closed-loop implementation coordination mechanism to achieve multi-subject information sharing, resource sharing and work sharing, and build a collaborative governance pattern of "government empowerment, school leadership, enterprise support, overseas Chinese association assistance" to provide a solid guarantee for the long-term operation of multi-school cluster cross-border school-enterprise cooperation.

5. Practical Paths for Multi-school cluster Linkage and Cross-border School-Enterprise Cooperation

The mechanism construction addresses the institutional framework of "how to cooperate", while the practice path focuses on the specific action plan of "how to implement". Anzhong College has explored feasible paths for multi-school collaborative overseas expansion from four aspects: system construction, industry-education integration, local adaptation and guarantee support.

5.1. Build a multi-school cluster collaborative system to address the shortcomings of single-school overseas expansion

Five schools, including Wenzhou Vocational and Technical College, jointly built Anzhong College to form a resource integration and collaborative education system, achieving an upgrade from "single-point breakthrough" to "cluster linkage" for vocational education going global. There are practical problems such as insufficient overseas teachers, single curriculum resources and weak sustainability of overseas education in independent cross-border education of individual schools. Cluster-linked overseas education can effectively make up for these shortcomings. To ensure the efficient operation of the cluster linkage, Anzhong College has

established a systematized and standardized operation model through regular collaborative governance and resource sharing. The five schools have set up a linkage system of annual work promotion meetings, quarterly special connection meetings, and regular online communication to coordinate the dispatch of teachers, co-construction of courses, student cultivation, quality control, etc., to avoid internal resource consumption and management disconnection in collaboration. The cluster builds a cross-university teaching resource sharing platform, uniformly adapts the talent training standards that meet the industrial demands of Angola, and constructs a cross-border vocational education curriculum system. Each school implements a rotational assignment system for key teachers, and alternately selects dual-qualified teachers to go to Angola for teaching, jointly sharing the pressure of overseas education and ensuring the quality of overseas education, forming a new model for vocational education going global: "One school takes the lead, multiple schools provide support, the cluster collaborates, and the model operates for a long term".

5.2. Deepen cross-border integration of schools and enterprises and build a long-term cooperation model

The project breaks through the traditional shallow cooperation of one-way teaching in vocational education going global, continuously deepens cross-border integration of industry and education as well as school-enterprise collaboration, and builds a long-term cooperation system of mutual empowerment between schools and enterprises. Anzhong College, in collaboration with Chinese-funded enterprises in Anzhong such as Zhongding International, accurately identified the types of talent shortages in enterprises, dynamically adjusted the professional Settings, optimized the curriculum system, updated the practical training content, focused on industry adaptability, and fully integrated the overseas production standards, technical specifications, and job requirements of enterprises into the entire process of talent cultivation to address the disconnection between talent cultivation and enterprise demands. The school and enterprises deepen all-round and full-chain collaboration. Chinese-funded enterprises open their overseas production workshops, training equipment and technical teams, and jointly build overseas training bases and skills training centers with the school. They transform real production projects and technical breakthroughs of enterprises into teaching and training content to achieve deep integration of the teaching process and the production process. The segmented training program enables graduates to obtain certification from both China and Angola and directly enter Chinese-funded enterprises for employment. School-enterprise cooperation expands the boundaries of cooperation, extends from single talent cultivation to multiple dimensions such as technical services, faculty co-construction, and industrial empowerment, and builds a sustainable cross-border industry-education integration ecosystem.

5.3. Strengthen cross-cultural adaptation and local integration to enhance the sustainability of cooperation

Vocational education going global has both educational and cross-cultural communication attributes. There are significant differences between China and Angola in terms of educational systems, teaching concepts, cultural customs, and labor cognition. Insufficient cultural adaptation and lagging localization integration are the core problems restricting the long-term development of China-Africa vocational education cooperation. Traditional vocational education going overseas directly copying the domestic teaching system and management model, ignoring the local education reality and humanistic characteristics in Africa, is prone to problems such as inadaptability to the teaching environment, low student fit, and difficulty in sustaining cooperation. Anzhong College adheres to the construction idea of "Chinese standards, local adaptation, integration and innovation", comprehensively promotes the localization transformation of education and teaching, teacher training and cultural dissemination, breaks down cross-cultural barriers, fully respects the Angolan education system, folk culture and social development needs, based on the local industrial development stage and youth employment characteristics, optimizes the positioning of talent cultivation, Balancing skills development with adaptation to local society. The curriculum retains "Chinese + skills" while incorporating local Angolan industrial cases and labor standards, optimizing the curriculum content and teaching methods, and adding distinctive features such as cross-cultural communication; Implement the dual-teacher teaching model of “Chinese expatriates + local Angolan teachers", conduct regular two-way exchange and training of teachers, and cultivate localized teaching teams; Build a platform for cultural exchange between China and Angola based on resources from overseas Chinese communities such as the Angolan Chinese Chamber of Commerce, and eliminate cultural barriers and cognitive biases; Actively connect with Angolan education authorities and local governments, deeply integrate into the local vocational education system, strive for local policy support and recognition of educational qualifications, enhance the social recognition and long-term viability of the project, and achieve "foreign education" taking root in the local area.

5.4. Improve the multi-dimensional guarantee system to support the implementation of collaborative cooperation

The multi-university cluster's joint overseas expansion and cross-border university-enterprise cooperation involve long cycles, numerous participants, wide-ranging scopes, and high risks. A sound policy, teaching staff, funding, and quality assurance system are crucial supports for the continuous and stable operation, as well as the improvement and enhancement of the project's efficiency.Anzhong College actively connects with vocational education policies at all

levels in China and Angola, provinces and cities, and strives for policy empowerment and support to provide institutional guarantees for cross-border education, talent certification, teacher dispatch, and school-enterprise cooperation; Based on the actual situation of multi-school cooperation, improve the internal management system, the teacher dispatch system, the teaching quality monitoring system, and the school-enterprise cooperation management system to achieve the full-process standardized operation of cross-border education; Continue to improve the three-in-one three-dimensional guarantee system of teachers, funds and quality to lay a solid foundation for cluster overseas development; Work together to form an international dual-qualified teaching team, select key teachers with overseas teaching experience, cross-cultural communication skills and professional practical skills to participate, and continuously enhance the ability to run and teach overseas; Innovate diversified funding mechanisms to ensure the smooth operation of teacher dispatch, curriculum development, and training base construction, etc. In collaboration with Chinese-funded enterprises and China-Angola education authorities, conduct multi-faceted evaluations, carry out regular assessments on teaching quality, talent cultivation, enterprise fit, and social recognition, optimize school-running models and training programs, and ensure the sustainable implementation of multi-school cluster linkage and cross-border school-enterprise cooperation in all aspects.

6. Conclusion

This paper, taking Anzhong College as a case study, focuses on the new trend of vocational education going global from independent output by a single school to multi-school cluster linkage, and systematically sorts out the operation mechanism and practical path of multi-school coordination, school-enterprise linkage, and multi-party collaboration. The research shows that multi-school cluster collaboration can effectively address the shortcomings of single-school overseas expansion. Through deep integration of industry and education, cross-cultural adaptation and transformation, and multi-dimensional guarantee system construction, it can precisely meet the local talent demands of Chinese-funded enterprises in Africa and facilitate China-Africa vocational education cooperation. Although the project still has problems such as insufficient refinement of multi-school collaboration and the need to enhance the depth of local adaptation, in the future, the division of labor mechanism needs to be further optimized and the construction of localized courses and teaching staff needs to be deepened. As a typical practice of higher vocational colleges going overseas in groups, Anzhong College provides a new model for vocational education cooperation in the Belt and Road Initiative and Africa region. Its cooperation model of multi-school clusters, school-enterprise symbiosis, and assistance from overseas Chinese enterprises is highly replicable and has significant promotion value and application prospects for

promoting the large-scale and high-quality overseas expansion of China's vocational education.

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