Advances in Vocational and Technical Education (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/avte.2025.070119
ISSN 2523-5834 Vol. 7 Num. 1

Exploration and Practice on the Cultivation Path of Applied Innovative Talents in Industrial Colleges

Tingting Li[a,*], Yantao He[b], Yiqi Lu[c]

Guangdong University of Science and Technology, Dongguan, Guangdong Province, China
[a]2720433265@qq.com, [b]1796991329@qq.com, [c]1647758104@qq.com
**Corresponding author*

Keywords: Modern Industry Colleges; Application-oriented Innovative Talents; Industry-education Integration; Tencent Cloud Ecosystem; Dual-qualified Faculty; Research-driven Teaching

Abstract: Under the national background of deepening industry-education integration and industrial transformation[1], Tencent Cloud Industry College at Guangdong University of Science and Technology explores pathways for cultivating application-oriented innovative talents to address the disconnection between traditional education and industrial demands. By integrating resources from universities and enterprises, the college constructs a "1+2+N" industry-education integration ecosystem model and develops a four-chain integrated curriculum system ("industry chain-talent chain-education chain-innovation chain"). Leveraging Tencent Cloud's technological advantages, modular courses and practical training platforms aligned with real-world industrial scenarios are established. Innovations include a dual-qualified faculty mechanism (combining academic and industry expertise), a research-driven teaching model, and industry evaluation standards such as "code volume metrics," forming a distinctive education system characterized by "cloud-industry focus, research-driven innovation, craftsmanship cultivation, and agile learning." Significant outcomes include enhanced employability of students in the "Elite Engineer Program", with graduates' average salaries exceeding industry standards. The college has co-developed 18 industry-aligned courses, secured over 90 competition awards, and increased the proportion of dual-qualified faculty to 80%. This study provides a replicable "cloud paradigm" for local universities to overcome industry-education barriers and support regional economic development. Future efforts will focus on dynamic curriculum adaptation to technological advancements and deepening collaborative ecosystems.

1. Introduction

The cultivation of applied innovative talents constitutes an indispensable component of national economic and social development[2]. The National Medium- and Long-Term Education Reform and Development Plan (2010–2020) explicitly emphasized the importance and necessity for higher education institutions to nurture applied innovative talents. As early as 2011, leading universities under China's "211" and "985" initiatives had initiated talent cultivation programs focused on innovation. However, regional universities, disadvantaged in student recruitment and faculty

resources compared to top-tier institutions, face challenges in establishing effective applied innovative talent cultivation models.

The 20th National Congress of the Communist Party of China underscored the imperative to "strengthen enterprise-led deep integration of industry, academia, and research." Guidelines such as the Modern Industrial College Construction Guide (Trial) (Document No. 16 [2020]) issued by the General Office of the Ministry of Education and the General Office of the Ministry of Industry and Information Technology further advocate for "innovating talent cultivation models to enhance educational quality," providing new strategic directions for talent development at regional applied undergraduate institutions.

Since their establishment, modern industrial colleges have achieved notable progress in talent cultivation, digital resource development, faculty training and exchange, scientific research, and social services. Nevertheless, significant operational barriers persist in practice. Consequently, addressing these challenges in modern industrial college development and promoting their sustainable growth hold substantial theoretical and practical significance.

2. Modern Industrial Colleges as Effective Platforms for Cultivating Applied Innovative Talents

As a strategic platform for deepening industry-education integration, the modern industrial college constructs an innovative talent cultivation system that is "demand-oriented, collaborative in talent training, and dynamically iterative."[3] By integrating the disciplinary strengths of universities with the resources of leading enterprises in the industry, it takes the real needs of the industry as the logical starting point. Relying on the school-enterprise co-built modular course clusters, immersive practice bases, and joint research and development centers, it creates a full-chain training path of "theory-practice-innovation." At the same time, through the teacher exchange mechanism of "industry mentors stationed at schools + dual-qualified teachers entering enterprises," it deeply integrates industry technical standards, engineering cases, and innovation scenarios into the entire teaching process. This not only strengthens students' ability to solve complex industrial problems but also promotes the rapid transformation of scientific research results into industrial applications. It effectively resolves the structural contradiction in traditional education where knowledge supply lags behind industrial transformation and has become a new type of talent incubator supporting high-quality regional economic development.

Under the strategic framework of the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) to build an international science and technology innovation center and a highland of advanced manufacturing, Dongguan, as a global smart terminal manufacturing base and a hub for technology transfer in the Bay Area, local applied universities should take on the special mission of cultivating innovative talents, breaking through the bottlenecks of "stuck neck" technology transfer, and supporting the digital transformation of the industrial chain. Faced with the intelligent upgrading needs of trillion-yuan industrial clusters in the GBA such as electronic information and high-end equipment manufacturing, relying on innovation poles such as Songshan Lake Science City and Binghaiwan New District, a "industry demand map-driven curriculum development, scientific and technological research projects feeding back into teaching innovation" industry-education integration ecosystem is constructed. Through the dual-system training model of "enterprise proposition - university solution - student problem-solving," it cultivates "Bay Area craftsmen" with new engineering practice capabilities such as intelligent equipment debugging and industrial Internet maintenance, and fosters "industry makers" who can connect the Guangzhou-Shenzhen-Hong Kong-Macao innovation corridor and achieve cross-border technology integration and application. This provides a strong talent fulcrum for coping with the industrial chain restructuring

and global competition in the Bay Area under the background of the Fourth Industrial Revolution.

Responding to the call of the times, Guangdong University of Science and Technology has initiated the construction of a modern industrial college and jointly signed a strategic cooperation framework agreement for industry-university-research with Tencent Cloud Computing (Beijing) Co., Ltd. and Beijing ZR International Education Technology Co., Ltd. to build the Tencent Cloud Industrial College. Since its establishment, the Tencent Cloud Industrial College has followed the Guangdong Province Science and Technology Innovation "14th Five-Year" Plan, focusing on strategic emerging industries such as new-generation information technology. Relying on the school's educational policy of "cultivating virtue, student-centered, industry-education integration, serving the region, and coordinated development," it closely meets the digital transformation needs of "Dongguan Manufacturing." Guided by the seven strategic emerging industries of Dongguan, it targets the scarce technical positions in fields such as new-generation electronic information, intelligent manufacturing, and digital economy. By integrating the advantages of enterprise resources, it has formed a talent training system of "cloud industry focus, research-driven, virtue nurturing, and keen learning competition," which is suitable for local applied innovative undergraduate colleges and universities. This system cultivates outstanding engineering talents urgently needed for the transformation and upgrading of the local economy. After several years of implementation, it has achieved good application results.

3. Common issues in the innovative talent cultivation process of modern industrial colleges

Due to the structural contradiction between the educational model and the rapidly changing industrial demands, modern industrial colleges need a period of reform and innovation to truly adapt to the needs of social development. In the cultivation of innovative talents, modern industrial colleges generally face the following issues:

3.1. Outdated Talent Cultivation Programs and Disconnection from Industry Needs

The business demands and technological updates of enterprises are extremely rapid, while the talent cultivation and teaching systems of universities have not kept pace with the times. Traditional professional education and teaching cases in universities are outdated, and practical cases are criticized for being obsolete. As a result, students often face the serious problem of being able to understand concepts but unable to apply them effectively, leading to unemployment upon graduation. Even in some courses with practical components and case studies, these are often several years behind the industry, being described as "stale and outdated." There is a need to enhance the authenticity and challenge in students' engineering practice education.

3.2. Shortage of Applied Teachers and Low Proportion of Dual-Qualified Faculty

Students who are trained to be application-oriented and innovative require teachers with practical experience. The faculty of industrial colleges are the core of talent cultivation aligned with industrial applications, and it is essential for teachers to have rich experience in enterprises, especially in the internet sector. However, most universities have not included dual-qualified teachers in their title evaluation and annual performance assessment indicators. As a result, teachers' main focus remains on research and teaching construction, which has little impact on enhancing practical skills and cultivating professional qualities.

3.3. Lack of Industry Evaluation Standards and Incomplete Quality Assessment System

Industrial colleges involve multiple stakeholders, including schools, enterprises, governments, and students, with the core being the school-enterprise relationship. Only by establishing a stable and sustainable cooperation model of co-construction and sharing between schools and enterprises can the dual-subject talent cultivation and integration of industry and education be truly implemented. It is crucial to explore how to promote the evaluation and management of industry-university-research services with enterprises. How to encourage enterprises to participate in the evaluation and management of talent cultivation quality in industrial colleges and form a community of shared destiny in talent cultivation between schools and enterprises is a thorny issue that needs to be addressed currently.

4. Exploration and Practice of the Path for Applied Innovative Talent Cultivation in Tencent Cloud Industrial College

4.1. Content of Cooperation and Implementation

In exploring the path for applied innovative talent cultivation, Tencent Cloud Industrial College takes the "ecological demand anchoring—ecological coupling—capability progression" of Tencent Cloud as the main construction line. It deeply integrates Tencent Cloud's technological resources with the regional industrial upgrading needs and reconstructs the talent cultivation framework. Through a "course-project-certification" integrated model, cutting-edge technologies such as cloud computing and artificial intelligence are transformed into modular courses, embedded in the "cloud-based training platform" with real industrial scenarios, achieving precise alignment between technological tools and industry pain points. Relying on the "school-enterprise dual-mentor system" and the linkage mechanism of "research-competition-innovation-incubation," real projects from Tencent's ecosystem enterprises drive interdisciplinary collaboration, building a closed loop for full-chain capability cultivation from technological development to commercial implementation. Meanwhile, a dynamic feedback industry-education data platform is created to track real-time technological iterations of enterprises and talent capability gaps, optimizing the curriculum system and evaluation standards in reverse[4]. This forms a sustainable ecological cycle of "industry demand traction—educational resource alignment—innovation results feedback," providing talent support for high-quality regional digital economic development. The specific practices are as follows:

4.1.1. Establishing a "1+2+N" Excellent Engineer Industry-Education Integration Ecological Model

Adhering to the cooperation philosophy of "sharing, innovation, and leadership," Tencent Cloud Industrial College continuously integrates high-quality resources from schools and enterprises in collaboration with the Dongguan Municipal Government, Tencent, and ZR International. This forms the "1+2+N" industry-education integration ecological model, focusing on comprehensive cooperation around all elements of teaching[6]. The college innovatively develops talent cultivation programs and curriculum systems, implements project-based teaching, and establishes an innovative engineering talent cultivation model with deep integration of industry and education and multi-party collaboration. Meanwhile, industry and enterprise standards are introduced to formulate talent cultivation evaluation standards for the industrial college, enhancing the social relevance of talent cultivation.

4.1.2. Studying the Interdisciplinary System of the Industrial College and Building a Four-

Chain Integrated Curriculum System

Closely linked with the actual needs of Tencent Cloud's ecological industry, the college, guided by the industrial chain, jointly studies the interdisciplinary system of the industrial college with enterprises. It develops a curriculum system integrating the "industry chain—talent chain—education chain—innovation chain" and revises the talent cultivation program[7]. This ensures seamless alignment between talent cultivation and market demand by optimizing course settings and teaching content. Through deepening school-enterprise cooperation and integration of industry and education, a bridge for practice and innovation is built. Additionally, entrepreneurship and innovation education is strengthened to stimulate students' innovative thinking and practical abilities[5]. The curriculum content is closely integrated with Tencent's advanced technologies and practical cases in artificial intelligence, big data, and cloud computing. Jointly developed courses include "WeChat Mini Program Development" ,"Tencent Personalized Recommendation System Development", "Visual Perception Applications in Autonomous Driving", and "Tencent Cloud Technology Certification" ,among others.

4.1.3. Building a Hybrid Faculty Team of School and Enterprise Teachers and Increasing the Proportion of "Dual-Qualified" Teachers

A faculty team composed of school teachers and enterprise experts is cultivated. Policies and measures are introduced to enhance teachers' capabilities in theoretical teaching, applied research, and social services, increasing the proportion of "dual-qualified" teachers. Relying on the Tencent Cloud technology industry-education integration ecosystem, a multi-party faculty co-construction mechanism is established, forming a community of shared destiny between school and enterprise faculty. A teaching innovation team composed of both school and enterprise teachers is built, with shared responsibilities and long-term sustainable development. This forms the development framework for "dual-qualified" teachers in the industrial college.

4.1.4. Constructing Diversified Enterprise-Level Online Teaching Platforms Such as “Teng-xue-hui” and “Zhi-yun-shu”

Leveraging the technological and resource advantages of Tencent and ZR International, enterprise-level course teaching platforms such as "Teng-xue-hui" and "Zhi-yun-shu" are utilized. Through learning and practice, students gain insights into the latest industry technologies and tools, broadening their horizons and ways of thinking. Additionally, through teachers' internships in enterprises, part-time enterprise teachers entering classrooms, joint course development, co-application for teaching and research projects, and co-construction of practice platforms, a "shared" model of talent, skills, resources, funding, and platforms is achieved, realizing win-win cooperation between schools and enterprises. The “Teng-xue-hui” is a one-stop teaching and practice platform.

4.1.5. Creating Off-Campus Practice Centers Such as Tencent and ZR International

Advanced experimental and training environments are established, equipped with professional experimental devices and software. Close cooperation is maintained with enterprises such as Tencent Cloud and ZR International to provide students with a rich array of off-campus internship positions and practical opportunities[7]. Students can participate in the development and implementation of real projects at off-campus practice bases, understand corporate workflows and management models, and enhance their professional quality and employability. Students can also attend academic reports conducted by base experts on campus, such as an academic report on "Artificial Intelligence Technology and Its Progress in AIGC (Generative AI)" delivered by an

academician from a new engineering research institute.

4.2. Innovations

After years of practical exploration and continuous iterative optimization, Tencent Cloud Industrial College has formed the following core construction experiences in the field of applied innovative talent cultivation, creating a replicable and iterative "cloud paradigm" for applied talent cultivation.

4.2.1. Focusing on the Tencent Cloud Ecosystem to Build a Talent Cultivation System of "Cloud Focus, Research-Driven, Virtue-Oriented Craftsmanship, and Agile Learning for Excellence"

Focusing on the Tencent Cloud ecosystem, the college has built a unique talent cultivation system of "Cloud Focus,Research-Driven,Virtue-Oriented Craftsmanship,Agile Learning for Excellence." Centered around Tencent Cloud, the system deeply integrates cutting-edge technologies such as cloud computing, big data, and artificial intelligence, providing students with learning and practice platforms that are closely aligned with industry frontiers. The college has selected classic project cases, including research-oriented horizontal projects, special envoy projects, and enterprise horizontal projects, to guide students in competitions and help them complete extracurricular theoretical learning, self-exploration in engineering practice, and achieve results through teamwork and collaboration. Additionally, the college emphasizes the cultivation of students' professional ethics and craftsmanship, shaping their good professional qualities. It advocates agile learning and active competition, encouraging students to continuously improve themselves and pursue excellence. The talent cultivation system is shown in Figure 1.

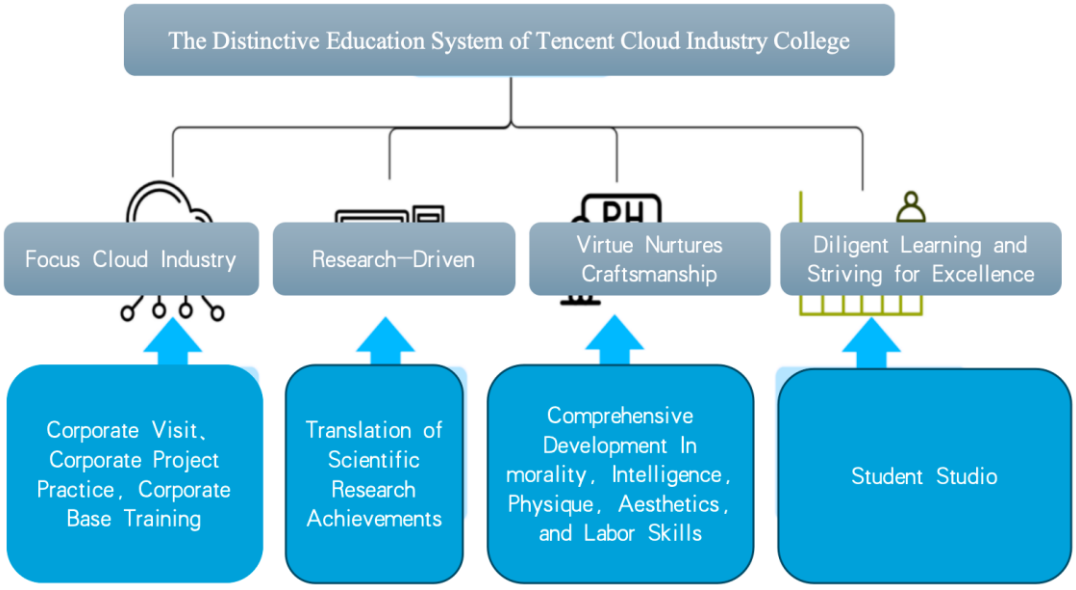

Figure 1 The Distinctive Education System of Tencent Cloud Industry College.

4.2.2. Relying on Research-Driven Development to Build an Integrated “Industry-Academia-Research-Application” Service Platform

Leveraging the strong research and development capabilities of Tencent, ZR International, and other partners, an integrated platform that combines industry, academia, research, and application has been established. This platform deeply integrates industrial practice, academic research, and

technological innovation, promoting the efficient transformation and application of research outcomes. Through close cooperation with enterprises, universities, and research institutions, the platform conducts cutting-edge technology research, product development, and technical services, driving industrial upgrading and innovative development. The platform also provides students with abundant practical opportunities, allowing them to develop skills and gain experience through real projects, thus laying a solid foundation for their future career development. The Tencent Cloud Industrial College Industry-Academia-Research-Application Service Platform is shown in Figure 2.

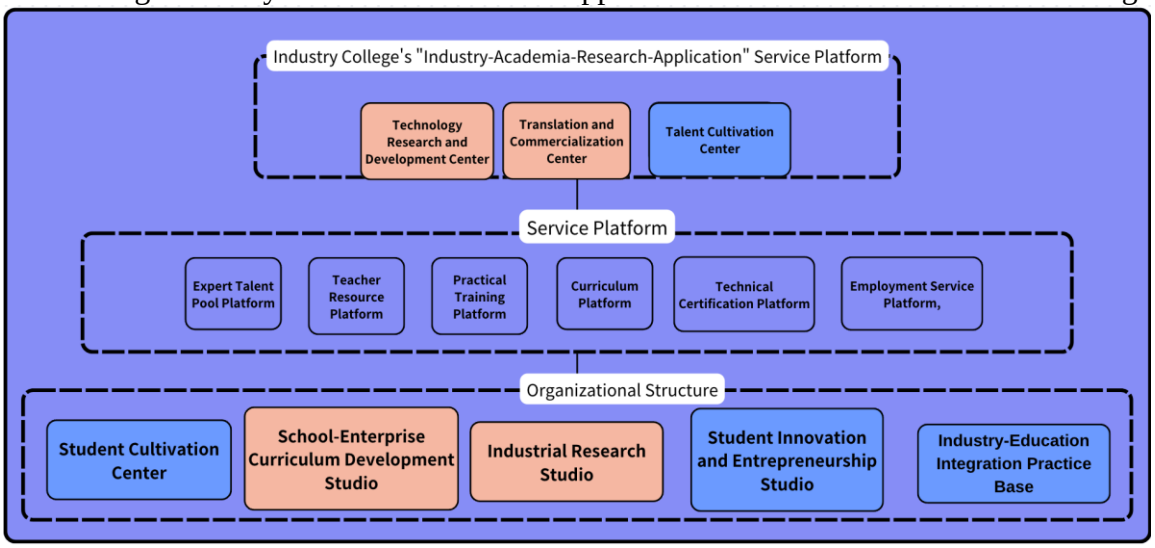

Figure 2 Industry College's "Industry-Academia-Research-Application" Service Platform.

4.2.3. Research Feedback into Teaching: A Mutually Reinforcing Relationship

The collaboration between the teacher innovation research studio and student studio at Tencent Cloud Industrial College promotes the transformation and application of research outcomes. Teachers are encouraged to apply for horizontal projects such as special envoy programs, transforming research results into practical applications and contributing to industrial and social development. The research-to-teaching feedback model of the Tencent Cloud Industrial College is shown in Figure 3.

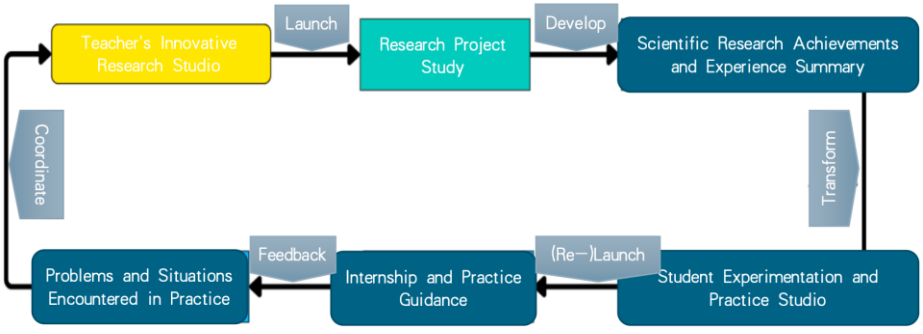

Figure 3 Research-to-Teaching Feedback Model in Industry-Oriented Colleges.

4.2.4. Innovatively Introduced Industry and Trade Association Evaluation Mechanisms to Assess the Quality of Applied Talent Cultivation

In collaboration with Tencent Cloud, ZR International, and other enterprises, an innovative “code volume” evaluation mechanism has been introduced to explore and assess the engineering practice capabilities of computer science students[8]. By utilizing code hosting platforms, the

quantity and quality of students' practical work are automatically tracked and statistically analyzed. This mechanism provides feedback on the phased outcomes of talent cultivation. It clearly shows students how to learn effectively and helps teachers understand how to teach more efficiently.

4.3. Achievements in Exploring Innovative Talent Cultivation Models

Since the implementation of the project, Tencent Cloud Industrial College has launched a total of 12 Excellent Engineer classes, cultivating 430 students in total. The students in the industrial college have benefited significantly, with many outstanding individuals participating in horizontal projects led by teachers and research team projects. Student groups have won multiple awards in competitions and have generated several intellectual property achievements. After nearly four years of exploration, this initiative has improved the talent cultivation quality of majors such as Computer Science, Software Engineering, Data Science and Big Data Technology, and Intelligent Science and Technology in the Computer Science Institute, achieving certain effects and influence.

4.3.1. Extensive Benefits for Students Involved in Workshops and Research Teams

Students participating in student workshops and teacher-led research teams have benefited greatly, achieving high professional competence and social recognition after graduation, with positive feedback from students. Approximately 40 students have participated in student workshops and teacher research teams. After graduation, their average monthly salary is about 8,000 yuan, which increases to 12,000 yuan after three years. The vast majority of them have become key members of enterprises or project teams.

4.3.2. A Replicable and Promotable Path for Innovative Talent Cultivation in Modern Industrial Colleges

This initiative has explored and established a new path for the cultivation of excellent engineers in modern industrial colleges that can be replicated and promoted. Through this project, the following achievements have been realized:

Jointly developed 18 project-based practice tutorials with enterprises, including "WeChat Mini Program Application in Practice," "Development of Tencent Personalized Recommendation System," "Visual Perception Applications in Autonomous Driving," "Git: Getting Started and Practical Use," and "Maven: Principles and Practical Use."

Developed 25 sets of standardized curriculum resources for professional clusters.

Established 18 on-campus practice teaching platforms and one off-campus industry-education practice teaching base.

Built one "industry-university-research-application" service platform and one student engineering capability quantitative assessment platform.

Developed two online learning and experimental platforms.

Established one teacher innovation studio and one student studio.

4.3.3. Faculty Development

The proportion of senior engineers in the school-enterprise hybrid faculty team has increased to over 80%. Several in-house teachers have obtained professional skill certificates in industry-university collaborative talent training, such as "WeChat Mini Program Development," "Big Data and Security," and "HarmonyOS + Large Model 'Edge-Cloud' AI Intelligent Applications." They have participated in the joint development of multiple courses with enterprises, published more than 20 high-level papers, filed over 10 patents and software copyrights, and assisted multiple teachers in

obtaining promotions in professional titles.

4.3.4. Significant Achievements in Student Competitions

Students have won more than 90 awards in high-level specialized skill competitions such as the "Chinese College Students' Computer Competition," "Challenge Cup," "Chinese College Students' Computer Network Technology Challenge," "GBA IT Application System Development Competition," and "Industrial Software Design Competition." A total of 52 students have obtained Tencent Cloud Technology Qualification Certifications, and students have been guided to publish nearly 20 research papers and apply for software copyrights and patents.

5. Conclusions

The innovative practices of Tencent Cloud Industrial College have effectively addressed the long-standing issue of the disconnect between traditional university talent cultivation and industry needs, forming an applied talent cultivation paradigm characterized by technology empowerment, scenario-driven development, and dynamic iteration. Its core value lies in the creation of a closed-loop ecosystem integrating the "education chain—talent chain—industry chain." This not only significantly enhances students' technical application and innovation capabilities but also drives the digital upgrading of regional industries through a resource feedback mechanism.

Looking ahead, as technologies such as artificial intelligence and cloud computing accelerate their penetration into industrial scenarios, three major challenges need to be further addressed: First, maintaining a dynamic balance between technological iteration and the timeliness of curricula, which requires strengthening the predictive capabilities of the industry-education data platform to achieve preemptive updates of the curriculum system; second, building a collaborative network across regions and institutions to promote the standardized output and localization of the "cloud-based" talent cultivation model; and third, extending the evaluation system in a multidimensional way to explore a comprehensive assessment model that covers technical skills, business thinking, and social value.

Moving forward, the college will continue to rely on the global layout of the Tencent ecosystem, deepen collaboration among multiple stakeholders including government, industry, academia, research, and finance, and build an open and shared digital talent cultivation platform.

Acknowledgements

This work was supported by the Dongguan Science and Technology of Social Development Program (20221800905782) ,Guangdong University of Science and Technology's 2022 Quality Engineering Higher Education Teaching Reform Project (GKZLGC2022024) and Guangdong University of Science and Technology Teaching Research Project (GKJXXZ2024012).

References

[1] Fan X ,Jia Z ,Zhang X .Exploring the Deep Integration Model of Industry and Education, Research on the Construction of Modern Industrial Colleges in Universities[J].International Journal of Social Science and Education Research, 2024,7(12):15-23.

[2] Ye P ,Kang Y .Exploration of the Construction Path of Modern Industry College in Local Applied Undergraduate Colleges[J].Frontiers in Educational Research,2024,7(10)

[3] Jian L ,Xiaona H ,Jian Q .Research on the Construction of Modern Industrial Colleges in the Context of Industry-Education Integration[J].Education Reform and Development,2024,6(4):102-107.

[4] Fan C .Exploration and Innovative Research on the Construction of Practical Training Bases for Art Majors in Science and Engineering Universities from the Perspective of "Double First Class" Construction:-- Taking the Art

College of Southwest Petroleum University as an Example[J].Highlights in Art and Design,2024,6(2):13-17.
[5] Cai C ,Wan X.Research on the Construction of IoT Engineering Major System in the Background of Emerging Engineering Education[J].Curriculum Learning and Exploration,2024,2(2)
[6] Wei L ,Zhiang Y .Research on the Construction and Characteristic Development of Disciplines and Professions in Local Industry Universities[J].Frontiers in Educational Research,2022,5(22)
[7] Liu Z ,Li J ,Wang W .Exploration on the Construction Reform of Geology Specialty with Deep Integration of Artificial Intelligence under the New Engineering Background[J].Curriculum and Teaching Methodology,2022,5(3)
[8] Olajide O A ,Busayo T A,Olawale T E.Discussion on the Construction of the Core Curriculum of General Education in Engineering Majors in Colleges and Universities under the New Background[J].Indian Journal of Public Health Research & Development,2017,3(9)