Journal of Contemporary Educational Research, 2026, Volume 10, Issue 5
http://ojs.bbwpublisher.com/index.php/JCER
Online ISSN: 2208-8474
Print ISSN: 2208-8466

Construction Logic and Improvement Path for "Dual-Qualified" Teacher Competency in Applied Universities under the Background of Industry-Education Integration

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Abstract: Amid the deepening implementation of the industry-education integration strategy, the development of "dual-qualified" teachers in applied universities has become a critical link between the educational chain and the industrial chain, as well as a key bridge connecting talent cultivation with industry needs. This process faces new opportunities and challenges in terms of connotation enrichment and quality enhancement. Through historical analysis and literature review, this study traces the evolution of "dual-qualified" teachers across three stages: the qualification-oriented phase in vocational education, the competency-oriented phase during transitional development, and the integration-innovation phase under deepened industry-education integration. Grounded in competency theory and the requirements of industry-education integration, a four-level, twelve-dimensional construction logic for "dual-qualified" teacher competency is proposed, encompassing value guidance, subject role, capability structure, and elemental composition. Furthermore, an action strategy of "four emphases, four models" and practical pathways are explored. Through diversified disciplinary ecosystems, multi-dimensional training systems, cross-boundary collaboration, and classified developmental evaluation models, the competency of "dual-qualified" teachers can be comprehensively enhanced. This will provide solid faculty support for applied universities in cultivating innovative engineering talents, thereby facilitating the effective alignment of deeper integration of industry and education with regional economic and social development needs.

Keywords: Industry-education integration; Applied universities; "Dual-qualified" faculty; Teacher competence; Construction logic; Enhancement path

Online publication: June 4, 2026

1. Introduction

The comprehensive implementation and in-depth advancement of China's industry-education integration strategy signify a new phase of symbiotic development between higher education and industrial progress. This integration advocates resource consolidation and collaborative innovation in educational reform, while

striving to achieve supply-demand alignment and practice-oriented models in talent cultivation. Within this multi-stakeholder ecosystem, teachers serve as both the driving force for implementation and the key to optimizing talent quality. Policy documents such as the Ministry of Education's *Plan for Deepening Industry-Education Integration* explicitly propose establishing a faculty training system aligned with this integration, highlighting the structural supporting role of "dual-qualified" teachers in local applied universities within this ecosystem.

2. The historical evolution of the concept and connotation of "dual-qualified" teachers

In China's vocational education and applied higher education development, dual-qualified teachers (those with both academic and industry expertise) have evolved as pivotal connectors between academia and industry. Their conceptual framework has continuously deepened alongside the transformation of industry-education collaboration. This study, grounded in historical development logic, delineates three developmental phases: the qualification-oriented phase in vocational education, the competency-oriented phase during the transition period, and the integration-innovative phase in the deepened industry-education integration era. By systematically analyzing policy contexts, defining characteristics, and practical models across these phases, the research reveals their intrinsic evolutionary logic, providing theoretical references for cultivating dual-qualified teacher teams in the new era.

2.1. Qualification-oriented in vocational education

In 1998, the Ministry of Education issued the *Opinions on Deepening Vocational Education Reform for the 21st Century*, which first introduced the concept of "dual-qualified" teachers in policy documents [1]. This marked a new starting point for professionalizing vocational education teachers in China, establishing their policy status at the institutional level and demonstrating vocational education's proactive response to industrial restructuring. The 2000 *Opinions on Strengthening Talent Cultivation in Higher Vocational and Technical Education* further refined development requirements, established a basic framework for cultivating "dual-qualified" teachers, and emphasized their pivotal role in applied talent training systems. During this period, policy designs primarily addressed the issue of "overemphasis on theory at the expense of practice" in vocational college faculty. The core characteristic of this phase was "qualification-oriented" policies, manifested in several aspects: In terms of certification, the "dual-certificate" system was emphasized, requiring teachers to hold both teaching qualifications and vocational certifications. For professional title structures, a "dual-title" evaluation mechanism was implemented to encourage teachers to obtain dual titles in both teaching and engineering fields. Training approaches focused on short-term corporate internships and vocational skill certification as primary methods.

2.2. Competency-oriented in the transition development period

With the promulgation of the *National Medium- and Long-Term Education Reform and Development Plan (2010–2020)*, China's teacher workforce development entered a phase focused on quality enhancement. The State Council's 2014 *Decision on Accelerating Modern Vocational Education* explicitly emphasized strengthening the development of "dual-qualified" teachers, shifting policy priorities from formal funding to substantive competency. The 2015 *Guiding Opinions on Transforming Some Local Undergraduate*

Universities into Applied Institutions first extended the "dual-qualified and dual-skilled" concept to applied undergraduate institutions, reflecting an expanded definition that reinforced the central role of engineering practice capabilities. This shift theoretically resonated with the value orientation of the subsequent New Engineering Education initiative. Three pivotal transformations emerged during this period: the transition from "dual certifications" to "dual competencies," emphasizing substantive improvements in teaching and engineering practice abilities; the shift from "individual development" to "team building," focusing on constructing structured teaching innovation teams; and the evolution from "one-way mobility" to "interactive collaboration," exploring diversified school-enterprise cooperative training models.

2.3. Integration of innovation in the deepening stage of industry-education integration

The introduction of policy documents such as the *Several Opinions of the General Office of the State Council on Deepening the Integration of Industry and Education* (2017) has propelled the integration of industry and education into a deeper development phase, imposing new requirements on the comprehensive capabilities of "dual-qualified" teachers. The *National Vocational Education Reform Implementation Plan* (2019) established proportion targets for "dual-qualified" teachers, while the *Notice of the General Office of the Ministry of Education on Doing a Good Job in the Recognition of "Dual-Qualified" Teachers in Vocational Education* (2022) formulated basic standards (trial) for "dual-qualified" teachers in vocational education and established a unified national recognition system, marking the entry of "dual-qualified" teacher team development into a standardized and regulated phase. The core requirements of this stage are reflected in: cross-disciplinary integration of knowledge structures, requiring mastery of interdisciplinary knowledge networks aligned with industrial demands; systematic integration of competency elements, emphasizing the organic unity of teaching, practical skills, innovation capabilities, and industrial service capacities; and ecological development paths, constructing a collaborative training system involving government, schools, and enterprises.

The essence of industry-education integration lies in establishing a new paradigm for talent cultivation that synergizes education and industrial development. This paradigm presents three new challenges for applied "dual-qualified" teachers: first, the adaptive needs arising from the transformation of industry-education collaboration models; second, the practical demands of deep industry-education integration; and third, the developmental requirements for innovative talent cultivation. Therefore, applied universities should adhere to the "demand-competency-development" collaborative logic, positioning the enhancement of "dual-qualified" teachers' competencies as a strategic lever for reforming talent cultivation models. This approach effectively addresses the dual demands of national strategies and regional industrial development.

3.Interpretation of the connotation and construction logic of the competence of "dual-qualified" teachers in applied universities under the background of integration of industry and education

Against the backdrop of the in-depth advancement of the industry-education integration strategy and the new context of symbiotic development between higher education and industrial progress, application-oriented universities, as the core carrier connecting talent cultivation with industrial needs, the construction of the competence of "dual-qualified" teachers has become a key starting point to solve the practical difficulties in the implementation of industry-education integration and improve the quality of talent cultivation. In

line with the essential characteristics of industry-education integration, which emphasizes coordination and practicality, and based on the school-running orientation of application-oriented universities and the development needs of emerging engineering education, systematically interpreting the connotative characteristics of "dual-qualified" teachers and clarifying the construction logic of their competence elements are not only the inherent requirement to promote the professional development of teachers and strengthen the construction of the teaching staff, but also an important support to facilitate the in-depth integration of industry and education and cultivate compound engineering and technical talents, laying a solid foundation for the subsequent interpretation of connotation and construction of logic.

3.1. The connotation of "dual-qualified" teacher from the perspective of multi-dimensionality

In the context of deepening industry-education integration, the competency framework for "dual-qualified" teachers in applied universities serves as a core element to enhance teaching quality and cultivate innovative engineering talents. A proper interpretation of the "dual-qualified" teacher concept is essential for shaping their professional beliefs and internal motivation for development, while also constituting a critical entry point for advancing their professional growth.

3.1.1. Historical development perspective

The concept of "dual-qualified" teachers originated from vocational education's need to cultivate industry-adaptive talents. Through the transformation and development of local undergraduate institutions, it has achieved innovative evolution under the framework of New Engineering Education. This developmental trajectory profoundly reflects higher education's adaptive transformation in response to socio-economic demands. Industry-education integration, characterized by synergy and practicality, emphasizes resource integration, supply-demand alignment, and industry leadership, aiming to cultivate innovative, interdisciplinary, and application-oriented engineering talents suited for industrial upgrading. Therefore, understanding the competencies of "dual-qualified" teachers must be contextualized within the developmental threads of vocational education, applied undergraduate education, and New Engineering Education, grasping its conceptual evolution and paradigm shift through a dynamic and developmental perspective.

3.1.2. Multidimensional integration

The theoretical interpretation of the connotation of "dual-qualified" teachers should transcend the simplistic binary cognitive framework of "dual = two," establishing a multidimensional theoretical model that unifies structure and function. From a structural perspective, the competencies of "dual-qualified" teachers comprise three interdependent subsystems: qualification certification, professional competence, and professional ethics, demonstrating significant complexity. Functionally, it requires the integration of academic, technical, and pedagogical dimensions, manifested as the organic unity of an engineer's practical skills, a teacher's innovative teaching abilities, and a mentor's moral cultivation and talent development capabilities. This multidimensional integration reflects the complex requirements for teacher professional development in modern higher education.

3.1.3. Institutional adaptability dimension

From an institutional research perspective, the competency framework for "dual-qualified" teachers

must align closely with the institution's educational mission, service orientation, and regional economic development needs. Specifically for engineering-focused applied universities, the competency elements of "dual-qualified" teachers should embody three distinctive institutional characteristics: close alignment with regional industrial structures, deep integration with the institution's established industry-academia-research collaboration, and effective adaptation to the demands of industry-education integration. This institutional adaptability requires "dual-qualified" teachers to develop a diversified competency system that combines universal professional skills with institutional and disciplinary-specific expertise, thereby fulfilling the core objective of cultivating "application-oriented" talents.

3.2. The construction logic of competence elements of "dual-qualified" teachers

The concept of "competency" was first proposed by American psychologist and Harvard University professor McClelland, falling under the domain of psychological concepts. It primarily encompasses elements such as traits, motivation, cognition, skills, values, and attitudes [2]. Although there is no explicit conceptual definition of competency transitioning from psychology to education, it has provided theoretical support for teacher competency research in academic circles worldwide and has become a classic theory in human resource management. The core connotation of competency lies in the organic integration and unification of intrinsic and extrinsic factors, explicit and implicit elements, benchmarking and identification factors. Based on the core connotation of competency and its developmental application, this paper combines teacher professional growth theory with the developmental needs of new engineering integration to explore the construction logic of competency element systems for "dual-qualified" teachers in applied universities. It proposes a systematic design from four levels and twelve dimensions—"value guidance, subject roles, competency structure, and element composition" (as shown in **Figure 1**)—aiming to establish a "hierarchical, structured, and diversified" framework for "dual-qualified" teachers, highlighting the developmental, systematic, dynamic, and guiding nature of their competencies.

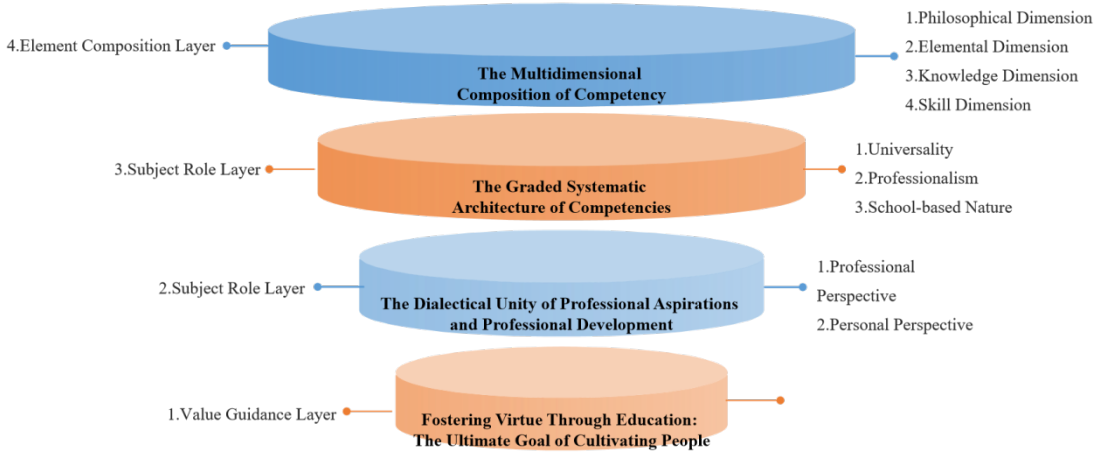

Figure 1. Competence construction logic of "dual-qualified" teachers in applied universities

3.2.1. The value guidance layer: Emphasizing the ultimate goal of moral education and talent cultivation

When developing competency models for "dual-qualified" teachers in applied universities, the foundational

value orientation must be prioritized as the cornerstone of competency development, which fundamentally serves the mission of cultivating virtue and nurturing talent. Marxist theory on human development provides the philosophical basis for this dimension, emphasizing that educators should not only teach students to solve practical problems but also guide them in establishing proper values, ensuring that technological applications ultimately serve human welfare.

In the context of industry-education integration, competency development in value-oriented leadership is primarily achieved through engineering ethics education, cultivation of craftsmanship spirit, and ideological-political integration in curricula. Engineering ethics education embeds social responsibility awareness into professional instruction, helping students understand engineers' societal obligations [3]. When participating in specific engineering projects, teachers guide students to deeply consider the potential impacts of engineering activities on the environment, society, and human health, thereby recognizing that technological innovation must adhere to corresponding ethical standards. The craftsmanship spirit reshapes the value dimension of engineering education, fostering a professional attitude of pursuing excellence. This intangible yet powerful spiritual force ignites students' career passion and sense of responsibility. Ideological-political integration in curricula achieves organic unity between professional knowledge and value guidance, promoting students' comprehensive development. This level of construction not only concerns individual teachers' professional beliefs but also serves as a key factor in ensuring the correct direction of applied talent cultivation, reflecting the dialectical unity of instrumental rationality and value rationality in education.

3.2.2. The main character layer: Competence perspective and personal perspective

In the competency model of "dual-qualified" teachers, the subject role layer reflects the cognition of "self-concept," which covers the dual perspectives of professional and personal development, and pursues the dialectical unity between the professional mission of teachers and individual growth.

The professional perspective focuses on career commitment, teacher ethics, and educational philosophy. Educators should uphold professional integrity, strengthen role awareness, and guide students in developing professional identity and social responsibility. Noble character, dedication, and care for students subtly influence their growth. Facing the return to the essence of education and contemporary challenges, it is essential to implement student-centered approaches, focus on learning processes and outcomes, and cultivate lifelong learning capabilities. The personal perspective emphasizes that "dual-qualified" teachers should be versatile talents balancing theory and practice. They must continuously enhance professional skills, strengthen complex engineering analysis and interdisciplinary integration through industry practice, nurture outstanding students, supply talent to industries, realize professional value, and achieve a sense of accomplishment and fulfillment [3]. The professional and personal perspectives reinforce each other through the "cognition-practice-reflection" cycle: professional practice provides a platform for professional development, while professional growth feeds back into career capabilities. This not only fulfills universities' social service functions but also ensures teachers' sustainable development, alleviating role anxiety and stimulating intrinsic motivation [4].

3.2.3. The competency structure layer: Reflecting the gradient of competence

The competency structure layer serves as the external cornerstone for the competence of "dual-qualified" teachers, encompassing a three-tiered gradient of "foundation-core-characteristics." It systematically integrates the multifaceted requirements of new engineering disciplines for "dual-qualified" teachers,

reflecting the diversity, hierarchical nature, and dynamic progression of their competencies.

General competencies form the foundation and benchmark for career development, encompassing core teaching skills, educational technology proficiency, cross-cultural communication, and academic integrity. These capabilities provide a solid foundation for dual-qualified teachers to adapt to evolving educational environments and industry demands. Professional competencies serve as the core, reflecting the distinctive features of engineering education and the key attributes of dual-qualified teachers, including the ability to analyze complex engineering problems, integrate interdisciplinary knowledge, and innovate teaching methods. School-specific competencies highlight the applied orientation of dual-qualified teachers, including responsiveness to regional industrial needs, development of school-based resources, and innovation in organizational culture inheritance. These competencies enable dual-qualified teachers to better serve their institutions and local communities, ultimately achieving the goal of cultivating applied talents.

3.2.4. The element composition layer: Reflecting the multidimensional competence

The competency framework of "dual-qualified" teachers consists of four elements: philosophy, literacy, knowledge, and skills, forming an organic system. Philosophy serves as the developmental orientation, literacy constitutes the intrinsic foundation, knowledge provides theoretical support, and skills determine practical effectiveness. These four elements collaboratively enhance teachers' adaptability to teaching, practical innovation capabilities, and career development potential in the context of new engineering education.

The conceptual framework encompasses three pillars: the New Engineering Education philosophy, industry-education integration, and lifelong learning. The New Engineering Education philosophy emphasizes innovation and interdisciplinary approaches, driving faculty to modernize teaching methods and cultivate students' cross-disciplinary competencies. Industry-education integration focuses on aligning education with industrial needs, enabling teachers to bridge academic knowledge with practical applications. The lifelong learning philosophy motivates educators to pursue continuous professional development, adapting to technological and societal transformations.

The literacy dimension encompasses engineering literacy, educational humanism, and innovative critical thinking. Engineering literacy ensures teachers' profound understanding of the engineering field; educational humanism focuses on students' holistic development, fostering their sense of social responsibility and humanistic spirit; innovative critical thinking drives teaching exploration, cultivating students' innovative and critical thinking abilities.

Knowledge dimension is the foundation of competency development. "Dual-qualified" teachers should possess subject-specific expertise, educational theories [5], and emerging interdisciplinary knowledge to meet the demand for cross-disciplinary integration capabilities in the new economy. They provide students with bridging education from school to industry, helping them become versatile applied talents.

The skill dimension emphasizes practical transformation, with engineering practice capabilities at its core. Industry trend awareness empowers teachers to identify and adapt teaching approaches; career planning skills enable educators to provide students with tailored guidance; interdisciplinary application and R&D capabilities facilitate the integration of academic and professional knowledge; while intelligent technology application and school-based resource development skills equip students with advanced technologies, fostering their practical and innovative abilities to become well-rounded field engineers.

4. The path of competence improvement for "dual-qualified" teachers in applied universities under the background of industry-education integration

Under the background of industry-education integration, based on the high-quality connotative development needs of applied universities and the logic of "dual-qualified" competence construction, the action path of "four highlights, four models" is formed to comprehensively improve the competence of "dual-qualified" teachers, realize the synergistic value-added of teachers' professional development and talent training quality, and provide strong support for applied talent training.

4.1. Forming the development strategy of "Four Prominent" to clarify the trend of teacher development

First, emphasize mission-driven development and strengthen accountability. Grounded in the fundamental task of cultivating virtue and nurturing talent, we integrate socialist core values throughout engineering education to continuously enhance teachers' ethics, pedagogical approaches, and professional competencies. Second, prioritize applied education aligned with societal needs. Proactively serving regional development and national strategies, we promote deep integration between education systems, talent pipelines, and industrial chains, facilitating the transformation of teaching and research achievements. This ensures competency enhancement is reflected in cultivating high-quality applied talents. Third, highlight interdisciplinary integration to achieve unity of knowledge and practice. Adhering to the principle of "integrating theory with practice and unifying principles with techniques," we deepen the fusion of engineering theory and practice, achieving a balanced structure of theoretical and practical, academic and professional qualities in faculty development. Fourth, emphasize institutional innovation to support substantive development. Leveraging universities' distinctive characteristics and disciplinary strengths, we build a school-specific "dual-qualified" faculty team through industry collaboration and local industrial support, thereby driving high-quality, substantive development of higher education institutions.

4.2. Establishing the action path of "Four Models" to comprehensively improve the competence of "dual-qualified" teachers

4.2.1. Diversified disciplinary ecological models enrich the competency enhancement carriers for "dual-qualified" teachers

Modern technology is increasingly demonstrating comprehensive and interdisciplinary trends, requiring deep integration of knowledge, methodologies, and technologies. The enhancement of "dual-qualified" teachers' competencies and knowledge structures necessitates a multi-level, cross-disciplinary ecosystem to provide sustainable endogenous development support. Firstly, the foundational support layer: Guided by engineering education accreditation standards, reconstruct the professional curriculum system, strengthen dynamic alignment between professional standards and industries, and establish discipline clusters that connect with industrial sectors. This helps "dual-qualified" teachers continuously expand their knowledge boundaries and innovate content. Secondly, the core integration layer: Develop interdisciplinary research platforms and establish special funds to support teachers in participating in cutting-edge, cross-disciplinary research projects. Encourage deep integration across disciplines and specialties, enabling teachers to stay at the forefront of disciplinary development and actively engage in innovative and challenging research initiatives. This promotes the synergy between research and teaching, accelerating the transformation of research outcomes into high-quality teaching resources. Thirdly, the practical application layer: Relying on

new organizational structures like industry-academia collaboration institutes, establish a three-tier teaching innovation unit comprising "teaching-research offices, experimental centers, and workshops." Continuously improve grassroots teaching organizations that reflect engineering education characteristics and align with institutional positioning. Explore innovative project-based learning models and methods to facilitate the conversion of research achievements into teaching resources.

4.2.2. Multidimensional and three-dimensional training model to optimize the pathways for enhancing "dual-qualified" competencies

With the rapid advancement of information technology, the deep integration of internet technology and education has transformed teaching methods from structured to boundaryless, and from single to intelligent and diversified. This evolution necessitates the establishment of diversified teacher training models and multi-dimensional professional development pathways. Firstly, based on the unified goal of enhancing teachers' professional competencies through "Dao-Shu" integration, we implement categorized and tiered school-based training programs. These are designed according to teachers' disciplinary backgrounds, professional expertise, and career development needs to ensure targeted and effective training. Secondly, aligning with the practical orientation of industry-education integration, we strengthen collaborative training programs between academia, industry, and enterprises. This involves immersing teachers in frontline corporate operations, engaging them in production practices, engineering R&D, and technology transfer activities. Such experiences allow them to gain hands-on understanding of industrial processes and technological applications, thereby enhancing their engineering practice skills and industrial innovation capabilities. Thirdly, leveraging information technology to consolidate high-quality educational resources, we promote regular blended online-offline training. This approach facilitates self-directed and collaborative learning, combines individual and group training, integrates scheduled training with self-directed learning, and merges externally mandated training with internally driven training needs.

4.2.3. Cross-border development model to expand the competency enhancement space for dual-qualified teachers

The integration of industry and education aims to break down barriers between academia and industry, promoting resource complementarity. Universities should open up collaboration, deepen cooperation with industries, enterprises, research institutes, and high-tech parks, and establish a "cross-university, cross-regional, cross-disciplinary" collaborative model. This approach expands the development space for "dual-qualified" teachers across multiple dimensions, including teaching, research, and technology transfer. Firstly, inter-university collaboration. Leveraging regional and disciplinary advantages, universities should strengthen inter-institutional coordination, jointly build industry-academia-research bases, accelerate project incubation and teacher exchanges, enhance teachers' professional competence and institutional characteristics, and solidify the distinctive features and professional skills of "dual-qualified" teachers. Secondly, university-enterprise collaboration. Focusing on talent supply-demand alignment, a "three-in-three-out" model should be established: "engineers into classrooms, teachers into enterprises, projects into courses, achievements into society, standards into syllabi, and talents into positions." This helps teachers improve their "engineering task" capabilities and strengthens their engineering practice and cross-disciplinary application skills. Thirdly, university-local collaboration. In line with regional development needs, universities should cooperate with governments and enterprises to provide social service and practice platforms for teachers, enhancing their

industrial service capabilities and social responsibility, thereby contributing to regional development.

4.2.4. Classification developmental evaluation model to stimulate the endogenous motivation of dual-qualified teachers

Evaluation incentives serve as a crucial safeguard for promoting the connotative development of higher education institutions. To stimulate the vitality of "dual-qualified" teachers, universities should reform traditional evaluation models and establish a classified, diversified, and dynamic comprehensive evaluation system. This system must accurately reflect teachers 'actual contributions, enhance their professional identity and social status, thereby effectively supporting the improvement of teachers' competencies and the connotative development of universities. Firstly, adhere to the principle of balancing comprehensiveness and individualization by establishing a multidimensional comprehensive evaluation system covering professional ethics, teaching and education, scientific research, and social services. At the same time, set differentiated evaluation standards and weights for teachers with different professional backgrounds and characteristics to fully and objectively reflect their actual contributions and unique value. Secondly, uphold the principle of dynamic developmental evaluation by strengthening process management and dynamic monitoring, promptly identifying teachers' strengths and weaknesses, and flexibly adjusting evaluation methods to achieve improvement through evaluation and growth through evaluation, promoting synchronous enhancement of teachers' work improvement and personal development. Thirdly, adhere to the principle of outcome-oriented and application transformation by emphasizing the diverse utilization of evaluation results. Establish special reward programs (such as teaching achievement awards and social service contribution awards) and directly link evaluation results to professional title promotions, position appointments, and salary benefits. This effectively stimulates teachers' enthusiasm and creativity, enhances their professional belonging and sense of achievement in development.

5. Conclusion

As technological revolution and industrial transformation deepen, society's demand for high-quality engineering and applied talents grows increasingly urgent. Applied universities must align their institutional characteristics and talent development goals with contemporary demands and a holistic perspective, systematically advancing the competency development of dual-qualified teachers. By focusing on the progressive integration of technical expertise, academic knowledge, and moral integrity, institutions should establish a comprehensive strategy that combines value guidance, institutional uniqueness, and practical application to enhance teacher capabilities in a systematic and targeted manner. Through building a high-caliber, highly skilled dual-qualified faculty, universities can provide solid talent support for deepening industry-education integration, serving regional development, and supporting the national innovation-driven strategy.

Funding

Key Project of Hujiang Philosophy and Social Sciences Fund at the University of Shanghai for Science and Technology (Project No. 20HJ-DSDG-ZD-007)

Disclosure statement

The authors declare no conflict of interest.

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