VTE VOCATION, TECHNOLOGY & EDUCATION

CASE STUDY

Economic transition and educational innovation: Shenzhen Polytechnic University's model of skill formation with Chinese characteristics

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Abstract

The evolution of practice in vocational education is driven by the dynamic logic of economic transformation. In China, the remarkable progress of higher vocational education during the country's era of reform and opening up is exemplified by Shenzhen Polytechnic University (SZPU) as a representative institution of the aforementioned sector. SZPU's developmental trajectory compellingly illustrates the dynamic interplay between vocational education and the nation's economic transformation and upgrading. Building on the framework of historical institutionalism, this research investigated SZPU as an exemplar through which to analyze the trajectory of China's higher vocational education. The analysis was directed toward three distinct phases of the institution's exploratory development, shaped by the dual forces of economic transformation and educational innovation. This study systematically examined the practical approaches employed by the university to address the challenges posed by industrial development and shifts in educational policy. It also uncovered the implementation strategies and underlying logic that drive SZPU's efforts to advance world-class vocational education. This paper ends with a forecast of future development trends, providing a foundational framework for understanding the rapid growth of higher vocational education in China.

Keywords

vocational education, economic transformation, skill formation system, Chinese characteristics, Shenzhen Polytechnic University

INTRODUCTION

The skill formation system of a nation is fundamentally a product of its economic and social institutional structures, intricately embedded in the interactive framework of political, economic, and cultural institutional environments (Busemeyer & Trampusch, 2012). This system comprises vocational education as a critical vehicle inherently coupled with national economic production systems, strategic skill demands, and institutional incentives (Hao, 2020). For example, Germany's dual vocational educational system is substantially integrated with high-skill-density industries, which enabled the country to establish a skill formation system characterized by enterprise leadership and industry-wide coordination. At its core, the institutional framework underlying Germany's vocational education sector is designed to ensure the long-term stability of skill investment through mechanisms such as the co-governance of labor management, skill protection measures, and a robust system for vocational qualification certification. In contrast, the free market-oriented economic system of the United States has given rise to a vocational education model

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that relies heavily on low-skilled labor, with businesses tending to address their skill requirements through flexible employment practices and short-term training programs. The observed differences between the German and US cases underscore how economic contexts shape the structures and forms of vocational education provided in a country. The demands of economic development and the orientations of national policies during specific periods directly determine the positioning, allocation of resources, and pathways for innovation of vocational education.

In China, the development of higher vocational education has been similarly driven by the dynamic logic of economic transformation. During the country's planned economy era, China formed the "integration of industry and education" system (Shi & Fan, 2025). This integration was prominently reflected in the role of industry enterprises, which represented the state in assuming the social responsibility for providing vocational education and serving as the primary driving force behind its delivery (Lan, 2013). However, China's reform and opening up, coupled with the rapid development of its market economy, disrupted the previously established cohesion between industry and education. This disruption has resulted in increasingly fragmented school–enterprise collaboration, accompanied by a noticeable decline in its effectiveness. As the country's economy transitioned into a phase of advanced development, vocational institutions and enterprises have re-established close, collaborative partnerships. In particular, Shenzhen, as a leading frontier in China's reform and opening up and a catalyst of economic development, has experienced rapid economic growth and transformation—progress that has generated significant impetus and practical demand for higher vocational education. Shenzhen is not only pivotal in supporting China's economic strategy but also serves as a testing ground for the exploration of new industries and innovative models. This dual function imparts a distinctive exemplary importance in addressing economic transformation to Shenzhen Polytechnic University (SZPU).

SZPU, situated in the Nanshan District of Shenzhen, has its origins in Shenzhen Polytechnic, which was founded in 1993. It has significantly contributed to the advancement of the higher vocational and technical education sector as one of China's pioneering public institutions dedicated to independently providing such education. In June 2023, it was officially designated by the Ministry of Education of China as Shenzhen Polytechnic University. By 2025, SZPU had developed 15 program clusters aligned with Shenzhen's key industrial sectors, offering 26 full-time undergraduate programs and 84 full-time vocational programs. The university currently employs over 2900 faculty and staff and enrolls more than 30,000 full-time students. Its comprehensive strength consistently ranks it among the top comparable institutions in China. SZPU's development trajectory exemplifies the transformative progress of China's higher vocational education during the country's reform and opening up era. It also highlights the dynamic interplay between vocational education and economic development, illustrating that "vocational education is inherently a component of economic activity" (Yang & Zhang, 2020).

Taking SZPU as a case study, we inquired into the historical evolution of practice in China's higher vocational education sector across three phases of exploratory development amid economic transformation. The issues of interest included the influence of educational policy on the aforementioned evolution. Through a systematic review of SZPU's educational practices in addressing the challenges posed by economic shifts and industrial upgrading at various stages, this study shed light on the logic underlying the manner by which China delivers vocational education as its economy undergoes modernization. Finally, we examined development trends to develop a foundational framework for understanding the rapid advancement of higher vocational education in China.

ECONOMIC REFORM SHAPING TALENT CULTIVATION

The period from 1993 to 2006 marked SZPU's foundational phase, which corresponded with a pivotal stage in China's implementation of market economy reforms and its acceleration of marketization. During these years, the country progressively freed itself from the constraints of a planned economy, established a socialist marketplace, and actively engaged with the global financial system. Its economy also rapidly grew as a result of market-oriented reforms. Following 1993, for instance, the Chinese government actively advanced economic system reforms, optimized resource allocation, implemented market-oriented competition policies, increasingly opened itself to the global market, and attracted foreign investment. As market demands grew increasingly diverse and industrial scales expanded, the requirements of the labor market intensified. These developments presented a problem to China's traditional academic education model, which proved inadequate in meeting the pressing need for talent quality and structural adjustments.

This macroeconomic backdrop created a compelling imperative to strengthen China's higher vocational education sector. First, rapid economic growth and ongoing advancements in industrialization generated considerable societal demand for skilled technical professionals. Such practical

requirements could not be satisfied by the country's conventional education model, thereby stimulating the emergence of higher vocational education. Chinese society anticipated the development of technical talent that directly addresses the demands of economic transformation. This could be achieved by enhancing practical training that is distinct from general education to fulfill the market economy's reform-driven need for professionals in technology, management, and services. Second, the reform of China's market economy has tremendously advanced the development of vocational education as a whole. In response to the evolving economic and social development requirements of the 1990s, China issued *the Decision on Vigorously Developing Vocational and Technical Education* in October 1991, initiating efforts to enhance the country's vocational education system (Shi & Que, 2024). In the early 1990s, vocational education in China centered predominantly on secondary education, while higher vocational education remained a nascent concept. As market economy reforms deepened, the development of the latter became a crucial agenda for enhancing the entire vocational education system.

The accelerated market reform also drove China to not only impose greater demands on the quantity and quality of its workforce but also emphasize the need to shift talent cultivation from mere knowledge dissemination to the development of practical and specialized technical job skills through higher vocational education. As a pioneering city in China's economic reform and development, Shenzhen has undergone even more rapid modernization and has faced a more pressing demand for higher vocational education. Against this backdrop, the newly established SZPU laid a solid foundation for such education and talent development by actively responding to the demands of the reform.

Training goals aligned with economic demands

Beginning in the 1990s, Shenzhen resolved to shift from an extensive model of economic development, thus putting forth its Ninth Five-Year Plan with the explicit goal that by 2000, the output value of high-tech products should constitute 35% of the city's total industrial output, equivalent to an increase of 14.5 percentage points. The plan was designed to advance the industrialization of cutting-edge sectors, modernize scientific and technological equipment, and optimize the knowledge structure of the workforce. These efforts, in turn, were intended to propel development toward a fundamental transformation that enhanced overall quality and fostered new competitive advantages. In 1996, Shenzhen established a high-tech industrial park in Nanshan District, and in the following year, it released *the Development Plan for Shenzhen High-Tech Industrial Park*, which heralded the beginning of an industrial evolution and upgrade driven by state-of-the-art industries. These initiatives were aimed at facilitating the growth of technology-intensive enterprises. Accordingly, progress in high-tech industries urgently necessitated appropriate human resource support, but there was a significant shortage of experts. In 1999, Shenzhen had only 584 individuals with a college education or higher per 10,000 employed persons, a figure notably lower than that in Beijing (965) and Guangzhou (634). Among the 184,000 technicians employed by municipal enterprises, only 5.8% were senior technicians, which was considerably lower than the 30% observed in developed countries (Shenzhen Municipal Bureau of Statistics, 2008). The task of addressing Shenzhen's labor resource demands for economic development was entrusted to SZPU.

In response to this call, the newly established SZPU has addressed the prevailing inclination toward traditional university education by clearly defining its training objectives so that it could cultivate application-oriented technical specialists who possess comprehensive vocational competence, robust career development capabilities, and the requisite qualities to serve on the frontlines of production and work sites, providing technical guidance and management to workers. More specifically, SZPU's training objectives are structured into three tiers. The first focuses on developing engineering transformation skills that are essential for production sites, enabling the conversion of blueprints into tangible products. The second tier revolves around fostering technical guidance and management competencies, along with the ability to perform technical coordination functions at work sites. The third encompasses guaranteeing the potential for career development through the cultivation of comprehensive vocational skills to support sustainable growth in talent.

Market demand-oriented program design

During this foundational phase, China had yet to establish specific national policies for the design of programs in higher vocational education, thereby compelling vocational institutions to model their offerings after the catalogs of general undergraduate universities. This conventional approach was disregarded by SZPU, which instead adopted a distinctive principle: "We establish our programs wherever Shenzhen's economic growth emerges". The university argues that as the bridge between societal needs and vocational education, academic programs must align with Shenzhen's industrial landscape for these programs to effectively cultivate vocational talent. Therefore, the university deems it necessary to "find ways to establish programs that align with the vocational and technical skills demanded by the market". SZPU further uses markets, occupations, and technologies as key features that distinguish its program design from those of general universities.

Specifically, it emphasizes "market demand-oriented, occupation-based, and technology-driven" approaches to comprehensively guiding program development. This principle takes into account Shenzhen's industrial restructuring, urban functional positioning, and evolving requirements for social talent as essential prerequisites for program planning.

SZPU correspondingly developed a three-dimensional "coordinate" model for program design, driven by market demand as the primary dimension, structured around occupational job clusters, and defined by technical content as the quality dimension. This model's implementation was typified by the development of Shenzhen's digital creative industry in 2002, when the city's animation industry was in its infancy. SZPU invested 6 million yuan to establish an animation department—three years before the municipal government's 2005 Animation Capital strategic plan was issued. The university's strategy of "intervention during the industry's emerging phase and formation during the policy window period" effectively achieved spatiotemporal correspondence between program structure and regional industrial upgrading, creating a positive interactive pattern wherein "programs were half a step ahead of the industry". Following this strategy, SZPU established program designs that not only satisfied but also anticipated industry demands.

Institutionalized innovation in school–enterprise cooperation

Alignment with economic growth opportunities necessitated collaboration with enterprises. To encourage their participation, SZPU emphasized the need to "explore every possible approach to channel industry and enterprise enthusiasm into the entire education process". This direction adhered to the core principle of "mutual benefit and service of enterprises". Building on this foundation, the university initiated enterprise-focused training, technical research and development (R & D), and on-site educational services. From 2003 to 2005, SZPU conducted more than 20,000 vocational skill assessments and delivered vocational training and skill certification services to over 30,000 individuals. These efforts spanned more than 100 projects, encompassing junior, intermediate, advanced, and technician levels.

To tackle weak school–enterprise collaboration in Chinese vocational institutions at the time, SZPU developed a "bidirectional empowerment" cooperation framework, which involved generating enterprise value through technical R & D services and vocational skill assessments, accumulating 30,000 person-times from 2003 to 2005. The framework also entailed leveraging enterprise resources, which has resulted in equipment donations accounting for 35% of the total training equipment used in the university and part-time enterprise instructors constituting 21% of the total teaching staff. In particular, the establishment of the Program Management Committee system in 1995 marked an innovative step in the delivery of vocational education in China. By engaging industry experts in the formulation of talent cultivation plans, the Program Management Committee ensured dynamic alignment between the curriculum and vocational standards, creating a closed-loop feedback system that seamlessly integrated "educational supply" with "industry demand". During this period, school–enterprise cooperation in educational practice typically reflected a model of production–education integration that was centered on and spearheaded by schools.

Organizational innovation in teaching

SZPU adopted a teaching approach grounded in the "three proximity" principle: Aligning closely with production, technologies, and processes while also pursuing organizational innovation. First, the university adopted the principle of "teaching according to job requirements" and enhanced the role of the Program Management Committee to include guiding program design, training plans, and teaching outlines, ensuring that teaching content satisfied industry and job requirements. Second, in 1997, China established its first large-scale, advanced on-campus training base designed to simulate real vocational environments—the Industrial Training Center. Centrally managed by the university, it replaced the traditional laboratories of general universities with training workshops (rooms) modeled after modern factories as the primary venue for practical teaching. Over this time span, the Industrial Training Center functioned as a principal centrally managed institution and the primary mechanism for vocational skill development at SZPU. Owing to the center's state-of-the-art equipment and training resources, it effectively fulfilled the vocational and technical training needs of students at the time. Third, the "dual-qualified" faculty development system mandated that instructors of professional courses have both extensive theoretical knowledge in their fields and substantial practical experience. SZPU attached considerable importance to the need for educators to engage in practical, hands-on teaching rather than relying on rote methods to ensure that students find the classroom experience both valuable and fulfilling. In 1999, more than 40% of SZPU's regular faculty members were senior engineers or technicians with frontline experience. This was accompanied by the remarkable achievements of SZPU students, underscored by their exceptional performance in various Chinese language skill competitions. Students graduating from popular programs consistently enjoyed high employability, often being "reserved" for positions even before graduation, and 30 students successfully obtained the Cisco Certified Internetwork Expert from 2004 to 2005.

Moreover, SZPU established an educational practice system focused on cultivating technical skills tailored to specific job roles. The educational and teaching processes were designed to closely match employment requirements, effectively addressing the labor market demands of the time. This focus set the university apart from traditional higher education, positioning it as a leader and model among modern vocational institutions. Naturally, during this stage, Shenzhen had begun planning for the advancement of its high-tech industry, but the effectiveness of related policies was slow to manifest. The profit performance of Shenzhen's top 100 enterprises indicated that profits in 2005 reached 28.228 billion yuan, representing a 3.70% increase over the levels achieved in 2004 (*i.e.*, 27.221 billion yuan). However, profit growth was significantly lower than the overall expansion in volume, suggesting that many enterprises were still in the early stages of attempting extensive development (Wei, 2005). Within this period, Shenzhen retained a labor-intensive economy characterized by relatively simple and singular technical demands.

THE TRANSFORMATION AND UPGRADING OF ECONOMIC STRUCTURE: CULTIVATING MULTIDISCIPLINARY TECHNICAL TALENT

The period 2006 to 2016 represents SZPU's phase of exploratory development, coinciding with a time when China's economy underwent structural transformation and industrial upgrading. During the earlier rapid reform of the market economy, China depended to a large extent on resource- and labor-intensive industries to fuel its fast-paced economic growth. However, with intensified global economic integration and events exemplified by shocks such as the 2008 global financial crisis, China was compelled to shift focus from "quantitative growth" to "qualitative improvement". The structural evolution and adjustment that followed were aimed at comprehensive industrial upgrades and technological innovations. Throughout these years, many technology-driven and capital-intensive industries replaced their labor-intensive counterparts, giving rise to a new core driver of economic expansion in China (He, 2025).

Amid such macroeconomic changes, the development of China's vocational education sector attracted unprecedented attention. Shortly after the country explicitly advocated for "vigorously developing higher vocational education" in 1999, the scale of this education domain accounted for half of the country's higher education system (Ping *et al*., 2018). In 2004 and 2005, China issued two policy guidelines consecutively: *Several Opinions on Further Strengthening Vocational Education Work* and *Decision on Vigorously Developing Vocational Education*. This was succeeded by the 2010 release of the *Outline of the National Medium- and Long-Term Plan for Education Reform and Development (2010-2020)*, along with other significant policy documents. These policies not only vigorously promoted vocational education but also established new goals for the development of higher vocational education, such as adapting to the transformation of the economic development model and the requirements for industrial structure adjustment. As a result, China's higher vocational education embarked on extensive, rapid progress into a more open industry, with local vocational institutions actively endorsing various forms of school–enterprise cooperation models to harmonize educational practices with industry and enterprise requirements. Concurrently, government support in the form of policies, funding, resource investment, and institutional innovation created favorable conditions for reforming educational practices in higher vocational institutions. On this basis, the sector of interest has shown remarkable vitality.

During the period discussed in this section, China generally accelerated its economic structural transformation. In this initiative, Shenzhen, as a pioneer in economic reform and development, spearheaded an innovation-driven economy, with strategic emerging industries and modern service sectors rising fast to become new engines of economic growth. Given that economic development had increased the need for highly skilled technical talent, the concentration on cultivating a single technical competency in higher vocational education was no longer sufficient to meet the demands accompanying industrial augmentation and enterprise innovation. Amid these circumstances, SZPU initiated continued development, with its efforts revolving around adjusting objectives, incorporating cultural education concepts into its curriculum, and reforming teaching methods to enhance the substance and quality of educational practices.

Refining and adjusting training goals

SZPU conducted a tracking survey from 2007 to 2011 on the demand for human resource quality among more than 2100 enterprises in the Pearl River Delta. The survey results clearly showed that enterprises prioritize comprehensive qualities, such as responsibility and communication skills, over specific vocational abilities. In 2012, the university cultivated well-rounded technical talent by emphasizing "ethical and professional advancement, the integration of learning and critical thinking, and the coordination of mind and hands".

The need to adjust training objectives arose from significant pressure on educational practices due to Shenzhen's industrial transformation and labor market demands. From an external perspective, the city's economic progress had

transitioned into a stage characterized by independent innovation driven primarily by high-tech industries. This movement engendered a trend of advancement marked by considerable added value and advanced technological content. In 2009, Shenzhen released the *Overall Plan for Shenzhen's Modern Industrial System (2009-2015)*, setting clear development targets: The added value of technologically sophisticated industries was to account for 35% of the city's Gross Domestic Product (GDP), modern service industries were to comprise over 60% of the tertiary sector, and the output value of cutting-edge products protected by proprietary intellectual property was to exceed 70%. The year 2011 witnessed Shenzhen's high-tech industrial park, which occupied less than 0.6% of the city's land area, achieve an industrial output value of 363.012 billion yuan. This accomplishment represented a 20.16% year-on-year growth and contributed 17.78% to the city's total industrial output value. The industrial added value amounted to 109.59 billion yuan, denoting a year-on-year increase of 36.78% and constituting 21.94% of Shenzhen's total industrial added value. This explosive advancement in the high-tech industry rendered the previous stage's singular focus on operational technical training for frontline positions insufficient.

More importantly, as external circumstances evolved, the marginal effectiveness of SZPU's then-operational system for building capabilities for technical practice was declining. By 2006, the institution had a full-time student enrollment of 20,000—figures that kept growing, making it challenging for the Industrial Training Center to effectively support the development of technical expertise for all students. To begin with, although the center's equipment assets and the per-student value of teaching and research equipment had been steadily increasing, they still lagged behind the rapid advancements and evolving demands of the industry in Shenzhen. Additionally, the requirements for developing practical skills across different programs had become increasingly diverse and personalized. Consequently, the centralized technical training model, which relied on the Industrial Training Center, could no longer adequately address these evolving needs. These changes have also driven the school to recognize the necessity of moving beyond a narrow focus on producing individuals with purely technical "tool-like" abilities. Instead, greater emphasis must be placed on addressing students' various developmental needs to mold exceptional, well-rounded technical professionals capable of meeting the demands of swiftly transforming sophisticated industries.

Introduction and application of cultural education concepts

To address the tendency of vocational education to produce "tool-like" competencies, SZPU integrated cultural education into its curriculum. The core essence of such education lay in the integration of technical adeptness and cultural development in higher vocational education. During this period, society largely relegated vocational education to a means of livelihood training, acknowledging only its skill acquisition dimension while overlooking its role in fostering students' capacity for sustainable development and their humanistic qualities. Vocational education had been predisposed to miss the cultural aspects of learning, prioritizing only the development of job-specific skills while neglecting the cultivation of professional cultural heritage and innovation. From SZPU's perspective, while graduates from higher vocational institutions may have held "dual certificates" that addressed immediate employment and job placement challenges, issues related to sustainable development and core competitiveness had gradually surfaced over time, with a lack of cultural foundation being a significant contributor to this problem. Culture exerts a profound influence on vocational careers and lifelong evolution. Higher vocational education should not be confined to narrow technical goals while inadvertently ignoring the nurturing of professional competence and a humanistic spirit. On this basis, SZPU asserts that its educational practices should "advance cultural education with a heightened sense of cultural awareness, guide the cultivation of skilled talent through cultural leadership, and drive the transformation and advancement of higher vocational education".

Throughout this stage, SZPU's foregrounding of cultural education concepts only partially aligned with the prevailing practices of Chinese vocational institutions. Following the issuance of China's 2005 *Decision on Vigorously Developing Vocational Education*, vocational institutions focused primarily on two key areas: Prioritizing employment-oriented education and enhancing students' practical and vocational abilities. They then considered students' vocational skills and employment rates as core metrics for assessing the effectiveness of educational and teaching practices. China's 2010 *Outline of the National Medium- and Long-Term Plan for Education Reform and Development (2010-2020)*, along with related policies, highlighted the importance of integrating work and study, fostering collaboration between schools and businesses, and improving students' employability. From 2006 to 2010, there was a marked inclination toward vocational skill development, with higher vocational education increasingly accentuating this aspect in its endeavors (Wang *et al*., 2024). Under policy guidance, local higher vocational institutions leveraged their latecomer advantages to pay greater attention to honing students' technical skills. Conversely, SZPU concentrated its efforts on implementing an exhaustive cultural education approach, which appeared

somewhat unconventional. The institution recognized the pressing competitive challenge of "followers becoming leaders". Its principle of "cultivating skilled talent through cultural guidance" foregrounded the imparting of knowledge in the humanities, arts, sciences, and other cultural domains, training students through university culture and integrating practical experiences into courses. This approach was designed to elevate students' ideological and moral standards, humanistic and scientific literacy, aesthetic sensibilities, and cultural appreciation while equipping them with vocational aptitude to fulfill the need for versatile technical talent.

Transformation of teaching practices

By 2006, as full-time student enrollment surpassed 20,000, the centralized model of technical skills development centered on the Industrial Training Center proved inadequate for meeting practical demands. To address this issue, SZPU has progressively advanced its strategy of "decentralizing the technical training model" since 2009. First, it revamped the system for building job competencies before decentralizing the cultivation of professional practical skills to assign responsibility to its secondary colleges. By establishing diverse forms of school–enterprise collaboration, such as training platforms and workshops, SZPU dealt with the increasingly specialized and individualized demands of different programs for practical skill development. However, while it expanded the capabilities of the Industrial Training Center, the primary focus remained the delivery of general technical training.

Second, SZPU implemented a "dual-track approach to advancing both skills and culture". Cultural education not only complemented singular technical objectives but was also integral to the teaching process, placing equal emphasis on the development of students' comprehensive qualities, sustainable development capabilities, and technical skills. In 2013, the university issued the *Outline for the Implementation of Cultural Education* and established the Cultural Education Research and Development Center, in addition to the Cultural Quality Education Base. This initiative comprehensively launched cultural education practices that covered more than a dozen themes, including faculty development and student engagement. To enhance students' cultural literacy, the university organized over 500 cultural lectures between 2009 and 2013, attracting a total audience of more than 80,000. At that time, such a level of cultural edification was rare among Chinese higher vocational institutions. By reinforcing its cultural cultivation goals, SZPU had exhaustively restructured its teaching processes, systematically enhancing the ideological and spiritual qualities of both faculty and students as well as their professional competencies.

Third, SZPU explored mechanisms for collaboration among government, schools, industry, and enterprises while also developing open operational models. In this framework, local governments were instrumental in policy leadership, financial support, and assurance functions, while educational institutions offered a range of resources and platforms for teaching. Industry endeavors were directed toward research on industrial policies, forecasting talent demand, and formulating vocational standards. Leveraging their production and technical expertise, enterprises contributed to the development of curricula, textbooks, and practical teaching. By 2012, SZPU had forged stable partnerships with over 2000 renowned enterprises, industries, and government departments with the support of the Shenzhen municipal government. This collaboration gave birth to numerous national industry associations, public technical service platforms, and policy consulting institutions, thereby providing essential external backing for education and teaching. The main issues plaguing school–enterprise collaboration in China's vocational education delivery at this time were shallow engagement, fragmentation, superficial cooperation, and a mismatch between nurtured skills and industry demands. The effectiveness of school–enterprise cooperation in practice was hindered by deep-rooted institutional barriers. In the first place, the lack of robust skill-based reward mechanisms in the labor market and the limited career advancement pathways for skilled workers diminished individuals' motivation to pursue vocational education. Similarly, enterprises lacked the intrinsic motivation necessary to immerse themselves in vocational education due to the external risks associated with skill investment and the pressures stemming from short-term costs. Across this developmental phase, SZPU's educational initiatives deepened and broadened the practice of vocational education, establishing a robust foundation for tackling forthcoming challenges.

FOSTERING DIVERSE AND INNOVATIVE TECHNICAL TALENT THROUGH OUTSTANDING ECONOMIC DEVELOPMENT

Since 2017, SZPU has strived for excellence-driven development, consistent with China's transition to a period of robust economic growth. In the previous phase, China's economy rapidly expanded amid structural adjustments, with increases in capital input consistently outpacing those in labor input, thus serving as the central engine of economic expansion. Since 2015, however, the rate at which capital input grew had significantly declined, posing challenges to China with respect to sustaining expeditious economic progress through capital investment alone (Chen & Hou, 2024). Beginning in 2017, therefore, innovation emerged as the principal catalyst of the country's economic

growth. The industrial structure underwent further optimization and modernization, enterprise innovation capabilities markedly moved forward, and global competitiveness strengthened. These progressions propelled China toward a new phase of exceptional economic development—an advancement stimulated primarily by the rapid expansion of the digital economy, artificial intelligence, the industrial internet, and green low-carbon industries. Concurrently, sectors engaged in conventional trades accelerated their transformation to intelligent technologies, facilitating the extension and upgrading of industrial chains. The ongoing process of globalization, coupled with substantial adjustments in international trade patterns and the intertwined progress of technological and industrial revolutions, has continuously heightened the uncertainty and complexity of economic development. Since 2019, China has introduced new occupations across four phases of implementation, totaling 13, 16, 9, and 18, respectively—fast-emerging professions that have significantly reshaped the structure of China's labor market (He, 2025). These changes, in turn, have amplified the demand for higher vocational education to adapt accordingly. Vocational education must transition from merely "teaching existing technologies" to "cultivating talent capable of developing future technologies" (Pan *et al*., 2025).

Extensive economic development has thus stimulated efforts from the vocational education sector to reinforce its collaboration with industry enterprises and accelerate the enhancement of its educational standards and quality. In 2014, China released *the Decision on Accelerating the Development of Modern Vocational Education* and *the Modern Vocational Education System Construction Plan (2014-2020)*. These documents laid out a comprehensive strategy for advancing the modern vocational education system, emphasizing the shift from scale expansion to connotative development in the sector. These moves were followed by the Chinese government's issuance of a series of extensive policies aimed at advancing vocational education. These included *the National Vocational Education Reform Implementation Plan*, *the Implementation Plan for Accelerating Education Modernization (2018-2022)*, *the Vocational Education Quality Improvement and Excellence Action Plan (2020-2023)*, *the Opinions on Deepening the Reform of Modern Vocational Education System Construction*, and *the Trial Implementation Measures for Establishing Industry–Education Integration Enterprises*. The 2017 *Several Opinions on Deepening Industry–Education Integration* addressed both economic and educational matters, framing coordination between industry and education from a strategic perspective. This resolution heralded the elevation of such integration to the level of a national development approach (Wang, 2022). This period likewise corresponded with the emergence of the practical needs of economic transformation, upgrading, and industrial restructuring as immediate concerns for China's higher vocational education. To tackle these challenges, the Chinese government prioritized the rapid development of modern vocational education systems and regional frameworks that align with market demands and industrial structures (Huai, 2024). *The Outline of the Plan for Building China into a Leading Country in Education (2024-2035)* highlights the strategic orientation of vocational education, punctuating its "industrial [and] regional attributes" (Pan & Nie, 2026). In this context, industry–education integration has increasingly transformed into a crucial lever for advancing outstanding development in China's higher education sector (Long, 2026). The thorough coordination between industry and education has become a central focus for Chinese higher vocational institutions in addressing the challenges posed by economic development to vocational education.

Amid China's pursuit of the abovementioned economic development, SZPU gave precedence to the strategic shift from traditional school-centered skill cultivation models to dual school–enterprise counterparts. This transformation was intended to elevate educational quality while simultaneously contributing to Shenzhen's robust economic progress, achieved chiefly through initiatives devoted to building world-class vocational institutions.

Defining the objectives for building world-class vocational institutions

The 2014 *State Council Decision on Accelerating the Development of Modern Vocational Education in China* explicitly stipulates the goal of establishing world-class vocational institutions and flagship programs, thereby creating hubs for talent cultivation with strong international competitiveness. At Shenzhen's 2016 Two Sessions, municipal leaders emphasized that although the city's vocational education system ranked among the best in China, it remained far behind international first-class standards and the city's demands for state-of-the-art, precision, and intelligent manufacturing. In response, the 2017 Shenzhen Annual Education Work Conference explicitly tasked SZPU with developing a plan for constructing premier vocational institutions with Chinese characteristics, to be submitted to the Communist Party of China (CPC) Shenzhen Municipal Committee and Shenzhen Municipal People's Government. This responsibility gained central importance for SZPU.

One of the critical issues was how to define the evaluation standards for "world-class" vocational education. Although there are currently no universally accepted indicators of

first-class vocational education, international experience has pointed to German vocational education as the exemplar primarily because of its significant contributions to national economic and social development, as well as its global reputation stemming from the promotion of its "dual system" model. This assertion resonated with SZPU, which accordingly pursued excellence via close integration between educational practices and the industries of Shenzhen, serving as the cornerstone for the school's establishment in Shenzhen and the key to building globally competitive vocational institutions. SZPU further refined its talent cultivation objectives to direct attention particularly to nurturing innovative and diverse technical professionals.

China's latest technological revolution and industrial transformation have centered on artificial intelligence—a rapidly progressing initiative, thus necessitating the development of exceptional technical talent and the establishment of outstanding vocational institutions. The added value of Shenzhen's strategic emerging industries rose from 531.478 billion yuan in 2013 to 918.355 billion yuan in 2017, reflecting an average annual growth rate of nearly 20%. The city actively advances its evolution into a premier city in artificial intelligence, digital twin technology, and global digital energy innovation. Recent studies have suggested that digital transformation in enterprises primarily facilitates an increase in high-skilled employees (Wang & Zhang, 2024), giving rise to the creation of numerous positions that require mastery (Li *et al*., 2024). These changes presented significant challenges to the development of vocational institutions and their training objectives, sending a clear and urgent signal to SZPU to accelerate its pursuit of superior development. Accordingly, the social foundation for refining vocational education considerably changed. Intent on building world-class vocational institutions, SZPU augmented its educational practices by fulfilling its mission to support national, regional, and industrial development.

Correspondingly, the institution developed 24 observable, measurable, and assessable indicators covering five key areas: Capability for talent cultivation, program development, technical R & D and services, the quality of faculty, and the degree of internationalization. To prevent the dilution of its concentration on "first-class" standards, SZPU adopted a pyramidal indicator structure. At the foundational level, principal metrics included a 98% student employment rate and a 10% entrepreneurship rate. At the core level, SZPU enhanced its technical feedback capabilities, successfully serving 1500 enterprises over three years with a conversion rate of 68%. At the leadership level, the focus was on actively formulating industry standards and expanding authority for setting guidelines. The evaluation criteria for talent cultivation encompassed the proportion of students employed by Fortune 500 or industry-leading companies, the percentage of recent graduates obtaining internationally recognized certifications, best-in-class industrial endeavors to secure starting and mid-career salaries for graduates, the extent of alumni entrepreneurship, and the achievements of students in competitions and patenting. This system provided clear guidance and momentum for realizing the objectives underlying school construction.

Aligning program design with Shenzhen's industrial structure

Effectively contributing extraordinary value to Shenzhen's social development warrants the consistency of academic programs with the city's industrial structure. Shenzhen has established a development framework consisting of four pillar industries, seven strategic emerging industries, and five future industries. SZPU, situated in Nanshan District, puts a premium on sectors such as communication, the digital economy, new materials, digital audiovisuals, digital software, creative design, robotics, wearable devices, and more. The district also hosts renowned companies that include DJI, ZTE, and Huawei. To improve the caliber of educational practices, SZPU introduced the strategy of "developing programs based on industrial chains" to achieve alignment between industry and the aforementioned settings. First, SZPU has conducted in-depth research on industry enterprises, firmly believing that "the cultivation of high-quality talent must be grounded in a deep understanding of industry enterprises". To enhance the transformation of enterprise resources into assets for program development, SZPU carries out systematic and dedicated enterprise research annually. In 2023, it refined and established a revolutionary industry–enterprise tracking system, steering program development in a way that integrated technical, operational, and innovation logics. Second, SZPU has optimized its mechanisms for dynamic program adjustment and enhanced its review systems for discipline and program establishment with industry–enterprise participation. On the basis of Shenzhen's industrial structure, the university has introduced 37 new programs, transformed and upgraded 72 offerings, and closed or merged 29 programs. This refinement has resulted in 97% alignment between specialized settings and industry needs, equivalent to an increase of 32 percentage points over the national average.

Strong school–enterprise dual-entity collaboration

SZPU has articulated a clear strategy for building a world-class vocational institution: "Partnering with top-tier enterprises to deliver top-tier education". By emphasizing the integral function of enterprises and seamlessly integrating education and teaching into the collaborative framework of schools and businesses, the university has created the condi-

tions for a profound transformation of the conventional educational model. The main approaches encompass three aspects.

The first is collaboration with premier enterprises to establish specialized industrial colleges, creating a dual-entity education model that involves schools and enterprises. Supported by the Shenzhen Municipal People's Government, SZPU has facilitated each specialization cluster's collaboration with a Fortune 500 company or leading enterprise to establish distinctive industrial colleges. These efforts revolve around the core needs of industrial and innovation chains, fostering a shared, sustainable, and stable dual-entity cooperation model. SZPU has also established 18 specialized industrial colleges with top corporations such as Huawei, BYD, DJI, and Han's Laser. Their partnership covers nine domains: Party building, curriculum development, faculty training, technical R & D, industry standards, certification, innovation, entrepreneurship, and internationalization through "nine joint efforts". Characteristic industrial colleges operate under a governance model wherein the president is accountable to a board of directors. Their curricula are meticulously aligned with global industrial development trends and complement Shenzhen's strategic emerging industries, future industries, modern service sectors, and traditional industries with competitive advantages.

The second aspect is the construction of platforms for services in technical skill innovation through leading-edge applied research. Such research and service capabilities have been rapidly advanced by SZPU, thus paving the way for innovation in educational practice by creating the necessary space and resource conditions for this undertaking. It has worked with dominant domestic and international corporations to establish a network of applied technology innovation centers and public technical service platforms in fields such as next-generation information technology, biomedicine, new energy, advanced materials, energy conservation and environmental protection, robotics, and intelligent manufacturing. More specifically, the institution has established six workstations and laboratories for academics, 14 applied technology innovation centers, and 10 publicly accessible technical service platforms. These initiatives include cutting-edge platforms such as the Hoffmann Advanced Materials Research Institute, the Intelligent Manufacturing Technology Research Institute, and the Intelligent Science and Engineering Research Institute. Over the past three years, SZPU's technical research and development, along with its services, has benefited over 1500 enterprises, thus facilitating the conversion of numerous achievements and robustly supporting the cultivation of technical skills in high-end, precision, and intelligent manufacturing.

The third aspect is pioneering the establishment of a Future Technology College. SZPU, in collaboration with the Shenzhen Nanshan District government, built the Future Technology College with a view to nurturing top-tier talent in hard-tech innovation and entrepreneurship. The college fosters strong partnerships with enterprises, focusing on three major industries—consumer electronics, intelligent healthcare, and intelligent manufacturing—as well as professional roles such as enterprise founders, product managers, and system engineers. By breaking down disciplinary boundaries, promoting project-based learning, designing curriculum modules congruent with industry chains, and implementing outcome-oriented assessments, the college effectively cultivates innovation and entrepreneurial skills among students. Future Technology College not only empowers students to independently shape their professional paths through interdisciplinary curriculum design but also evaluates learning through market outcomes. It also encourages enrollees to launch enterprises rooted in their projects, striving to build a platform that helps build and sustain hard-tech enterprises.

The initiatives undertaken by SZPU to establish leading vocational institutions have proved effective. In recent years, the initial employment rate of SZPU graduates has consistently exceeded 98%, with 29% securing positions at Fortune 500 companies and premier enterprises within one year of graduation. In 2024, 95% of enrollees in vocational programs surpassed undergraduate admission thresholds, with the minimum scores exceeding the special type admission control score by 27 points. That same year, the success rate of graduate entrepreneurs surpassed 10%. These data illustrate the effectiveness of SZPU's strategy of "leveraging top-tier enterprises to advance education", offering valuable insights and exemplary models for the development of China's skill formation system.

EVOLUTIONARY LOGIC AND FUTURE PROSPECTS OF CHINA'S HIGHER VOCATIONAL EDUCATION

The evolution of SZPU's educational practices serves as a microcosm of China's skill system development in higher vocational education institutions. An analysis of such practices during periods of economic transformation reveals that its three distinct stages of educational practice systematically resolved the challenges posed by economic changes at different times. In response to the dynamism of the economic landscape at various stages, SZPU has consistently broadened its cognitive and operational horizons, refining and updating its inherent models to align with

external demands. This process adheres to three fundamental principles.

First, the primary catalyst for change in the delivery of education at vocational institutions across various phases is demand driven by economic development. Being at the forefront in China's economic reform and development, Shenzhen has seen its economic transformations most swiftly reflected in vocational education. The primary motivation for establishing SZPU was to serve as a pioneering model for Shenzhen's transition to a technology-intensive economy by cultivating technical talent specifically tailored to the city's economic development needs, distinct from those produced by traditional higher education institutions. To keep pace with the evolving economic landscape and quality enhancement initiatives in Shenzhen, SZPU has strategically guaranteed congruence between its educational practices and economic requirements. This alignment fosters a dynamic synergy between the institution's skill offerings and the city's industrial growth, thereby clearing the way for sustainable human capital support for exceptional economic advancement.

Second, the implementation of vocational education at various stages reflects the national vision and priorities for its development. China's vocational education policies serve as both significant constraints and driving forces in the evolution of educational practices in vocational institutions. Despite the growing autonomy of local governments in the development of vocational education in recent years, the governance of this sector remains predominantly centralized. The central government retains primary authority over leadership, while local governments function mainly as policy implementers (Xie & Xiang, 2023). Over the past decade, China's central government has actively introduced policies to advance vocational education, creating robust "policy landscapes" and "policy fields" (Shi & Que, 2024). Through excellent planning and systematic frameworks, these policies have clearly guided and substantially supported the provision of education in vocational institutions. Notwithstanding the various stages of reform at SZPU being designed to meet the practical needs of Shenzhen's economic development, their exploratory directions remain consistent with the overarching guidance of China's vocational education policy. National vocational education policies fundamentally stem from the evaluation and planning of economic development. China's vocational education policies align with its economic development, collectively advancing the exploration of educational practices in vocational institutions.

Third, the educational practices of vocational institutions are undergoing a shift from closed, school-centered systems to open, integrated networks characterized by dual collaboration between schools and enterprises. The quality of such practices hinges on effective cooperation between educational institutions and corporations. Through three stages of practical exploration on the grounds of school–enterprise collaboration, the first two stages led to a recognition of enterprises primarily as external influences on vocational education. Collaboration was thus frequently perceived as an avenue through which to amplify school value and achieve educational goals, with vocational education practices remaining largely school-centered and closed in nature. In the third stage, a significant shift occurred: Driven by the advancement of China's policy on the robust integration of industry and education, school–enterprise collabo-ration evolved into the core essence of vocational education. The delivery of such education began to transcend conventional boundaries, moving away from school-centered models as enterprises and schools gradually merged into dual pillars of educational practice. The relationship between these entities has transformed from mere cooperation to the creation of a collaborative community (Shi & Que, 2024). The scope of their collaboration has broadened from skill training to encompass comprehensive integration, including technical R & D and the formulation of standards. The development paradigm has evolved from "resource introduction" to "value co-creation" (Wang, 2025).

In light of the aforementioned evolution in vocational education practices, the provision of vocational education has emerged as a crucial strategy for China's national and economic development. The country seeks a significant qualitative leap in its modernization efforts, centered on economic development, as outlined in its upcoming five-year development plan. This sets the course for advancing reforms and achieving breakthroughs in higher vocational education. The direction that China has taken in this regard is represented by the promotion of vocational education in a way that substantively integrates it into regional economic development processes, with a focus on industry–education integration while innovating and adding value to local social and economic growth. At this stage, future practices in China's higher vocational education are expected to exhibit three major trends.

First, under policy guidance, local governments will strengthen their leadership in vocational education reform and accelerate the advancement of high-quality vocational education. In previous practices, China's central government has served as a key driving force in vocational education reform. Looking ahead, the agency and influence of local governments in China are expected to become more prominent. *The Outline of the Plan for Building China into*

a Leading Country in Education (2024-2035) released in 2024 emphasizes the importance of provincial perspectives in building a modern vocational education system, reinforcing the primary responsibility of local governments in coordinating development initiatives for vocational education. As the strategic core for advancing vocational education, the focus on governance for industry–education integration is gradually shifting from the central to the local level (Pan & Li, 2022). Building on the intensified efforts of local governments, diverse stakeholders in vocational education will further overcome existing institutional barriers and work collaboratively to drive innovative reforms in practice.

Second, the localization features of vocational education practices have progressively dominated. As the concentration of vocational education reform moves comprehensively to the local level, vocational education is expected to become more deeply embedded in local communities, catering to their needs and highlighting diverse regional characteristics. For years, China's vocational education has experienced rapid development under systematic national planning. However, its implementation has struggled to effectively embrace regional and local characteristics. A vocational education system tailored to China's national context has been established (Zeng & Xu, 2025), and the development of vocational education has entered a phase of in-depth exploration at the local level. Integrating the localized characteristics of vocational education into the regional economic development ecosystem is anticipated to further enhance such attributes. SZPU, situated in the economically thriving city of Shenzhen, has greatly benefited from the city's advanced industrial structure throughout its development. Nevertheless, China's expansive territory and significant regional disparities pose challenges to the straightforward promotion of specific vocational education models—a longstanding issue that continues to impact the country's vocational education practices. Under the guidance of national policy, new practices customized to regional characteristics are emerging, effectively overcoming existing challenges. For example, Xianning Vocational and Technical College, located in Xianning City, Hubei Province, has confronted challenges such as limited regional industrial support and constrained fiscal resources. The college introduced the "multiple college students per village" strategy, focusing on talent development and entrepreneurship services catering to rural communities. As of this writing, 30% of participants have become members of village-level "two committees", while 25% have arisen as local leaders in entrepreneurship and wealth creation (Guo, 2025). These achievements have been realized by the graduates of SZPU. Wide-ranging vocational education models will continue to emerge across different regions in the future, further highlighting the vitality and inherent richness of China's economic development.

Third, vocational education will play a key role in redefining value to drive economic development. World Bank data indicate that a 1% increase in return rates on vocational education investment can engender a 0.37% growth in the GDP (Zhang, 2025). Germany's dual system model, with its strong enterprise involvement in apprenticeship training, has accelerated the pace at which manufacturing intelligence is transformed by 40% (Lin & Liang, 2019). Increasing evidence has shown that vocational education has overcome the constraints of traditional education, rising as a vital element in prompting national economic development and innovation. The value of vocational education in China's economic development is becoming increasingly evident. Research has illustrated that between 2005 and 2020, China's contribution to the development of higher vocational education through its economic growth surged rapidly during the initial phase, eventually stabilizing at around 80%. While the contribution of higher vocational education to economic development has shown a gradual upward trend, it started with relatively low rates in earlier periods but steadily increased, reaching 5% in later stages (Zhou, 2025). This increase is expected to continue, and the enhancement stems from the seamless integration and dynamic interaction between higher vocational education practices and economic development. In this process, the former will evolve from having an instrumental value to embracing innovation collaboration: It will transition from merely supplying human resources to fostering innovation, shift from adapting to development to leading it, and diverge from "ensuring employment" to embrace "promoting innovation". In addition to being stimulated by talent development, this shift will be more significantly achieved through engagement in technological innovation. Vocational institutions, particularly higher vocational colleges and vocational undergraduate institutions, play a dual role as principal contributors to scientific and technological advancements and as vital agents in the application and commercialization of these achievements (Pei & Chen, 2024). In 2022, vocational schools in China generated 5.161 billion yuan in technical service revenue for enterprises by collaborating on the development of technical service platforms and other initiatives, marking a 9.13% increase relative to 2021 levels (China Academy of Educational Sciences, 2024). This transformation is particularly evident in Shenzhen, where 56% of the city's 1.74 million skilled workers are graduates of vocational institutions, contributing to 46% of the Greater Bay Area's scientific and technological achievements being successfully translated into practical applications. Vocational education is predicted to redefine its role in supporting China's economic devel-

opment. It is foreseeable that the broader integration of advanced intelligent and digital technologies will lead to a breakthrough enhancement in the contribution of higher vocational education to China's economy, building upon its steady growth.

Traditional Chinese social perceptions relegated vocational education to being a last-resort option for education, but modern society has progressively embraced this sector's identity as a vital engine of exceptional development. The transformation is underpinned by a fundamental shift in educational logic. As industrial upgrades shift job requirements from "single skills" to "skill clusters", vocational education must transition from "instrumental rationality" to "developmental rationality". With the deepening of China's pursuit of the aforementioned development, vocational education is poised to transcend traditional conceptual and structural constraints, marking a comprehensive shift from its "instrumental value" to its "developmental value".

CONCLUSION

This study examines the developmental course of vocational education practice at SZPU and explores the dynamic relationship between vocational education and the evolution of economic development. It illustrates that the three stages of educational practice at SZPU represent a systematic response to the challenges posed by economic changes across different periods. This process is influenced by the demands of economic development, national education policies, and the extent of school-enterprise collaboration. Further analysis reveals that vocational education has become a crucial strategy for China’s national and economic development. Focusing on industry-education integration to drive the deep embedding of vocational education in regional economic development, while pursuing innovation as it contributes value to local social and economic progress, represents the key direction of vocational education practice in China for the foreseeable future. In this process, diverse models of vocational education practice will continue to emerge across different regions of China, further highlighting the vitality and inherent richness of China’s economic development. Ultimately, this study contributes to the ongoing effort to deepen the understanding and continuously advance the development of vocational education in China.

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