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Research on Talent Cultivation Model for Aviation Service Art and Management Major Based on Symbiosis Theory

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Abstract

Against the strategic backdrop of constructing a modern civil aviation system and promoting high-quality development in the transportation sector, the demand for interdisciplinary aviation service professionals has undergone profound transformation. The Aviation Service Art and Management major, as an emerging interdisciplinary and application-oriented program, is confronted with multiple structural contradictions, including fragmented curriculum systems, superficial industry-education integration, insufficient practical training support, and misalignment with rapidly evolving industrial standards. Drawing upon symbiosis theory, this study conceptualizes talent cultivation as a dynamic system composed of symbiotic units, symbiotic relationships, and symbiotic environments. Through systematic analysis, key dilemmas in the current cultivation model are identified, including asymmetric stakeholder participation, low-level symbiotic interaction, and constrained institutional environments. Based on this analytical framework, a mutualistic symbiosis-oriented talent cultivation model is constructed. This model emphasizes the establishment of a multi-stakeholder collaborative governance mechanism, the development of an integrated "art-management-service" curriculum system, the enhancement of immersive practice platforms, the formation of a "dual-qualified, dual-mentor" faculty team, and the optimization of policy and institutional support systems. This study aims to provide both theoretical references and practical pathways for promoting the high-quality development of Aviation Service Art and Management education and for cultivating composite talents aligned with the evolving demands of the civil aviation industry.

Keywords

Symbiosis Theory; Aviation Service Art and Management; Talent Cultivation Model; Mutualistic Symbiosis.

1. Introduction

The civil aviation industry constitutes a crucial pillar of modern transportation and a strategic component of national economic development. The Outline of China's 15th Five-Year Plan (2026-2030) explicitly emphasizes the need to improve the modern transportation framework and promote the coordinated development of aviation characterized by safety, intelligence, and sustainability [1]. Within this macro-policy context, the competency requirements for aviation service professionals are undergoing profound transformation. Specifically, the industry no longer demands solely traditional service skills and emergency response capabilities; rather, it increasingly requires composite competencies encompassing artistic literacy, managerial capacity, digital application proficiency, and cross-cultural communication ability [2].

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Since its official inclusion as an undergraduate major in 2019, the Aviation Service Art and Management program has expanded rapidly, with more than 80 universities nationwide offering this discipline. As an interdisciplinary major situated within the category of Music and Dance Studies, it integrates artistic training, management education, and aviation service competencies, aiming to cultivate high-quality professionals for airlines, airports, and related high-end service industries. IHowever, the rapid expansion of program scale has not been accompanied by a corresponding improvement in cultivation quality, leading to increasing concerns regarding graduates' employability and professional adaptability.

Despite ongoing reforms, the current talent cultivation model still exhibits several prominent deficiencies. University-enterprise cooperation remains largely superficial and lacks institutionalized and sustainable mechanisms [3]; the curriculum system fails to achieve effective integration of artistic, managerial, and professional competencies [4]; and practical teaching resources are insufficient and disconnected from dynamic industry standards [5]; These issues fundamentally reflect the absence of an effective symbiotic mechanism among key stakeholders, including universities, enterprises, and regulatory bodies.

Symbiosis theory, originating from biological sciences and subsequently extended to social and educational research, provides a valuable analytical framework for understanding multi-stakeholder collaboration systems. By introducing symbiosis theory into the field of aviation service education, it becomes possible to systematically analyze the structural relationships, operational dilemmas, and optimization pathways of talent cultivation. Accordingly, this study aims to construct a mutualistic symbiosis-based talent cultivation model, thereby providing theoretical support and practical guidance for the reform and development of the Aviation Service Art and Management major.

2. Theoretical Framework: Symbiosis Theory and Its Application in Education

2.1. Core Concepts of Symbiosis Theory

Symbiosis theory was first proposed by the German biologist Heinrich Anton de Bary in 1879. who conceptualized symbiosis as a self-organizing phenomenon arising from the fundamental survival needs of organisms. Under this framework, different organisms tend to establish long-term and close associations through specific interaction mechanisms, forming interdependent and interactive relationships that ultimately lead to co-existence and co-evolution [6]. Building upon this theoretical foundation, Yuan Chunqing further deconstructed the symbiotic system into three core dimensions: symbiotic units, symbiotic relationships, and the symbiotic environment [7]. Among these, symbiotic units constitute the foundational elements of the system, referring to the basic carriers of resource production and exchange that provide the material basis for the formation and operation of the symbiotic structure. Symbiotic relationships represent the core dimension, describing the modes of interaction among symbiotic units. These relationships can be categorized into parasitic symbiosis, characterized by unilateral benefit at the expense of others; commensal symbiosis, in which one party benefits without affecting the other; and mutualistic symbiosis, where all participating entities achieve reciprocal benefits. Among these types, mutualistic symbiosis is widely regarded as the most stable and ideal form due to its capacity to promote coordinated and sustainable development [8]. The symbiotic environment serves as the external condition that underpins the existence and evolution of symbiotic systems. It encompasses a range of contextual factors, including policy frameworks, market conditions, technological advancement, and socio-cultural dynamics [9]. A well-developed symbiotic environment can effectively facilitate the transition of symbiotic relationships toward higher-level mutualistic forms, thereby enhancing the overall efficiency and sustainability of the system.

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2.2. The Applicability of Symbiosis Theory to Aviation Service Education

The talent cultivation system of the Aviation Service Art and Management major inherently exhibits the characteristics of a symbiotic system, which makes symbiosis theory highly applicable in this field.

Firstly, from the perspective of symbiotic units, the talent cultivation process involves multiple stakeholders, including universities, educational enterprises, civil aviation enterprises, government agencies, and industry associations, collectively forming a complex and interactive educational ecosystem. Within this system, universities function as the core entities responsible for curriculum design, theoretical instruction, and foundational training. Educational enterprises serve as intermediary platforms that facilitate resource integration between academia and industry, while also providing financial support, practical training environments, and professional instructors. Civil aviation enterprises, such as airlines and airports, act as key industrial partners by offering employment opportunities, operational standards, and real-world practice scenarios. Students constitute the central focus of talent cultivation, continuously acquiring and internalizing knowledge and skills through the integration of academic learning and industry practice. Meanwhile, government agencies and industry associations play a regulatory and coordinating role by formulating policies, establishing standards, and allocating resources, thereby ensuring the effective operation of the entire system.

Secondly, from the perspective of symbiotic relationships, the effectiveness of talent cultivation largely depends on the interaction patterns among these symbiotic units. Under the current framework, university–enterprise collaboration predominantly exhibits characteristics of intermittent symbiosis and commensal symbiosis, and in some cases even reflects elements of parasitic symbiosis, rather than evolving toward integrated and mutualistic symbiosis. Specifically, enterprises often participate in educational activities primarily for recruitment purposes, with limited involvement in curriculum development and talent cultivation processes. Conversely, universities tend to rely on enterprise resources without establishing effective mechanisms for value feedback and reciprocal benefit. This imbalance significantly constrains the depth, stability, and sustainability of collaborative development.

Thirdly, from the perspective of symbiotic interfaces, the key mechanisms connecting different symbiotic units include curriculum co-construction platforms, joint training bases, dual-mentor systems, and collaborative evaluation mechanisms. These interfaces function as critical channels for resource exchange and value co-creation. Their structural design, operational efficiency, and level of integration directly determine the intensity and sustainability of symbiotic relationships.

Lastly, from the perspective of the symbiotic environment, aviation service talent cultivation is embedded within a broader macro-context shaped by national education policies, the development trajectory of the civil aviation industry, technological innovation trends, and the increasing societal demand for high-quality aviation services. In particular, the strategic emphasis of the 15th Five-Year Plan on building a world-class aviation service system has created a favorable institutional environment, thereby providing strong external support for the deepening of industry–education integration.

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3. Symbiotic Dilemmas in Current Talent Cultivation of Aviation Service Art and Management

3.1. Asymmetric Symbiotic Relationship: Superficial and Imbalanced Cooperation among Multiple Stakeholders

At present, university–enterprise collaboration in the talent cultivation process of the Aviation Service Art and Management major exhibits a significant degree of asymmetry, and a stable mutualistic symbiotic relationship has not yet been effectively established [10]. In most cases, universities act as the primary initiators of cooperation and tend to occupy a dominant position in the collaboration process, with the expectation of obtaining internship opportunities, employment channels, and industry recognition from aviation enterprises. In contrast, many aviation enterprises regard such collaboration merely as a supplementary recruitment channel rather than as a strategic approach to long-term talent development.

This asymmetry is manifested in several key dimensions. First, enterprises demonstrate limited participation in core educational processes, particularly in curriculum design and talent cultivation program development, resulting in a weak alignment between educational content and industry requirements. Second, the cooperation model is predominantly characterized by short-term, project-based interactions, lacking institutionalized, standardized, and sustainable operational mechanisms. Third, the absence of a clear and effective benefit-sharing mechanism leads to a perceived imbalance in returns, thereby reducing enterprises' willingness to engage deeply in the talent cultivation process.

Furthermore, the multi-stakeholder coordination mechanism involving government, industry, academia, and research institutions has not yet been fully established. Although government agencies provide macro-level policy guidance, targeted and operational support measures for advancing industry–education integration in aviation service education remain insufficient. Meanwhile, the participation of research institutions and international organizations in talent cultivation is relatively limited, resulting in a misalignment between international service standards and domestic educational practices. In the absence of an integrated collaborative governance framework, stakeholders tend to operate in a relatively fragmented manner, which significantly constrains the formation of synergistic effects and hinders the evolution toward mutualistic symbiosis.

3.2. Insufficient Co-evolutionary Momentum in Symbiotic Mode: Remaining at a Low-Level Symbiosis Stage

The current symbiotic mode of talent cultivation in the Aviation Service Art and Management major remains at a relatively low developmental stage, primarily characterized by point symbiosis and intermittent symbiosis. In terms of interaction patterns, it predominantly reflects features of commensal symbiosis, thereby limiting its capacity to evolve toward an integrated, symmetrical, and mutualistic symbiotic state. This structural limitation is mainly manifested in two aspects: the fragmentation of symbiotic interfaces and the insufficient flow of symbiotic energy.

On the one hand, from the perspective of symbiotic interfaces, the curriculum system-serving as the key linkage between theoretical education and practical application-exhibits a high degree of fragmentation and structural disconnection. As an interdisciplinary program, the Aviation Service Art and Management major spans three core knowledge domains: artistic training, management education, and aviation service competencies [11]. However, these domains are often organized in parallel rather than integrated within the curriculum framework, resulting in a lack of systematic coherence. Moreover, due to the absence of unified national teaching quality standards, institutions tend to adopt heterogeneous and inconsistent curriculum structures, further intensifying the fragmentation of knowledge

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organization. The misalignment between curriculum content and industry development exacerbates this issue, weakening the functional effectiveness of the curriculum as a symbiotic interface. More critically, curriculum content has failed to adapt to the rapid digital transformation of the civil aviation industry. Emerging practices such as intelligent check-in systems, AI-assisted cabin services, data-driven passenger experience management, and digital media-based aviation service operations are fundamentally reshaping the industry's service paradigm. However, existing curricula in many institutions remain largely confined to traditional service etiquette training and foundational management theories, representing a superficial aggregation of disciplinary content rather than an integrated competency-oriented system. The lack of a dynamic curriculum updating mechanism further prevents the timely incorporation of cutting-edge industry knowledge, thereby constraining students' ability to adapt to evolving professional requirements.

On the other hand, from the perspective of symbiotic energy, practical training constitutes the primary driving force for transforming theoretical knowledge into professional competence. Nevertheless, the current practical training system remains underdeveloped and fails to provide sufficient support for competency formation. Empirical investigations indicate that practical teaching is predominantly limited to isolated simulation exercises aligned with individual courses, most of which serve as verification of theoretical knowledge rather than as integrative, problem-oriented training [12]. As a result, both the duration and depth of comprehensive practical training are inadequate, preventing students from forming a coherent understanding of the professional knowledge system.

Furthermore, significant deficiencies exist in practical training infrastructure and industry engagement. Many institutions, particularly those outside the civil aviation system, lack high-fidelity simulation training facilities tailored to aviation service scenarios. Internship opportunities provided by aviation enterprises are often observational in nature, with limited access to authentic operational tasks. Consequently, students have insufficient opportunities to engage in complex, real-world problem-solving processes, leading to weak practical adaptability and limited capacity for innovative application of knowledge.

The inadequate flow of symbiotic energy ultimately results in a mismatch between talent cultivation outcomes and industry demands. Graduates tend to possess relatively strong theoretical foundations but lack the practical competencies required by the civil aviation sector, which not only constrains their professional development but also undermines the effectiveness of the overall talent cultivation system.

3.3. Constrained Symbiotic Environment: Policy and Institutional Barriers

Although the macro-level policy environment has become increasingly supportive of multi-stakeholder collaboration in aviation service education, a series of institutional and structural constraints at the operational level continue to hinder the effective optimization of the symbiotic environment.

From the perspective of institutional supply, the absence of specialized national teaching quality standards for the Aviation Service Art and Management major constitutes a fundamental structural constraint. At present, the program relies primarily on the general teaching quality standards for the Music and Dance Studies category as a reference framework. However, such standards fail to accommodate the interdisciplinary characteristics, application-oriented nature, and industry-specific competency requirements of this major. As a result, a significant mismatch has emerged between standardized educational guidelines and actual talent cultivation needs.

This institutional deficiency has led to a high degree of fragmentation in program implementation. Universities tend to operate in a relatively decentralized manner in determining training objectives, designing curriculum systems, developing faculty teams, and

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evaluating educational outcomes. The absence of unified and specialized standards not only weakens the internal coherence of talent cultivation systems but also undermines the establishment of stable and standardized cooperation mechanisms between universities and enterprises. Consequently, the macro-level policy support for the symbiotic system remains insufficiently operationalized.

From the perspective of institutional incentives, existing university evaluation systems exhibit a strong bias toward academic research outputs and theoretical achievements, while providing limited incentives for faculty engagement in industry-oriented practical teaching and university-enterprise collaboration. This imbalance has directly contributed to the structural shortage of "dual-qualified" faculty. University instructors are predominantly characterized by strong theoretical backgrounds but lack substantial industry experience, whereas industry practitioners possess rich practical expertise but often lack formal academic qualifications and systematic pedagogical training. This structural divide significantly constrains the effective integration of theoretical knowledge and practical competence within the talent cultivation process.

From the perspective of cultural embedding, the integration of civil aviation professional culture into the talent cultivation system remains inadequate. The core values of the aviation industry, such as "safety first" and "service paramount", have not been systematically incorporated into curriculum design, teaching processes, or campus cultural development. At the same time, enterprises tend to focus primarily on short-term skill training during internships, with limited involvement in the cultivation of students' professional identity, ethical awareness, and value orientation.

As a consequence, students often demonstrate insufficient understanding of industry norms, professional ethics, and organizational culture, resulting in weak professional identity and limited adaptability to real-world working environments. After entering the workforce, graduates frequently encounter difficulties in integrating into corporate culture, which contributes to low retention rates and further reduces enterprises' willingness to participate in deep, long-term university–enterprise collaboration.

Overall, these institutional, incentive, and cultural constraints collectively impede the effective functioning of the symbiotic environment, thereby restricting the evolution of the talent cultivation system toward a higher-level mutualistic symbiosis.

4. Construction of a Mutualistic Symbiosis-Based Talent Cultivation Model

4.1. Establishing Symmetrical Symbiotic Units: Building a Multi-Stakeholder Collaborative Governance Mechanism

To facilitate the transformation from an asymmetric symbiotic relationship to a genuinely mutualistic symbiosis, it is essential to establish a multi-stakeholder collaborative governance mechanism that ensures balanced participation, coordinated interaction, and equitable benefit distribution among all symbiotic units. From the perspective of collaborative innovation theory, when a single entity is unable to meet its developmental demands independently, it tends to integrate resources with other stakeholders to pursue shared objectives, thereby generating synergistic effects through coordinated action.

At the institutional level, a multi-stakeholder talent cultivation steering committee should be established as the core governance body responsible for overall program coordination and strategic decision-making. This committee should consist of representatives from universities, airlines, airport groups, government agencies, and industry associations. Its primary functions include defining talent cultivation objectives in alignment with industry competency standards, reviewing and optimizing curriculum frameworks, coordinating practical training

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resources across multiple enterprises, and conducting comprehensive evaluations of training outcomes based on multi-dimensional quality indicators.

The establishment of a symmetrical symbiotic relationship fundamentally depends on the clarification and institutionalization of the rights, responsibilities, and benefit structures of all participating entities. Within this governance framework, universities are expected to leverage their disciplinary strengths, teaching resources, and research capacities, while aviation enterprises contribute industry expertise, practical training platforms, employment opportunities, and financial support. In turn, universities provide enterprises with customized training programs for in-service personnel, applied research support for service innovation, and a continuous supply of high-quality graduates, thereby forming a reciprocal and sustainable value exchange mechanism.

Meanwhile, government agencies play a pivotal role in providing macro-level support through policy guidance, financial investment, and standard-setting, while industry associations function as intermediary coordination platforms that facilitate interest alignment and resource integration among stakeholders. Through the establishment of formal cooperation agreements, standardized operational procedures, and clearly defined benefit-sharing mechanisms, a structured governance model characterized by co-construction, co-governance, and market-oriented operation can be formed.

Under such a governance framework, the symbiotic relationship among stakeholders can gradually evolve from fragmented and loosely connected cooperation toward an institutionalized, stable, and mutually beneficial symbiotic system, thereby enhancing the overall efficiency and sustainability of talent cultivation.

4.2. Optimizing the Symbiotic Interface: Constructing an Integrated "Art-Management-Service" Curriculum System

The reconstruction of the curriculum system constitutes the core pathway for optimizing the symbiotic interface between higher education and the aviation industry. To enhance the alignment between talent cultivation and industry demand, universities should collaborate with leading aviation enterprises to establish a job competency mapping framework. Through systematic analysis of key occupational roles-such as cabin service, ground service, and service quality management-the essential competency requirements can be clearly identified and standardized. The resulting Aviation Service Job Competency Standards provide a scientific and operational foundation for the design and implementation of the curriculum system.

On this basis, a three-tier modular curriculum system should be constructed in accordance with the principle of "curriculum–certification integration," thereby forming a structured and competency-oriented training framework.

The first tier, the Basic Literacy Module, aims to establish a comprehensive foundation for students' long-term professional development. It encompasses professional ethics, aesthetic competence, digital literacy, and cross-cultural communication ability, thereby supporting the holistic development of students' foundational qualities.

The second tier, the Core Competency Module, focuses on the targeted cultivation of position-specific capabilities aligned with industry requirements. It covers key areas such as cabin service operations, ground service management, safety and emergency response, as well as crew coordination and management, ensuring a close alignment between curriculum content and occupational competency standards.

The third tier, the Frontier Expansion Module, is designed to extend students' industry vision and enhance their adaptability to emerging trends. This module integrates cutting-edge topics

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such as intelligent civil aviation technologies, digital media operations, and AI-driven service innovation, thereby fostering forward-looking and innovative competencies.

To strengthen the linkage between educational outcomes and industry standards, a corresponding mapping mechanism between curriculum modules and vocational qualifications should be established. This mechanism forms an integrated training pathway characterized by "curriculum learning–skill development–qualification certification," thereby improving the precision and effectiveness of talent cultivation.

Furthermore, a dynamic curriculum updating mechanism should be introduced through the establishment of an industry advisory committee. By conducting regular (e.g., annual) reviews and iterative optimization of curriculum content, this mechanism ensures that the curriculum system remains responsive to technological advancements and evolving industry demands, thereby maintaining its relevance and sustainability.

4.3. Enhancing Symbiotic Energy: Building Multi-Tiered Immersive Practice Platforms

To enhance the efficiency of symbiotic energy flow within the talent cultivation system, it is necessary to construct a comprehensive practical teaching framework based on the principle of the "Four Integrations." This framework emphasizes the systematic coordination of practical teaching with industrial processes, vocational certification, skills competitions, and social service, thereby forming a multi-dimensional and highly integrated practice system.

(1) Integration of practical teaching with industrial work procedures

Practical teaching should be deeply embedded within real industrial work processes through the establishment of a smart training base for civil aviation services. Guided by the principles of high fidelity and strong interactivity, a multi-scenario and immersive training environment should be developed to replicate authentic airport operational contexts.

In particular, a smart airport service training center should be constructed to simulate real-world operational procedures, with training facilities integrated with backend simulation systems to enable dynamic interaction. This allows students to acquire professional competencies within realistic working environments. Furthermore, advanced technologies such as artificial intelligence-based behavior recognition should be incorporated to establish a data-driven training evaluation system, enabling the recording, analysis, and feedback of students' operational performance and communication effectiveness.

In addition, an integrated digital teaching platform should be developed to support blended learning and standardized assessment. By incorporating virtual simulation technologies and computer-based training systems, immersive three-dimensional operational scenarios-such as aircraft cabin environments-can be created, thereby enhancing the effectiveness and authenticity of practical learning.

(2) Integration of practical skills with vocational qualification certification

A systematic linkage between practical skill training and vocational qualification certification should be established to ensure the alignment between educational outcomes and industry standards. Key certifications, including Mandarin proficiency, civil aviation security screening qualifications, etiquette training credentials, and first-aid certification, should be incorporated into the training system.

Based on this framework, a "dual-certification" model should be implemented, enabling students to obtain both academic degrees and industry-recognized professional certifications upon graduation. This integrated approach not only enhances students' employability but also strengthens the standardization and credibility of talent cultivation outcomes.

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(3) Integration of training projects with skills competitions

Practical teaching should be closely aligned with industry-recognized skills competitions and professional evaluation systems. Following the principle of "learning through competition and teaching through competition," competition standards and assessment criteria should be embedded into curriculum design and training processes.

By integrating competition-based training projects into daily teaching activities, students' motivation for skill development can be significantly enhanced, while instructors are encouraged to continuously refine teaching methods and update instructional content. This mechanism facilitates the dynamic improvement of both teaching quality and learning outcomes.

(4) Integration of practical outcomes with volunteer services

Practical outcomes should be extended to real social contexts through the integration of professional volunteer service activities. Based on the disciplinary characteristics of Aviation Service Art and Management, students should be encouraged to participate in structured and long-term service activities, such as etiquette services for major events and operational assistance in airport terminals.

Through continuous engagement in authentic service scenarios, students are able to apply, internalize, and refine their professional knowledge and skills. At the same time, such activities contribute to the development of professional ethics, social responsibility, and service awareness, thereby promoting the comprehensive development of applied talents.

Overall, the "Four Integrations" practical teaching framework establishes a closed-loop system that links skill acquisition, practical application, competency evaluation, and social service. This integrated model significantly enhances the flow and transformation efficiency of symbiotic energy, thereby providing strong support for the cultivation of high-quality, application-oriented aviation service professionals.

4.4. Constructing a "Dual-Qualified, Dual-Mentor" Symbiotic Faculty Team

The faculty team constitutes a critical symbiotic component within the talent cultivation system, serving as a key linkage that integrates educational resources and industry practices. To address the structural shortage of dual-qualified faculty in the Aviation Service Art and Management major, it is necessary to establish a systematic development framework characterized by the parallel advancement of internal cultivation and external recruitment.

From the perspective of internal development, universities should strengthen the dual-competency enhancement of full-time faculty through institutionalized support mechanisms. A structured enterprise practice system should be established, requiring professional teachers to participate regularly in on-the-job practice, technical training, and service operations within partner airlines and airports. To ensure the effectiveness of such initiatives, a multi-dimensional evaluation mechanism integrating enterprise feedback and outcome-based performance indicators should be implemented. The results of industry engagement should be directly linked to faculty promotion, performance appraisal, and professional development pathways, thereby incentivizing sustained participation in frontline industrial practice. In addition, faculty members should be encouraged to engage in enterprise-oriented activities such as technical consultancy, service standard development, and vocational training delivery, further enhancing the integration of academic expertise with industry needs.

From the perspective of external recruitment, universities should establish a high-level part-time faculty system by systematically introducing experienced industry professionals. Guided by the principles of selective recruitment, quality-oriented appointment, and capacity empowerment, priority should be given to technical experts with extensive frontline experience and strong professional competencies, including senior flight attendants, ground

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service managers, and certified civil aviation trainers. To facilitate effective role differentiation, diversified positions such as Industry Professors, Distinguished Lecturers, and Technical Mentors should be established, with clearly defined responsibilities in theoretical instruction, practical training supervision, and curriculum development.

Furthermore, to promote deep integration between academic and industry knowledge systems, a university–enterprise collaborative teaching and research platform should be constructed. Through mechanisms such as joint curriculum development, collective lesson planning, and case-based research, this platform enables continuous knowledge exchange and collaborative innovation between university faculty and industry practitioners. Such an approach effectively breaks down institutional barriers and enhances the overall coherence and adaptability of the faculty system.

Overall, the implementation of this dual-path faculty development framework facilitates the formation of a structurally balanced and functionally integrated teaching team. By strengthening the coupling between academic knowledge and industrial practice, it provides a critical human resource foundation for the realization of mutualistic symbiosis in talent cultivation.

4.5. Optimizing the Symbiotic Environment: Strengthening Policy Support and Institutional Innovation

The optimization of the symbiotic environment constitutes a fundamental guarantee for the realization of mutualistic symbiosis in talent cultivation. It requires the coordinated efforts of government agencies, universities, enterprises, and industry associations to establish a supportive institutional and cultural ecosystem.

From the perspective of institutional support, government agencies should play a leading role in improving policy supply and regulatory frameworks for industry–education integration in aviation service education. Targeted policy instruments should be introduced to incentivize enterprise participation, including tax incentives for enterprises engaged in educational investment, special funding programs for the reform of aviation service talent cultivation, and the establishment of standardized institutional arrangements to facilitate student internships within aviation enterprises.

In addition, the Civil Aviation Administration of China, in collaboration with the Ministry of Education, should formulate unified national teaching quality standards specifically tailored to the Aviation Service Art and Management major. Such standards would provide systematic, standardized, and operational guidance for program development, thereby addressing the current fragmentation and inconsistency in institutional practices.

From the perspective of cultural embedding, universities should systematically integrate the core professional values of the civil aviation industry-such as "safety first" and "service paramount" -into curriculum design, teaching processes, campus culture construction, and student management systems. At the same time, elements such as the spirit of craftsmanship and the principles of quasi-military management should be incorporated to strengthen discipline, professionalism, and service awareness.

Through diversified educational activities, including industry-oriented lectures, professional skills competitions, and aviation culture-themed events, universities can effectively enhance students' professional identity and occupational literacy. Meanwhile, enterprises should actively participate in the cultivation process by providing structured training in corporate culture, professional norms, and ethical standards during internships and practical training. Such involvement enables students to develop a deeper understanding of industry expectations and facilitates their transition into professional roles.

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Furthermore, sustained interaction between universities and enterprises should be promoted to strengthen cultural integration between academic education culture and industrial professional culture. Through continuous dialogue, joint activities, and collaborative platforms, potential cultural discrepancies can be mitigated, leading to the formation of an open, inclusive, and collaborative educational ecosystem.

Overall, the joint optimization of institutional frameworks and cultural environments enhances the adaptability, stability, and sustainability of the symbiotic system, thereby providing essential external conditions for the realization of high-quality talent cultivation.

5. Conclusion

Guided by the strategic objective of building a world-class aviation service system as outlined, the demand for interdisciplinary aviation service professionals integrating artistic literacy, managerial competence, and professional service capabilities has increased significantly. In this context, the Aviation Service Art and Management major is undergoing a critical phase of transformation. Symbiosis theory provides a systematic analytical framework for understanding and optimizing the complex interactions among universities, aviation enterprises, government agencies, and other stakeholders involved in talent cultivation.

This study has identified key structural dilemmas within the current talent cultivation system, including asymmetric university–enterprise relationships, fragmented curriculum interfaces, insufficient practical training support, and constraints within the institutional environment. These issues fundamentally reflect the absence of an effective symbiotic mechanism and the low-level operation of the existing collaborative system.

In response, this paper constructs a mutualistic symbiosis-oriented talent cultivation model and develops an integrated framework comprising five core pathways: the establishment of a multi-stakeholder collaborative governance mechanism, the development of a competency-oriented modular curriculum system, the construction of an immersive and technology-enabled practical teaching framework based on the "Four Integrations," the formation of a dual-path faculty development system integrating internal cultivation and external recruitment, and the optimization of institutional and cultural environments. Together, these pathways form a coordinated and interdependent system that promotes the transition from fragmented cooperation to structured and sustainable symbiotic development.

The effective implementation of this model depends on the coordinated participation and sustained investment of all stakeholders. Universities are required to further open their educational systems and strengthen alignment with industry demands; aviation enterprises should reposition their role by engaging in talent cultivation as a long-term strategic commitment; and government agencies need to enhance policy supply and institutional innovation to support system-level transformation. Only through the establishment of a stable, balanced, and mutually beneficial symbiotic ecosystem can the Aviation Service Art and Management major achieve high-quality talent cultivation and effectively respond to the evolving needs of the civil aviation industry.

From a theoretical perspective, this study extends the application of symbiosis theory to the field of aviation service education and enriches the analytical framework for interdisciplinary talent cultivation. From a practical perspective, it provides actionable pathways for optimizing industry–education integration and improving the quality of applied talent development.

Future research should focus on empirical validation of the proposed model through case studies of representative institutions, as well as the development of quantitative evaluation frameworks to assess the effectiveness and operational performance of symbiotic talent cultivation systems in aviation service education.

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