

Innovation and Practice of the “Industry-education Integration and Innovation” Collaborative Education Model for Application-oriented Undergraduate Universities in the Context of New Liberal Arts Education

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Abstract: The cultivation of highly competent and well-rounded individuals, alongside the enhancement of students' comprehensive job-related abilities, lies at the core of an innovative talent development model. Drawing upon research encompassing the essence of new liberal arts education, collaborative education mechanisms, and the backdrop of professional establishment, this study aligns with the educational mission of application-oriented universities, aiming to drive societal progress and foster local industry cooperation. By analyzing the current state of talent cultivation in application-oriented undergraduate institutions and elucidating the goals of talent development, a novel and practical framework for the "Industry-Education Integration and Innovation" collaborative education model tailored to application-oriented undergraduate universities is proposed. This framework encompasses four dimensions of higher education and pedagogical reform: “Industrial Cultivation, Professional Establishment, Integration of Learning and Competitions, and Dual-Innovation Education.”

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1. Introduction

Talent constitutes the foundation and strength of a nation and serves as the wellspring for technological innovation and socio-economic development [1]. As higher education reforms advance in our country, the cultivation of applied innovative talents has emerged as a pivotal focus in professional education and pedagogy. The emergence of the new liberal arts, a significant product of global technological innovation and economic advancement, emphasizes the integration of modern information technology into traditional humanities curricula. This approach adopts a humanities perspective to interpret contemporary technological innovations and offers technological support for interdisciplinary learning. During a visit to Tsinghua University, General Secretary Xi Jinping emphasized the importance of effectively utilizing the "catalyst" of interdisciplinary fusion, adjusting and upgrading existing disciplinary systems, and continuously promoting the innovative construction of new liberal arts talent development models [2]. The establishment of pathways for the cross-disciplinary cultivation of versatile talents, anchored in the forefront of interdisciplinary science, aims to nurture a group of innovative-capable application-oriented undergraduate talents, becoming a current focal point in higher education [3].

Application-oriented undergraduate institutions, as critical sites for nurturing application-oriented and innovative talents required for national and regional economic development, play an indispensable role in addressing the mismatch between current university talent cultivation and societal demands, as well as the disconnection between supply and demand. To engage university students in proactive participation in innovative and entrepreneurial practical activities, aiming to achieve exploratory knowledge and autonomous innovation, many domestic application-oriented undergraduate institutions have scientifically constructed practical teaching systems based on the characteristics of their disciplinary fields and talent development types. These systems generally encompass curriculum-based practical training and competition-oriented training. After years of exploration and practice, it has been recognized that certain aspects of this practical teaching framework still exhibit shortcomings, such as insufficient practical teaching hours, lack of specificity in practical teaching disciplines, and low levels of student and faculty engagement. In order to address these issues, the innovation of the "Industry-Education Integration and Innovation" collaborative education model is urgently needed.

2. Literature Review

Under the backdrop of the new liberal arts, the cultivation of "versatile" talents has emerged as a current trend in talent development, driven by the imperative of advancing interdisciplinary integration. The "versatile" talent cultivation model is a systemic structure composed of multiple elements, primarily explored from the following three aspects:

2.1. Theoretical Dimension

The emergence of the concept of applied talents is a result of the ever-refining division of labor spurred by technological advancement [4]. For enterprises, talent development has been categorized into the cultivation of managerial talents, functional talents, and grassroots workers. For educational institutions, talent cultivation encompasses theoretical learning, practical exploration, social engagement, innovation, and entrepreneurship. While various industries have distinct requirements for talent cultivation, the overarching goal is to achieve comprehensive development encompassing ethics, intellect, physique, aesthetics, and labor skills. The talent cultivation model is a multi-faceted

systemic structure, including elements such as cultivation objectives, content, methods, and conditions, which interact and influence each other. In the process of talent cultivation, it is essential to consider the requirements and roles of these elements comprehensively, appropriately arrange and adjust their manipulation methods, and thus achieve the goals and demands of talent cultivation. Despite existing variations in the definition and composition of talent cultivation models, they all possess purposefulness, operability, and combinatory characteristics, ultimately falling within the domain of process-oriented cultivation. This constitutes a dynamic organization involving a mix of multiple factors, entailing teaching and nurturing processes realized through relatively stable instructional content, curriculum frameworks, management systems, and assessment methods [5]. Thus, the theoretical foundation for the "Industry-Education Integration and Innovation" talent cultivation model should primarily emanate from the perspectives of cultivation objectives, curriculum design, faculty training, and practical processes, with an emphasis on process-oriented cultivation.

2.2. Practical Dimension

Curriculum design within this model should emphasize the cultivation of students' practical abilities, including aspects such as interdisciplinary collaboration, industry-education integration, and university-industry cooperation. Hu Yongsheng (2019), based on the practice of constructing new engineering disciplines, found that the university-industry cooperation talent cultivation model lacked distinct features between higher education institutions and corporate talent development goals, resulting in relatively low levels of collaborative education and a need for improved nurturing mechanisms [6]. Han Deren (2023) and others analyzed deficiencies in the current cultivation model for traditional humanities talents, proposing measures to cultivate new liberal arts versatile talents by updating talent cultivation concepts, optimizing training mechanisms, and refining course knowledge structures [7]. Liu Q Z (2022) discovered that in the traditional versatile talent cultivation model, there was insufficient emphasis on practical elements in curriculum design, leading to limited practical experience and a call to base curriculum changes on practical teaching reform [8]. Xiao C (2022) and colleagues analyzed issues in the traditional business talents cultivation model and the characteristics of new demands, suggesting a talent cultivation approach relying on "two characteristics, one challenge, one course, three pathways" [9]. Hence, at the practical level, both domestic and international universities consider "problem-solving ability" and "work and technical development capability" as criteria for assessing talents, highlighting curriculum reforms based on work processes and advocating action-oriented teaching concepts. The curriculum structure emphasizes the organic integration of work and learning, enabling students to experience the entire work process, acquire work-related knowledge, and develop professional skills.

2.3. Teaching Dimension

Teaching within the applied talent cultivation model should prioritize problem-oriented and case-based teaching approaches. Currently, talent cultivation models both domestically and abroad primarily consist of "two-component," "three-component," "cooperative education," and "modern apprenticeship" systems. Domestically, the talent cultivation model is mainly reflected in the "two-component" and "three-component" dimensions. The implementation of the "two-component" model raises challenges in faculty development, establishment of experimental bases, university-industry cooperation, and complementary system construction. In comparison, the "three-component" teaching model places greater emphasis on university-industry cooperation and collaborative talent development, resulting in diverse learning experiences for students and enhanced learning outcomes. Internationally, talent cultivation models predominantly involve "modern apprenticeship" and "dual-

system" approaches. Cheng J and Wee V (2023), using the example of fashion disciplines, discuss the application of modern apprenticeship education in cultivating high-level skilled talents in the fashion field [10]. Mukhadis A (2016) explores the characteristics of the "School of Craft Industry Jepara" in implementing the dual-system education (DSE) and seeks to uncover the constraints faced by schools and corresponding institutions [11].

In summary, scholars both domestic and abroad have conducted extensive general, summarizing, and empirical research on applied talent cultivation, yet in-depth exploration of effective "integration" has been relatively limited. Moreover, there remains a dearth of comprehensive, summarized, and empirical research on applied talent cultivation. Traditional models like the "dual-system," "three-component," and "cooperative education" have become less suited to the current demands of applied talent cultivation due to their overly one-sided focus on specific aspects of cultivation. Therefore, application-oriented undergraduate institutions should break away from traditional teaching paradigms, with a focus on nurturing students' innovative and practical capabilities. This entails constructing the "Industry-Education Integration and Innovation" talent cultivation model centered on the principles of "industrial cultivation, professional establishment, integration of learning and competitions, and dual-innovation education," to foster students' practical abilities across multiple dimensions and cultivate modern, high-quality talents.

3. Challenges in Talent Cultivation in Application-oriented Universities

3.1. Disconnection Between Theory and Practical Teaching

In the current stage, instructors in application-oriented universities often employ a "cramming" teaching approach during curriculum instruction. This involves using textbooks combined with multimedia presentations to convey relevant knowledge to students, resulting in passive knowledge absorption in the classroom [12]. In courses such as "Investment Studies," "Financial Econometrics," and "Advanced Financial Management," which encompass substantial theoretical knowledge and numerous mathematical models, the limited classroom time impedes the reservation of sufficient hours for students to engage in independent thinking. The absence of enriched instructional activities involving real-world case discussions can cause some students to lag behind in the curriculum. Those lacking autonomous learning abilities may overly rely on rote memorization to enhance their grasp of professional knowledge, consequently lacking profound understanding of the market dynamics underlying the knowledge. This hampers their ability to apply theoretical knowledge to real-world issues and impedes the enhancement of their practical abilities. The pivotal challenge in talent cultivation for application-oriented universities lies in effectively applying theoretical knowledge to practical scenarios and defining teaching objectives and content for each chapter.

3.2. Insufficient Manifestation of Application-oriented Teaching

The new liberal arts underscore the need for talent cultivation to prioritize interdisciplinary integration and cultivate multi-dimensional talents. In courses such as "Principles of Economics," concepts like "price support" and "price restriction" require students not only to ponder how to address price fluctuations from a business perspective but also to understand how to formulate economic policies to promote orderly market development from a governmental standpoint. Clearly, students and instructors remain uncertain about addressing major societal needs and the skills required for employment. Investigations indicate that assessment standards in application-oriented universities predominantly consist of factors such as student attendance, completion of assignments, and exam scores. Examinations tend to emphasize objective questions that assess students' mastery of professional knowledge, with subjective questions playing a minor role. This limits the assessment of students' practical application abilities and their ability to enhance innovative and entrepreneurial

thinking. Furthermore, such assessment mechanisms tend to be overly simplistic, encouraging students to employ mechanistic memorization techniques to achieve high scores without delving into the underlying principles and mechanisms behind the courses, which does not facilitate comprehensive mastery of professional knowledge. Hence, enhancing students' adaptability to societal development, ability to meet job requirements, and capacity for innovative thinking is a pressing issue for current application-oriented universities.

3.3. Weak Innovation Abilities among Students

In the implementation of traditional application-oriented skill development models, a trend toward formalization, dogmatism, and proceduralism has emerged. These trends overlook the cultivation of students' innovation abilities, fragmenting theoretical and practical courses and failing to bridge their connection. In alignment with the global educational reform trend, China has defined the mission of 21st-century education as cultivating high-level innovative talents with both innovative spirit and practical abilities, leading to widespread educational reforms nationwide. Nevertheless, the influence of traditional exam-oriented education concepts continues to hinder the progress of educational reform. Many instructors in application-oriented undergraduate institutions exhibit a lack of practical teaching skills [13]. They fail to establish appropriate teacher-student relationships and cling to entrenched traditional educational philosophies. The teaching content tends to diverge from students' daily lives and real-world practices, neglecting the cultivation of their innovation and practical abilities. The evaluation system for education and teaching is unreasonable, and the utilization of teaching resources is often inefficient. Therefore, improving students' learning methods, fully utilizing available teaching resources, and fostering students' innovative spirit and practical abilities are fundamental to enhancing the quality of teaching in application-oriented undergraduate institutions and cultivating students' expressive and adaptive abilities.

3.4. Inadequate Exploration of Ideological and Political Elements in Curriculum

Within the context of integrating ideological and political considerations into the curriculum, effectively infusing ideological elements into the teaching system is one of the key issues that educators must deeply contemplate. The traditional approach of incorporating ideological and political content into professional course textbooks has diminished the objectivity and practicality of these materials, rendering them overly abstract and dogmatic [14]. Existing textbooks disproportionately emphasize theoretical knowledge while lacking practical case analyses and ideological and political elements. Many instructors in application-oriented universities lack the capacity to integrate professional curriculum with ideological and political elements, resulting in difficulties in merging these two aspects. The traditional lecture model not only disperses students' attention but also burdens them with knowledge acquisition, ultimately hampering their understanding of professional knowledge. Students desire easily understandable and practically relevant knowledge rather than rigid and hollow "theories." Due to insufficient classroom hours, instructors often fail to comprehend students' psychological states and respect their desires. Regarding the excavation of ideological and political elements, universities lack detailed ideological and political teaching plans, hampering the implementation and standardization of teaching processes. Relying solely on instructors' improvisation in the classroom fails to facilitate deep integration between professional knowledge and ideological and political elements.

4. Pathway to the “Industry-education Integration and Innovation” Talent Cultivation in Application-oriented Universities

4.1. Industry Development as the Propeller: Establishing a Multilevel System for Application-oriented Talent Cultivation

Industry stands at the core of high-quality development. Implementing a strategy of industrial revitalization and reinforcing a modern industry-education collaborative model to support talents are fundamental approaches to enhancing the quality of education in application-oriented universities. Traditional educational philosophies in universities involve aggregating students and delivering theoretical knowledge based on curricula, followed by concentrated practical learning. However, theoretical knowledge is often laden with abstract, symbolic, and idealistic principles. This results in a divergence between students' acquired knowledge and actual production and life, making it challenging for society or industries to acknowledge their competencies. Therefore, establishing a multilevel system for application-oriented talent cultivation, to better integrate theoretical knowledge into production and daily life, is a primary precondition for setting current educational goals.

Disrupting Traditional Teaching Methods: Firstly, departing from the institution's mission and educational philosophies, a reasonable orientation for talent cultivation is determined, proposing talent cultivation objectives that align with industrial development. Secondly, in conjunction with real-world enterprises, a series of distinctive courses are co-created, achieving the overall goals of student graduation and employment education. These courses prioritize enhancing students' proficiency in specialized knowledge while broadening their comprehensive practical skills. Moreover, by integrating distinctive characteristics of different majors, connecting with industry-oriented mentors, and implementing collaborative education involving both internal and external "dual mentors," the educational framework is established. This is further reinforced by defining teaching objectives for each major based on industrial projects, dissecting the distinct roles played by various majors in project production across different levels. Lastly, the relationships between these objectives are synthesized to construct a scientifically reasonable system for application-oriented talent cultivation.

4.2. Building on Professional Development: Strengthening the Foundation of Advantaged Disciplines

For application-oriented undergraduate institutions, the development of disciplines directly influences the quality of education, student cultivation, and the direction of graduates' careers. Discipline development must be oriented towards accommodating the demands of a market-oriented talent pool and timely adjustments to the discipline structure to facilitate collaborative development of academia, industry, and research. Discipline development serves as the bedrock of developing advantaged disciplines. It must be anchored in the development of academic fields, with high-level advantaged disciplines being a necessary condition for cultivating high-quality practical talents.

Firstly, application-oriented universities should discard the notion of solely benefiting from the results of foundational education talent cultivation and instead engage early in the process of cultivating application-oriented talents by leveraging their own specialized disciplines. Secondly, the cultivation of application-oriented talents highlights "application" capabilities, focusing on enhancing students' abilities to adapt to social development, respond to occupational demands, and foster innovative thinking. It is essential to clarify the relationship between "theoretical instruction" and "practical application." In theoretical teaching, a task-oriented approach is emphasized, turning theoretical knowledge and teaching tasks into practical tasks. This ensures that students recognize the connection between their learning content and occupational demands, thus elevating their level of

practical application and competence. Subsequently, based on societal needs, driving university-industry collaboration, constructing discipline-matched advantaged fields and specialties, restructuring curriculum systems, reshaping theoretical knowledge, and forming comprehensive and feasible knowledge modules and systems are crucial. Lastly, building upon the foundation of the prior two points, igniting students' interest in learning and practice, guiding students to engage in internships that align with their acquired theoretical knowledge, establishing a virtuous cycle of integrated learning and practical experience. This allows students to think, gain knowledge, and apply what they've learned, further propelling the diversified development of application-oriented undergraduate institutions.

4.3. Leveraging Discipline Competitions to Address the Lack of Collaborative Educational Mechanisms

The traditional model of cultivating practical abilities, primarily focused on practical training courses, has increasingly exhibited a trend towards formalization and dogmatism during implementation. It has neglected the cultivation of innovative abilities and has become disconnected from societal and occupational demands. This misalignment hampers the connection between students and societal needs. Achieving the integration of learning and competitions is a fundamental approach to addressing the deficiency in collaborative educational mechanisms within application-oriented undergraduate institutions.

Building upon discipline competitions that primarily assess student capabilities, a multi-tiered discipline competition framework is established, thereby innovating pathways for enhancing the capabilities of application-oriented talents. Firstly, using departmental and discipline-based student associations as a foundation, actively promoting and hosting various discipline competitions not only enhances the competitive practical abilities of students within their respective majors but also ignites enthusiasm among students from relevant disciplines and even across disciplines. Concurrently, faculty members can seamlessly integrate classroom teaching content with competition guidance through routine guidance in student associations, achieving a synergy between learning and competitions. Secondly, through discipline competitions, students with abilities, skills, and original ideas are identified and engaged in high-level competitions for in-depth development. This not only sets an example for other students but also vies for honor on behalf of the institution and individuals, thus fostering a ripple effect. Thirdly, by using education to spur competitions and vice versa, the fusion of teaching content and competition requirements is accomplished. The competition projects are driven by teaching content, and in turn, these projects enrich teaching content. This creates a dual-cycle, integrated learning and competition mode, forming a collaborative educational model that harmoniously integrates learning and competitions.

4.4. Leveraging “Dual-Innovation” Education to Guide Students in Creating Value and Expanding Their Thinking

Guiding students to translate valuable and novel ideas into actions, and helping them develop the capacity and methods for innovative thinking, is not only a continuous demand of society for the development of application-oriented talents but also the core of constructing an innovation and entrepreneurship education system that aligns with national strategies and significant societal needs.

Using national-level comprehensive competitions such as the “Challenge Cup,” “Internet+,” and “Youth Innovation and Entrepreneurship” as catalysts, the “entrepreneurship and innovation” education pathway is optimized to broaden students' perspectives and cater to societal demands. Firstly, by means of discipline competitions, high-level, high-caliber talents from various majors are identified, and multidisciplinary and multi-major student innovation teams are preliminarily

established. Leveraging national and provincial-level college student innovation training programs as an entry point, a brainstorming of students' diverse ideas on current economic and social development issues is conducted to facilitate the realization of valuable concepts into actionable initiatives, thereby promoting project implementation. This approach not only fosters academic innovation theoretically but also creates practical value, cultivating students' innovative awareness, spirit, and methodologies. Secondly, embracing the philosophy of "learning through creation" and "creation enhancing learning," the concepts and ideas of "entrepreneurship and innovation" education are instilled in students, nurturing innovative thinking and methods. Additionally, investment in building innovation and entrepreneurship teams is intensified, support for innovative entrepreneurial projects is provided, and self-directed learning among students is stimulated, culminating in the establishment of a conducive learning environment.

5. Conclusion

Cultivating high-quality, versatile, and innovative talents constitutes a significant endeavor in line with the socio-economic development and the critical strategic talent demands of the nation. The innovation-oriented talent cultivation model represents a paradigm in higher education with the ultimate goal of nurturing innovative talents that align with the needs of the era [15]. Through innovative and practical teaching methods, students are enabled to strike a balance between traditional theoretical courses and innovative practical courses. The implementation of interdisciplinary curriculum enables a thorough integration of multiple disciplines, fostering enthusiasm among students for course learning. The fusion of learning, competition, research, and creation enhances students' comprehensive practical abilities. The talent cultivation approach for applied universities should be oriented towards "serving local economic development, meeting industry demands, enhancing curriculum employability, and boosting students' job adaptability." This approach should continuously broaden the scope of practical teaching, delve deeper into the integration of academia and industry, and elevate the quality of education. By creating within the realm of practice and elevating through innovation, applied universities can foster holistic growth.

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