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Research and Practice on an Information Technology Application Innovation Talent Cultivation Model with Teacher Education Characteristics

Zhang Baoju[a,*], Zhang Yameng[b], Wang Yi[c], Zhang Bo[d], Xue Mengqi[e], Yang Yuqing[f]

Department of Electronics and Communication Engineering, Tianjin Normal University, Tianjin, China
[a]wdxyzbj@163.com, [b]19839365776@163.com, [c]wangyi@tjnu.edu.cn, [d]b.zhangintj@tjnu.edu.cn, [e]xue981017@163.com, [f]15136758781@163.com

Abstract: *Taking the "Kylin Software–Tianjin Normal University AI Science Popularization Base" as a case study, this paper addresses the traditional information technology application innovation talent cultivation model's overemphasis on professional knowledge and innovation capability. We propose a new talent cultivation model with the goal of nurturing information innovation professionals who possess excellent teaching potential. Anchored in the distinctive characteristics of teacher education and supported by the AI science popularization base at Tianjin Normal University, the model introduces effective curriculum alignment modules, integrates competition-based learning and the "Information Innovation +" concept, and establishes a closed-loop feedback and continuous improvement mechanism.*

Keywords: *Information Technology Application Innovation Talents; Teacher Education Characteristics; Industry-Education Integration*

1. Introduction

From a national development perspective, autonomous and controllable enterprises, the establishment of a national technological innovation system, and the substitution of domestic alternatives have gradually become key themes. Since 2020, provinces such as Hunan, Jiangsu, Guangdong, Sichuan, and Tianjin have successively established information technology application innovation committee and conducted extensive promotion nationwide. More than 30 significant enterprises have been newly introduced to the Beijing Economic-Technological Development Area[1]. Having gone through the stages of "awakening–initial development–acceleration–integration", the industry has now entered a transformation phase driven by both policy incentives and technological empowerment, alongside market demand. As a crucial support for China's independent and controllable information technology, the information technology application innovation industry replaces reliance on foreign technologies through independent research and development(R&D) as well as iteration of foundational hardware and software, thereby elevating the nation's informatization level and driving the digital transformation of the economy and society.

Simultaneously, teacher education serves as the foundational project in building the national teaching workforce. Its core objective is to supply high-quality teaching resources to the basic education system. Under the context of the new era, the connotation of teacher education continues to expand. Its function is no longer confined to the mere transmission of knowledge; rather, it now assumes the responsibility of promoting educational modernization and cultivating interdisciplinary, innovative talent. High-quality teacher education is capable of producing compound professionals who not only possess technical expertise but also educational and pedagogical competencies, thus providing strong support for the development of information technology education.

Integrating the distinct features of teacher education with the information technology application innovation industry represents a critical path for improving the quality of information technology application innovation talent cultivation. By incorporating pedagogical concepts, reinforcing teaching competency training, and fulfilling the fundamental task of moral education, information technology application innovation education can shift from a purely technology-oriented approach to one that emphasizes comprehensive quality. This integration not only helps to alleviate the structural mismatch

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between university graduates and industry demand but also contributes to enhancing China's core competitiveness in technological innovation, educational services, and information security.

This study takes the “Kylin Software–Tianjin Normal University AI Science Popularization Base” as a research case to systematically explore how to construct a information technology application innovation talent training model with teacher education characteristics. From multiple dimensions—including talent demand analysis, curriculum system construction, teaching ability enhancement, practice platform development, and industry-education integration mechanisms—the paper aims to offer a replicable and scalable model for teacher education institutions nationwide.

2. Demand for Information Technology Application Innovation Talents and Characteristics of Teacher Education

2.1 Current Talent Demand in Information Technology Application Innovation

In the context of the rapid development of the digital economy and information society, the demand for talents in the field of information technology application innovation is increasingly trending toward specialization and integration. At present, the industry requires not only a solid foundation in computer science but also strong capabilities in system design, software development, and engineering practice.

From a professional competency perspective, information technology application innovation talents should be proficient in core subjects such as data structures and algorithms, operating systems, and computer networks. They should also be capable of software development and system optimization using at least one mainstream programming language (e.g., Python, Java, C++). As the industry evolves toward cloud computing and artificial intelligence, it is also essential for professionals to understand the architecture of major cloud platforms (e.g., AWS, Azure, Google Cloud) and possess the ability to design and deploy cloud-based applications. Furthermore, mastery of frontier technologies such as machine learning and deep learning has become a key indicator of high-quality talent in this field.

In terms of comprehensive qualities, the industry places growing emphasis on innovation, problem-solving ability, teamwork, and adaptability. Especially with the accelerating trend toward practice-oriented and interdisciplinary integration, professionals must be able to propose innovative technological solutions in complex systems and effectively organize project implementation.

In recent years, as the training system for the information technology application innovation industry has continued to improve, there has been a rising demand from enterprises for professionals who also possess educational capabilities. These individuals are expected to not only demonstrate technical proficiency but also excel in technical communication, vocational training, and knowledge transfer. They play essential roles in corporate training and industry skill dissemination. Therefore, pedagogical competence has become a critical variable influencing a professional’s career competitiveness and developmental potential in this domain.

2.2 Characteristics of Teacher Education

The teacher education system possesses distinct advantages in educational methodology and a highly structured talent cultivation mechanism, imparting humanistic, normative, and systematic value to the field of information technology application innovation. From educational philosophy to curriculum practice, teacher education offers robust theoretical foundations and practical support for the development of interdisciplinary talent.

In terms of practical ability development, teacher education establishes a hierarchical and progressive system of practical teaching. Through educational observation, teaching internships, and project-based training, students are immersed in real teaching and management scenarios, where they refine their instructional skills, communication proficiency, and organizational coordination abilities. Furthermore, the adoption of interdisciplinary teaching and project-based learning breaks through disciplinary boundaries, stimulates students' innovative thinking, and enhances their capacity to tackle complex problems. This significantly promotes the deep integration of information technology application innovation with practical implementation, injecting fresh vitality into talent development in the sector[2].

From the perspective of educational value formation, teacher education consistently prioritizes the

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cultivation of professional ethics and a commitment to education. Guided by the value orientation of "technology for good", teacher education focuses on nurturing a strong sense of responsibility and public service among students, encouraging the co-development of technical competence and ethical awareness. This value-driven approach ensures that graduates are not only technically proficient but also socially responsible and mission-driven educators, capable of making meaningful contributions to technology education, digital literacy promotion, and social service. It facilitates the organic integration of technological value with societal value.

Through its structured theoretical training, multidimensional practical pedagogy, and value-oriented education model, teacher education provides comprehensive and multi-level support for the cultivation of talents in information technology application innovation. This model fosters the development of high-level professionals equipped with both technical expertise and teaching ability, and contributes to the establishment of a talent training system that meets the evolving needs of the times, promoting high-quality development in information technology application education.

3. Construction of the Talent Cultivation Model

3.1 Curriculum System Design

The design of the curriculum system is a key component in cultivating information technology application innovation talents who possess teaching capabilities. It plays a vital role in enhancing students' comprehensive quality and improving instructional effectiveness. When constructing the curriculum system, it is essential to follow sound principles and adopt scientific methods to ensure effectiveness and coherence. Each course should have clear objectives and positioning to provide students with a defined learning path and career trajectory, ensuring alignment with their real-world needs and future development.

In recent years, the rapid growth of the information technology application innovation industry has led to a high demand for professionals with teaching, communication, and training skills—individuals who can offer in-depth pre-service and in-service training for industry practitioners[3]. However, the vocational training market remains underdeveloped, lacking systematic frameworks, standardized content, and qualified instructors. This results in inconsistent training quality and an inadequate supply of high-level professionals. Traditional talent development models tend to focus primarily on technical knowledge and innovation capabilities, while overlooking pedagogical and instructional training. Due to the industry's fast-paced evolution, professionals must continuously acquire new knowledge and technologies, thereby creating a sustained need for educational training personnel within the sector.

Traditional models often foster a "test-oriented over application-oriented" mindset among students. They tend to focus excessively on examination techniques and grades while neglecting the practical application of acquired knowledge. As a result, graduates are often unaware of current technologies and industry trends, leading to a mismatch between their skill sets and the actual demands of the information technology application innovation industry.

To address these issues, as shown in Figure 1, the curriculum for the Artificial Intelligence (Teacher Education) major is structured into three major systems: theoretical courses, experimental and project-based courses, and industry-education integration modules. Each system emphasizes core goals, allowing the construction of a comprehensive curriculum and instructional framework through a point-to-surface strategy.

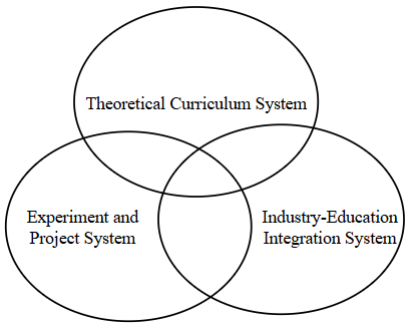

Figure 1: The Design of Curriculum System.

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3.1.1 Theoretical Curriculum System

To nurture professionals with both technical expertise and teaching ability, the theoretical curriculum system integrates teacher education courses into the AI major. It forms a cohesive curriculum cluster centered on "excellence in teacher education," and comprises general education courses, discipline-specific courses, and pedagogical training modules, as illustrated in Figure 2.General Education Courses include compulsory ideological and political courses such as Fundamentals of Marxism, Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics, along with a selection of elective and modular courses[4].Major-Specific Courses focus on specialized topics such as Deep Learning, Machine Learning, and Java Programming. These are complemented by innovation and entrepreneurship training, engineering literacy cultivation, industry-sponsored training projects, and practical modules—such as in-class projects (engineering application training) and extracurricular internships (industrial placements and thesis projects)—to strengthen technical foundations and develop applied innovation skills. Teacher Education Courses encompass topics such as Professional Ethics for Teachers and Introduction to Pedagogy. Practical training components include educational observation, teaching internships, and instructional research activities, all aimed at enhancing students' pedagogical competence and teaching literacy[5].

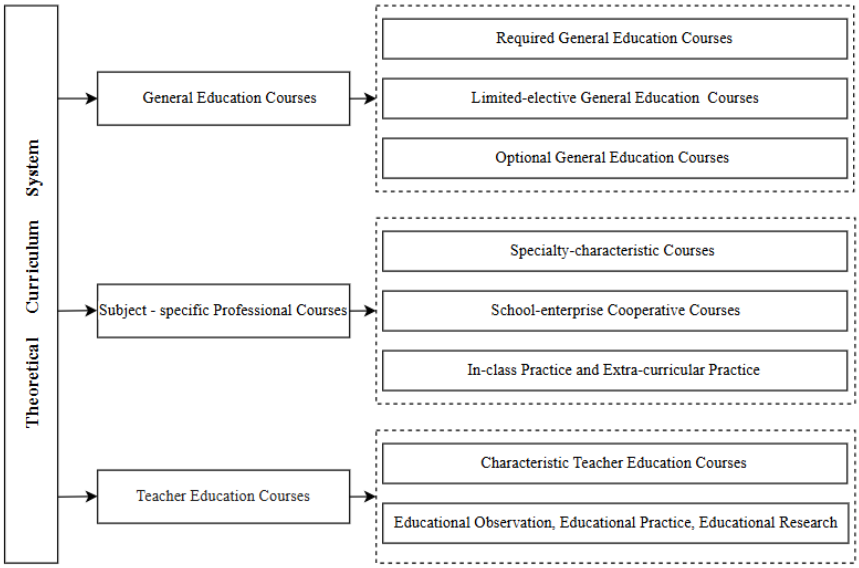

Figure 2: Theoretical Curriculum System.

3.1.2 Experimental and Project-Based Curriculum System

From May 18 to 21, 2023, the 7th World Intelligence Congress was held in Tianjin. The School of Artificial Intelligence at Tianjin Normal University showcased several projects at the event: The AI Smart Han Bookstore leverages next-generation IT to analyze the entire consumer behavior process, with the potential to directly create over 3,000 jobs and indirectly more than 20,000.The AI Empowered Digital Transformation of Traditional Retail system enables fully automated, unmanned shopping experiences-covering customer entry, product selection, payment, and exit-with four major product lines and nine application scenarios. The Domestic Information Technology Application Innovation Teaching System—developed in collaboration with the Kylin Software–Tianjin Normal University AI Education Science Base—offers a full-chain solution (teaching, learning, management, evaluation, competition, training, research) for AI education in primary and secondary schools nationwide[6].These projects demonstrate students' strong innovative spirit and practical competence, validating that student-led projects are not only essential components of academic learning but also critical to developing well-rounded capabilities. Such practical experiences lay a solid foundation for students' future careers and personal growth.

Traditional experimental courses are often dominated by basic verification exercises, which remove contextual complexity and ignore students' agency and personal learning experiences—limiting their ability to develop practical intelligence. In contrast, this program introduces a progressive experimental framework composed of foundational, integrative, and research-level experiments. Students start with basic skill acquisition, then advance to integrated projects solving complex problems, and finally engage in research-focused experimentation. This progression is designed to cultivate innovative

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thinking and boost students' creative potential.

By establishing open and innovation-oriented laboratories, and leveraging platforms such as Internet+, Challenge Cup, innovation and entrepreneurship competitions, and the National College Student Electronic Design Contest, students are encouraged to develop hands-on skills. These activities not only serve as platforms to showcase student innovation but also foster a spirit of entrepreneurship, practical competence, and teamwork. Figure 3 illustrates the design of the experimental and project-based curriculum system.

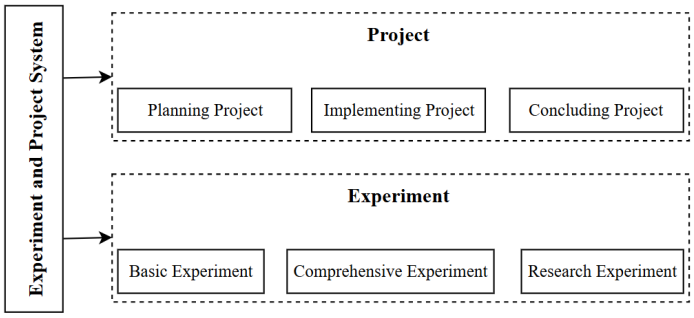

Figure 3: Experiment and Project System.

3.1.3 Integration of Industry and Education System

"Integration of Industry and Education" refers to a series of strategies and methods that align talent development objectives with workforce needs, including curriculum reform, corporate participation in education, and school-enterprise collaboration[7]. The goal is to bridge academia and industry, ensuring education keeps pace with evolving market demands. Colleges and universities should establish close partnerships with enterprises—jointly developing curricula, undertaking collaborative projects, and offering internships. These collaborations not only enrich students' practical experience but also enable academic institutions to stay informed of industry needs and update teaching methods accordingly. By incorporating professionals with teaching capabilities into the curriculum design process and developing distinctive, high-level courses aligned with industry standards, institutions can ensure students graduate with current, in-demand skills.

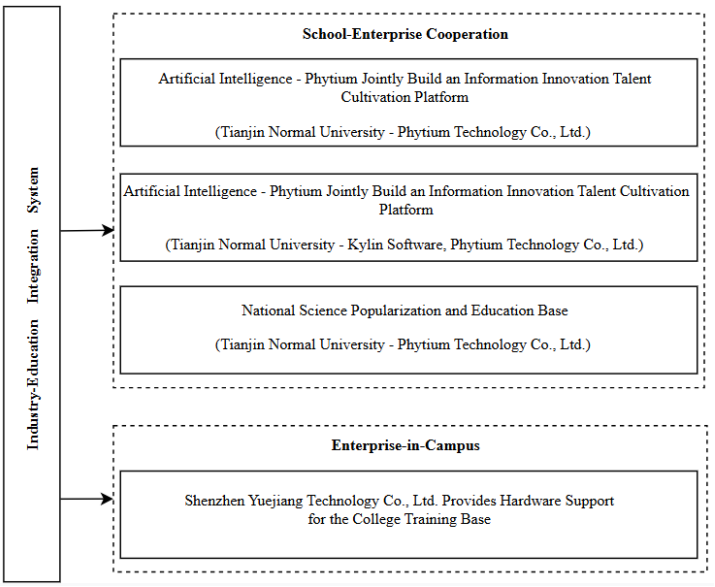

Figure 4: Industry-Education Integration System.

To enhance students' technical application and innovation abilities, Tianjin Normal University has partnered with key enterprises to establish industry-academia research bases. For example: the university and Phytium Technology co-created the AI–Phytium Talent Cultivation Platform, which integrates classroom instruction with R&D. Students participate in real-world projects and company research activities, strengthening their problem-solving skills. Joint efforts with Kylin Software and Phytium also led to the establishment of the Tianjin Educational Information Technology Application Innovation Joint Laboratory for Domestic Software-Hardware Integration. This center provides

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students with internships and corporate training opportunities, aligning the education and talent pipeline with industry and innovation chains[8].A national science education base and job-matching employment training program were also co-developed with Kylin Software. This internship and training platform spans electronics, integrated circuits, and AI fields, offering comprehensive practical opportunities for students. The structure of the industry-education integration curriculum is depicted in Figure 4.

3.2 Task-Based Teaching Method

Traditional teaching methods are typically teacher-centered, emphasizing the transmission and memorization of knowledge. Common practices include lecturing, demonstrations, and classroom discussions. However, in today's rapidly evolving society, the pace of knowledge renewal has accelerated significantly, and the demands placed on talent have changed accordingly. Traditional approaches that prioritize rote learning are increasingly inadequate for cultivating critical thinking, problem-solving, and well-rounded skill sets required in the modern era. In contrast, innovative task-based teaching methods emphasize creativity, critical analysis, and hands-on experience, offering a more adaptive framework for contemporary education.

The Task-Based Learning (TBL) approach centers on designing real-world tasks aligned with instructional objectives. Teachers formulate these tasks to guide students in acquiring knowledge, skills, and experience through active engagement[9]. This method emphasizes practical involvement and personal initiative, encouraging students to learn and grow by solving real problems, thereby fostering holistic development.

The core strength of TBL lies in its ability to closely integrate knowledge acquisition with practical application. It promotes comprehensive skill development across four interactive dimensions:

Task Orientation–Students are motivated by clearly defined objectives and deliverables embedded in realistic tasks, which drive autonomous learning and problem-solving.

Active Participation–TBL highlights the importance of student initiative. Learners are expected to think independently, engage in hands-on activities, and resolve challenges during task completion, thereby deepening their understanding.

Collaborative Learning–Students work in teams to accomplish complex assignments, developing communication, negotiation, and teamwork skills, as well as interpersonal competence.

Contextualized Learning–Tasks are embedded in authentic, real-life scenarios to enhance relevance and engagement, increasing student motivation and making learning outcomes more transferable.

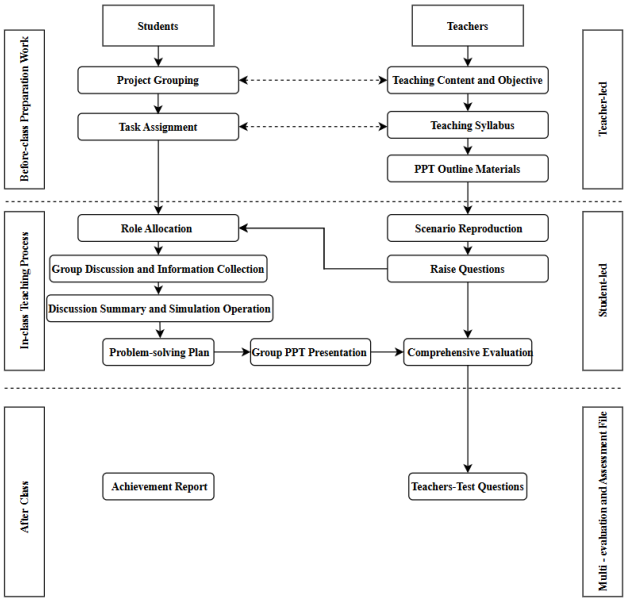

Figure 5: Flowchart of Task-Based Teaching Method.

As illustrated in Figure 5, the implementation of the task-based teaching method generally follows three interconnected stages. First, during the pre-class preparation phase, teachers take the lead by

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communicating learning objectives, instructional outlines, and project expectations to students, while also organizing group assignments and role distributions. Next, in the in-class learning stage, students become the primary agents of learning. Teachers present core problems based on the curriculum content, and student groups conduct discussions, gather materials, synthesize solutions, and present their findings—typically via group presentations—after which teachers offer comprehensive evaluations. Finally, in the post-class assessment phase, a multi-dimensional evaluation framework is applied. Teachers assess students using a combination of performance data, quiz results, and project reports to compile a holistic profile of learning outcomes and competencies.

3.3 Application of Digital Teaching Platforms

With the rapid development of network and multimedia technologies, digital teaching platforms have become increasingly integral to modern education. These platforms not only enhance instructional effectiveness but also foster more interactive, dynamic, and personalized learning environments that actively engage students and stimulate motivation.

For example, in the course Computer English, a blended teaching approach is adopted, combining online and offline methods. The digital platform Chaoxing Learning is employed as an auxiliary tool for evaluating assignments and tracking student participation. Before class, instructors release preview assignments via the platform to help students gain an initial understanding of the topic and identify questions in advance. During class, the platform is used for attendance tracking and synchronous assignment distribution, which improves engagement and ensures students remain focused on the learning content. After class, students are required to watch related MOOC videos within set deadlines, with backend data analytics enabling instructors to monitor task completion. Through the integration of this digital platform, students are provided with rich online learning resources and flexible study paths that accommodate diverse learning needs. As a result, student enthusiasm and autonomy are significantly enhanced, while instructional delivery becomes more targeted and efficient.

4. Conclusion and Outlook

This research aims to develop a talent cultivation program for information technology application innovation that incorporates the distinctive features of teacher education. Building on this foundation, the goal is to establish a comprehensive curriculum system, a high-level faculty team, a professional training environment for information technology application innovation, a sound engineering education certification system, and a leading cooperative education internship model. Our objective is to create a multi-level, interdisciplinary, and practical talent cultivation collaborative platform. Through the research and practice presented in this paper, we aim to construct a diversified and innovative talent development model that equips students with a comprehensive and systematic set of knowledge and skills, while enhancing their innovative thinking and practical capabilities. At the same time, we will continue to explore more advanced and practical educational models to continuously empower the cultivation of outstanding information technology application innovation talent.

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