Bidirectional Empowerment Pathways of New Quality Productive Forces and High-Quality Vocational Education Development: A Case Study of Guangdong Polytechnic College

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Abstract: This study examines bidirectional empowerment between new quality productivity and vocational education's high-quality development. Using Guangdong Polytechnic as a case study, this research analyzes how new quality productivity empowers vocational education and, reciprocally, how vocational education fosters its advancement. The study also proposes safeguards to support their mutual empowerment. The findings show that the two co-evolve along a "technology-talent-industry" chain. This provides theoretical insights and practical approaches for fostering a healthy ecosystem of interaction between education and industry.

Keywords: New Quality Productivity; High-Quality Development of Vocational Education; Bidirectional Empowerment; Safeguard Measures

1. Introduction

With continuous breakthroughs in next-generation information technology, artificial intelligence, biotechnology, and other cutting-edge fields, China's emerging productive forces have steadily advanced. Characterized by high technology, efficiency, and quality, these new productive forces have become a core driver of socioeconomic development, profoundly reshaping industrial structures and labor markets. Vocational education, as the primary platform for cultivating skilled talent, must closely align with these emerging productive forces to nurture more high-quality workers and highly skilled professionals meeting their demands. "Over nearly three decades, China's vocational education has made significant progress; however, challenges persist, such as curricula lagging behind rapid industrial restructuring and a mismatch between students' skills and emerging industries' demands. Recently, scholars have initiated preliminary research on the mutual reinforcement between new-quality productive forces and high-quality vocational education development, providing a foundation for deeper exploration in this field. Brynjolfsson (2014) introduced the theory of the 'Second Machine Age,' highlighting AI's disruptive effects on the labor market, yet his work did not explore how vocational education could proactively respond to technological shifts[1]. Acemoglu and Restrepo (2020) developed a 'technology-skill' matching framework to detect skill shortages early, but their model did not propose actionable reforms for supply-side education policies[2]. Jiang (2019) proposed the theory of cross-boundary integration but did not address the restructuring of the industry-education integration model driven by new quality productivity[3]. Deng (2024) argued for the necessity of vocational bachelor's education but failed to reveal its dynamic alignment with new quality productivity[4]. Wang et al. (2024) argued for developing vocational education to align with emerging productive forces, but failed to clarify the dynamic adaptation mechanisms between vocational education and new quality productivity[5]. The OECD (2024) released the report 'Digital Transformation of Vocational Education,' highlighting case studies from multiple countries. However, it does not provide a mechanistic analysis of how new quality productivity shapes vocational education. Overall, the international academic community tends to analyze educational transformation through a unidimensional technological lens, overlooking the bidirectional empowerment between emerging productive forces and vocational education.

How to achieve the dynamic alignment between vocational education and new quality productivity has become a core proposition for promoting high-quality economic and social development. New quality productivity is marked by high technology, high efficiency, and high quality, and represents the developmental direction of advanced productive forces[6]. As a pioneering region in

China's reform and opening-up and a leading manufacturing hub, Guangdong has witnessed profound industrial transformation and upgrading driven by the advancement of new quality productive forces. Guangdong Polytechnic College, located in Foshan, actively explores pathways to integrate new quality productivity with vocational education. The college has accumulated rich practical experience through proactive efforts in this integration. This study examines the college as a case to analyze mutual empowerment strategies and safeguard measures for advancing new productive forces and vocational education, offering significant theoretical and practical contributions.

2. Pathways of New Productive Forces Empowering Vocational Education's High-Quality Development

New quality productive forces, anchored in artificial intelligence, green manufacturing, and industrial internet technologies, transforms the vocational education ecosystem by technological infusion and resource integration, advancing its transition to high-end and intelligent development[7]. As new quality productivity advances, traditional industries are shrinking in proportion, giving rise to a continuous emergence of new industries[8]. On one hand, the deep integration of technologies like artificial intelligence and digital twins has dismantled the spatial and temporal constraints as well as the structural limitations of traditional vocational education. On the other hand, the evolution of new quality productivity has fostered a novel configuration of resources—combining technology, capital, and data—thus offering fresh pathways for resource integration within vocational education. By deeply integrating the technology chain, industry chain, and innovation chain, new quality productivity is propelling the transformation of vocational education from a single-actor model to an ecosystem-based community.

2.1 Driving the Dynamic Reconstruction of the Curriculum System

New quality productivity requires technical and skilled talents to possess interdisciplinary knowledge integration abilities. Guangdong Polytechnic College responds to the intelligent transformation needs of the Greater Bay Area's textile industry by offering new courses, including "Textile Equipment Digital Transformation" and "Enterprise Digital Management," while incorporating cutting-edge technologies like AI into teaching. Its program clusters focus on "Artificial Intelligence +" and "Green +" directions, significantly enhancing the relevance and alignment of majors. The iteration cycle of course content has been rapidly shortened, establishing a three-tier curriculum framework of fundamental theory, technical application, and innovative practice. Emerging productive forces are reshaping the curriculum system, allowing students to quickly access the latest industry technologies, developing interdisciplinary thinking and innovation capabilities, and enhancing their adaptability to evolving productive forces.

2.2 Strengthening the Industry-Education Collaboration Mechanism

New quality productive forces propel the shift of school-enterprise collaboration from informal partnerships to institutionalized operations[9]. Guangdong Polytechnic College utilizes key platforms—including the Guangdong Gaoming Industrial Innovation Institute and the Foshan Textile & Garment Intelligent Manufacturing Industry Education Consortium to foster deep collaboration with leading enterprises in the Gaoming Industrial Park. The college partnered with companies including Yida Textile to establish the Modern Industrial College, where real-world technical projects—like intelligent garment warehouse optimization and fabric detection algorithm development—are adapted into teaching curricula. Instructors guide students in technical problem-solving, creating a progressive learning chain that connects classroom instruction, practical training, and real-world enterprise applications. Additionally, enterprise engineers collaborate in designing professional talent development programs. In 2023, the college was awarded the China Industry-University-Research Cooperation Promotion Award and has ranked among the "Top 60 Vocational Colleges for Service Contribution" nationwide for three consecutive years. These accomplishments fully demonstrate the empowering effect of new quality productivity on enhancing vocational education quality.

2.3 Innovating Teaching Models and Evaluation Systems

Digital technologies embedded in new quality productivity empower innovative teaching scenarios that integrate virtual and real environments. Guangdong Polytechnic College uses a national-level virtual simulation teaching

center to create an intelligent virtual simulation system for textile and apparel production, allowing students to practice the full workflow—from order receipt to digital pattern making and intelligent production scheduling—in a virtual environment. Big data technologies have transformed teaching evaluation from experience-driven to data-driven by establishing a three-dimensional model that assesses knowledge mastery, skill application, and innovative thinking. This enhancement improves the accuracy of instructional diagnosis and consequently boosts teaching efficiency. Innovations in teaching models and evaluation systems have boosted students' motivation and initiative, developed their practical skills and innovative spirit, and better aligned talent development with the needs of modern productivity.

3. Analysis of How High-Quality Vocational Education Development Empowers New Quality Productivity

Vocational education serves as a key driver of new quality productivity by providing talent, facilitating technology transfer, and fostering ecosystem development[10]. In the context of increasing demands from new quality productivity on workers' knowledge, skills, and competencies, vocational education must transcend the limitations of traditional skill training and pivot toward cultivating high-caliber technical talents equipped with innovation capacity and interdisciplinary integration skills. This transformation requires strengthening industry-education integration, promoting technological innovation, and advancing ecosystem co-construction, thereby forming a systematic pathway that effectively supports the development of new quality productivity.

3.1 Talent Supply Supporting Industrial Technological Leapfrogging

Vocational education delivers targeted skill-upgrading training for enterprise employees, providing essential human resource support for adopting and applying new quality productivity. Guangdong Polytechnic College has partnered with Guangdong Yida Textile Co., Ltd. to establish a staff training base, providing more than 1,000 digital literacy training sessions annually for textile industry employees. In 2024, the college partnered with Gaoming District to carry out the "Hundreds-Thousands-Tens of Thousands Project," a rural revitalization training initiative that supports labor transitions into green agriculture and e-commerce. Through community education initiatives, the college developed "New Quality Productivity Popular Science Micro-Courses," targeting employees of small and medium enterprises (SMEs) and rural migrant workers. The program has achieved an annual training scale surpassing 10,000 participants. Vocational education cultivates a vast talent pool of highly skilled professionals, fueling industrial innovation and modernization while enabling technological leaps across key sectors[11]. Moreover, new quality productivity is not only reflected in technological breakthroughs but also in the recombination of production factors and adaptive changes in production relations. On one hand, emerging industries provide vocational education with abundant practical scenarios and teaching resources, such as applications of virtual reality and artificial intelligence in education. This necessitates that vocational education cultivates talents capable of operating and managing new production tools and mastering digital and intelligent technologies. On the other hand, new quality productivity has rendered labor division increasingly refined and complex, fostering closer collaboration among positions, which in turn requires the workforce to possess the ability to flexibly utilize new labor resources[12,13].

3.2 Technology Transfer Accelerating Industrial Innovation

Vocational colleges act as pilot bases for technology transfer of new quality productivity through platforms such as research think tanks, R&D centers, and industry academies[14]. Guangdong Polytechnic College established the Institute for New Quality Productivity and High-Quality Vocational Education Development and jointly developed Gaoming Industrial Research Institute with Gaoming District to facilitate the commercialization of innovative achievements and core technologies, supporting the R&D and product upgrading needs of industrial park enterprises. Within this research institute's park, four enterprises have surpassed 10 million yuan in output value and received 120 million yuan in funding for innovation teams. Through close collaboration with leading local enterprises, the college has established the 'One Cluster and One Center' initiative-consisting of professional skill innovation teams, a collaborative innovation center, and an Engineering Technology Research Center-to integrate technological innovation,

product upgrades, process improvements, and technology dissemination. In 2023, the college received the China Industry-University-Research Cooperation Promotion Award and has been ranked among the "Top 60 Vocational Colleges for Service Contribution" nationwide for three consecutive years—reflecting its key contributions to developing new quality productivity.

4. Safeguarding Synergy: New Productivity and Vocational Education

New quality productivity and high-quality vocational education mutually reinforce and co-evolve, with their integration emerging as a key engine for driving high-quality economic and social development. Achieving bidirectional empowerment requires not only sustained institutional support and policy guidance, but also the establishment of a support system characterized by multi-stakeholder participation, efficient resource allocation, and coordinated operational mechanisms, thereby creating a systematic and synergistic environment. To this end, it is necessary to advance from multiple dimensions—including institutional design, industry-education collaboration, resource investment, and evaluation reform—to systematically implement safeguard measures that promote the bidirectional empowerment between new quality productivity and high-quality vocational education.

4.1 Policy Coordination Guarantees: Establishing Incentive and Constraint Mechanisms

Policies are fundamental supports for driving the mutual empowerment between emerging productive forces and vocational education. On one hand,legislative frameworks must be strengthened, such as Guangdong's policy granting companies in vocational education a 30% tax deduction for tech investments, encouraging R&D and talent development. Similarly, better pay and recognition for skilled workers boost their motivation to upskill. On the other hand, a dynamic monitoring mechanism must be established. A provincial big data platform that integrates industry and education can publish timely talent demand reports (e.g., in AI and green manufacturing), offering data-driven guidance for vocational colleges to adjust curricula. This avoids misalignment between educational programs and industry needs, ensuring vocational education keeps pace with the development of new quality productivity.

4.2 Innovation in Industry-Education Integration Mechanisms: Building Institutionalized Operation Platforms

Industry-education integration is a pivotal pathway to realize the bidirectional empowerment between new quality productivity and vocational education. Establishing a novel integration model between emerging productive forces and vocational education is central to enhancing vocational education's capacity to provide effective support. Government-led and jointly participated in by enterprises and academic institutions, industry-education integration bases can achieve multifunctional synergy, encompassing talent cultivation, technological research and development, and social service functions[15]. Industry-education integration communities represent an innovative organizational model to strengthen school-enterprise collaboration and serve as a strategic, systematic institutional framework for modernizing China's vocational education. Governance in these communities is advanced through boards composed of educational institutions, enterprises, and research bodies, which jointly develop plans and policies to ensure all stakeholders' interests are considered. Mixed-ownership reform fosters the adoption of equity incentives in industry-academia collaborations, enhancing enterprise engagement in talent development and R&D, leading to mutually beneficial outcomes.

4.3 Guaranteeing Resource Investment to Enhance Vocational Education Quality

Resource investment underpins vocational education development. Fiscal preferential policies provide provincial-level special loans for updating vocational education equipment, actively improving teaching conditions and enabling the acquisition of advanced instruments to provide students with superior practical environments. Building dual-qualified teaching teams is critical; talent introduction programs offer settling-in subsidies to technical experts from enterprises, attracting them to vocational colleges as instructors. Enterprise practice experience is included as a necessary criterion in faculty promotion assessments, encouraging continuous updating of knowledge and skills to raise teaching standards. Additionally, investment in vocational education informatization is increased to develop high-quality online courses and teaching resources,

meeting students' diverse learning needs. This not only enhances the coverage and flexibility of education but also optimizes the teaching process through digital means, improves teaching effectiveness, and helps students better adapt to the rapid development of emerging industries and technological transformations.

4.4 Evaluation Reform Orientation: Establishing a Scientific Evaluation System

A scientific evaluation system can guide vocational colleges and enterprises to actively engage in the bidirectional empowerment process. Introducing a "New Quality Productivity Empowerment Index"—which measures graduate employment rates in emerging industries—ensures vocational education aligns with evolving productivity demands, motivating institutions to enhance curricula and training programs proactively. At the same time, this evaluation system can provide real-time feedback to policymakers, facilitating the alignment of educational resources and curriculum design with industry development needs, thereby enhancing the overall quality of vocational education and its capacity to serve society. This drives improvements in teaching quality and research capabilities, cultivating more high-quality technical and skilled talents to support new quality productivity development. The mutual empowerment of new quality productivity and high-quality vocational education requires building a healthy interactive ecosystem between education and industry, providing robust support for the high-quality development of the economy and society.

5. Conclusion and Discussion

This study systematically analyzes the bidirectional empowerment pathways between new-quality productivity and high-quality vocational education development, empirically supported by a case study of Guangdong Polytechnic College. The findings reveal that emerging productive forces drive the dynamic reconstruction of curriculum systems, deepen industry-education integration and collaboration mechanisms, and foster innovations in teaching models and evaluation frameworks. Vocational education enhances new-quality productivity through talent supply and technology transfer, creating a virtuous cycle of "technology-driven education - industry-supporting education - technology feedback from industry. The practical experiences of Guangdong Polytechnic College in curriculum reform, industry-education integration, and faculty development provide valuable reference models for other vocational institutions.

Future research may deepen in several areas: first, expanding micro-level analyses of bidirectional empowerment, such as investigating the translation pathways between specific technological components and curriculum content; second, conducting cross-regional comparative studies to explore how empowerment models vary across regions with different economic development levels; third, integrating emerging technologies like artificial intelligence to study how digital governance can optimize the efficiency of mutual empowerment. As new quality productivity continues to evolve, vocational education must dynamically adjust its empowerment strategies to better serve the national manufacturing powerhouse strategy and promote high-quality economic and social development.

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