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Situation of Aviation Education and Training Industry in Beijing

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ABSTRACT

This paper systematically analyzed the current status of professional and service skills training for aviation-related majors in Beijing through a questionnaire survey. The results showed that students performed well in practical skills such as passenger guidance, aircraft system inspection, and radar communication navigation,which reflected the effectiveness of training institutions in integrating theory and practice. However, there were discrepancies in the mastery of certain professional knowledge, such as meteorology, which necessitated curriculum adjustments. Based on data analysis, this paper proposed improvement suggestions such as optimizing course structures, introducing virtual reality simulations, and enhancing teacher capabilities, and designed a six-phase implementation plan. The study aimed to promote school-enterprise collaboration, improve training quality, provide practical evidence for aviation talent cultivation policies, and support the sustainable development of Beijing's aviation education and training industry.

INTRODUCTION

With the rapid development of the global air transport industry, the aviation education and training industry faced unprecedented opportunities and challenges. In recent years, the demand for professionals soared, which prompted the aviation education and training industry to constantly innovate and improve quality. As the capital of China, Beijing had many high-level aviation colleges and training institutions, which had trained a large number of outstanding talents for the country. However, changing market demand and rising international standards brought new challenges to the industry. Improving the training quality was an important way to meet the demand of aviation personnel. This paper focused on the status quo and existing problems of aviation education and training industry in Beijing, and put forward the optimization model and change suggestions of aviation education and training, in order to better promote the development of aviation education and training industry.

THEORETICAL REVIEW

On the combination of aviation industry demand and education training

Zhou (2022) noted that as demand for aviation maintenance personnel grew, training institutions faced the challenge of providing high-quality education to meet industry requirements. To address this issue, a solution integrating industry and education was proposed to cultivate professional skills and achieve aviation maintenance industry standards (Li, 2020). Li (2024) observed that the current vocational education system struggled to meet this demand due to issues such as a disconnect between industrial needs and educational supply, insufficient industry-education integration, and policy barriers. The development of the aviation industry was closely tied to the availability of technical personnel such as pilots, air traffic controllers, maintenance technicians, and flight attendants (Ding, 2020). Ran (2021) noted that to address this challenge, higher vocational colleges in the Beijing area focused on enhancing aviation-related educational programs, with an emphasis on improving the overall quality of aviation professionals. Huang (2018) highlighted the scarcity of research evaluating the alignment between industry demand and educational supply. This knowledge gap hindered educational institutions' ability to effectively respond to the dynamic evolution of the aviation sector. Yang and Dong (2024) emphasized the value of industry-education integration, drawing on the experience of Germany's applied university system to enhance employability. China’s “New Engineering Education” reform aimed to cultivate innovative engineering talent to meet the demands of the new industrial revolution (Shen et al., 2020). Pérez et al. (2021) noted that rapid advancements in information technology and the restructuring of work practices rendered traditional skill sets inadequate for future labor market demands. Education played a pivotal role in navigating digital transformation, necessitating greater emphasis on cultivating core competencies and comprehensive abilities aligned with 21st-century challenges. This perspective provided crucial theoretical grounding for re-examining the alignment between higher education and industrial needs.

On innovation and practice of teaching methods

Zhao and Selvarajan (2024) identified key directions for China's vocational education reform, including integrating teaching with practice and fostering multi-skilled development. Enhancing aviation education quality required transformations in program development, pedagogical philosophies, and collaboration among faculty, students, and administrators (Xu, 2019). These initiatives aimed to cultivate highly skilled professionals who could ensure aviation safety while meeting the industry's growing demands. The case-based teaching method, with its innovative strengths of openness and interactivity, better achieved the instructional objectives of aviation search and rescue courses, fostering capable and high-caliber new aviation rescue personnel (Wang & Zhao, 2020). Zhang et al. (2021) emphasized that to meet aviation industry talent demands, universities must carefully consider professional educational philosophies and rational curriculum systems, delivering high-quality specialized instruction to enhance learning outcomes in aviation search and rescue courses. Providing quality professional teaching promoted students' specialized course learning, thereby elevating their comprehensive professional competencies (Tang, 2019).

Although these scholars had studied the importance of innovative educational models and practical teaching methods, they still faced many challenges in the implementation process. Educational institutions needed to strengthen teacher training, optimise curriculum design, improve resource allocation and establish effective evaluation mechanisms to promote the successful application of innovative teaching methods.

This study examined aviation programs across all disciplines in Beijing (pilot training, flight attendant training, and aviation engineering technology) to analyze the current state of skill development in aviation education through quantitative survey methods. Meanwhile, "Establishing an Undergraduate Flight Attendant Training Model: A Case Study of Jilin Animation University" focused on constructing a talent development model for undergraduate flight attendant programs at regional institutions. Both studies were grounded in industry demands and educational practices for aviation talent cultivation, aligning closely with the industry-education integration and practice-oriented trends in aviation education. However, due to differences in research location, scope, and perspective, they yielded complementary yet contrasting findings. Comparing these studies not only highlighted the benchmark characteristics of aviation education and training in Beijing but also reflected both commonalities and distinct challenges in China's aviation education sector—from regional institutions to the capital, and from specialized programs to comprehensive training. This dual perspective offered valuable insights for refining China's aviation talent development system.

METHODOLOGY

Research Design

This study employed a quantitative approach, conducting a questionnaire survey among students at training institutions to validate skill recognition. The level of skill acquisition among students was closely linked to the future aviation service industry, providing professional capabilities and services to enhance employment prospects and align with industry trends.

Complete Research Process:

1. Literature Review and Problem Formulation (1-2 months): Systematically reviewed literature to identify research gaps.
2. Research Design and Tool Development (2 weeks): Designed Likert scale and conduct pre-testing (n=30).
3. Ethics Review and Participant Recruitment (1 week): Volunteers were recruited through school announcements and completed informed consent forms.
4. Data Collection (2-3 months): Distributed electronic questionnaires via WeChat Mini Program.
5. Data Cleaning and Analysis (2 weeks): Coded responses and analyzed using SPSS; Cronbach's $\alpha > 0.7$.
6. Interpretation of Findings and Report Writing (1 month): Drafted conclusions and recommendations.

Population

The representative institution was Beihang University. The survey subjects were undergraduate students at the university, selected through stratified sampling by major (pilot, flight attendant, aviation engineering technology) and academic year (intermediate and senior years, excluding lower-level students). The total sample size was 300 participants, with 50 students from each major and academic year, ensuring representativeness across professional backgrounds and academic stages. These figures were calculated using G*Power software with parameters including an effect size of 0.3 (moderate effect), statistical power of 0.8, and significance level $\alpha=0.05$. This determined the minimum required sample size to support reliable statistical inference.

Regarding the significance of data collection: First, the stratified sample structure ensured comprehensive coverage of skills oriented toward different aviation roles (service, technical, safety, soft skills), enhancing the external validity of results. Second, the 300 valid questionnaires provided a reliable foundation for subsequent reliability testing (Cronbach's $\alpha > 0.7$) and descriptive statistical analysis, ensuring the stability and consistency of the measurement tools.

Table 1. Sample size

Major Type	**Grade**	**Sample Size (Person)**
Pilot Major	Middle	50
Pilot Major	Senior	50
Flight Attendant Major	Middle	50
Flight Attendant Major	Senior	50

Aviation Engineering and Technology	Middle	50
Aviation Engineering and Technology	Senior	50
Total		300

Recruitment Criteria: Voluntary, non-compulsory. Invitations were extended via school WeChat groups, emphasizing no rewards/penalties, the option to withdraw at any time, and no academic repercussions to ensure no coercion.

Data Gathering Tools

The electronic questionnaire was created and distributed via a WeChat mini-program. Recruitment criteria: Participants had to sign an informed consent form prior to participation, which outlined the purpose, risks (low, such as emotional discomfort), benefits, anonymity, and voluntary participation, and provided a support hotline.

Treatment of Data

Likert scale (1-4 points) was employed. Participants consented before reporting information. Valid questionnaires were coded by the system and analyzed using statistical software.

Risk-Benefit Assessment: Low risk (anonymous, no physical harm); high benefit (policy reference). Expanded Inclusion Criteria: Mental health screening, no age restrictions, right to withdraw, improving the risk-benefit ratio.

Accuracy Assurance: Dual-review coding, Cronbach's α reliability testing, expert validity verification, and multi-tiered quality control prevented subjective bias. Even auxiliary personnel (e.g., ticketing agents) who were not pilot trainers underwent training to identify invalid questionnaires.

Table 2. Descriptive Interpretation of Likert Scale

Descriptions	Significant degree	Scale
I excel in this training skill.	Very much Agree	4
I am achieving passing results in this training skill.	Agree	3
I am underachieving in some areas in this training skill and it needs to be improved.	Slightly Agree	2
My performance in this training skill is very poor in all areas and must be improved.	Disagree	1

RESULTS AND DISCUSSION

The following presented the degree to which students had acquired different skills based on the data collected from the questionnaire.

Table 3 showed the mean and standard deviation of Beijing aviation education and training institutions in terms of multiple professional skills training. The mean was concentrated between 3.18 and 3.29, indicating that most respondents ″strongly agreed″ with the existing training programs and gave a generally positive evaluation.

Table 3. Based on the level of skill development of students

Key areas and specific skills	**Mean**	**Std. Deviation**	**Interpretation**
Professional English competence	3.23	.845	Very Agree
Service etiquette training	3.18	.792	Very Agree
Flight simulation training	3.20	.836	Very Agree
Use of radar communication navigation systems	3.21	.874	Very Agree
Ability in working with others	3.22	.845	Very Agree
Regulating aviation safety and security: ensuring the safety of passengers, staff, the public and facilities and equipment	3.21	.814	Very Agree
Decision-making ability	3.24	.834	Very Agree
Communicate effectively with others	3.27	.866	Very Agree
Meteorological knowledge analysis	3.21	.885	Very Agree
Ability in checking Aircraft systems	3.23	.887	Very Agree
Customer service awareness	3.23	.801	Very Agree
Ability in guiding passengers	3.29	.781	Very Agree
Ability in handling emergency landing	3.26	.835	Very Agree
Security alert handling in the event of unlawful interference (e.g., hijacking, explosive threats)	3.24	.875	Very Agree
Rescue evacuation treatment	3.26	.785	Very Agree
General Mean	3.23		

The highest rating on the Likert scale (4 points: Very much Agree) indicated that students self-assessed as “excellent” in mastering this aviation skill training. Based on a survey of 300 Beihang University students analyzed using SPSS, the average score ranged from 3.18 to 3.29 with a standard deviation of 0.781 to 0.887. All skills achieved this level, reflecting an overall positive evaluation of the training. The average scores clustered between 3.18 and 3.29, indicating that most respondents strongly agreed the existing training was effective, with an overall mean of 3.23. Passenger guidance (3.29) received the highest rating, while service etiquette (3.18) scored lowest but still reached the “Very Agree” level, demonstrating that practical skills were prioritized over theoretical details. “Very Agree” indicated that Beijing Aviation Training had achieved significant results in service, technical skills, safety, and soft skills, thanks to industry-academia collaboration and scenario-based simulations. However, the highest standard deviation (0.885) in meteorological knowledge suggested substantial variability that required optimization. This provided a basis for subsequent curriculum reform.

Service-related skills: Highest passenger guidance capability (3.29)

Service-related skills included service etiquette training (3.18), customer service awareness (3.23), and passenger guidance ability (3.29), among other indicators. Among these, "passenger guidance ability" ranked first among all indicators with an average score of 3.29, and its standard deviation of 0.781 was the smallest among all indicators, indicating that students had the most solid practical skills in passenger guidance and the smallest variation in skill levels among different students. This aligned closely with the aviation industry's "customer-centric" service philosophy, reflecting that training institutions emphasized scenario-based training (such as simulated boarding guidance and assistance for special passengers) in their service-related courses, consistent with Ni Wei's (2022) view that "scenario-based teaching methods help improve practical skills."

The average score for service etiquette training was 3.18, the lowest among service-related skills, but still at the "Very Agree" level, indicating that basic etiquette norms had been adequately covered in training. However, there might be room for improvement in high-end service details (such as cross-cultural communication etiquette and personalized service design), which should be further optimized in conjunction with international aviation service standards.

Professional technical skills: good balance between practical and theoretical trainingProfessional technical skills included flight simulation training (3.20), radar communication and navigation system usage (3.21), aircraft system inspection capabilities (3.23), and meteorological knowledge analysis (3.21). All average scores exceeded 3.20, indicating that students had a solid grasp of core technical tools and the application of theoretical knowledge.

The high scores for "aircraft system inspection capabilities" (3.23) and "use of radar communication and navigation systems" (3.21) reflected the effectiveness of training institutions' investments in practical equipment training—by introducing real equipment or high-fidelity simulation systems (such as flight simulators and radar operation platforms) through industry-academia collaboration, students learned through hands-on experience (a core principle of Dewey's pragmatism theory), thereby strengthening the application of technical skills. However, the standard deviation for "meteorological knowledge analysis" was 0.887, the highest among all indicators, indicating that students' abilities in interpreting meteorological data (such as assessing the impact of complex weather conditions on flight operations) varied significantly. This might be related to differing priorities in meteorological knowledge requirements across specializations (e.g., flight operations specializations emphasized application, while aviation engineering specializations emphasized principles), necessitating targeted adjustments to course depth.

Safety and Emergency Skills: Risk Response Capabilities Meet Standards

Safety and emergency skills included aviation safety regulation enforcement (3.21), emergency landing handling capabilities (3.26), response to illegal interference incidents (such as hijackings or bomb threats) (3.24), and rescue and evacuation handling (3.26). All average scores were above 3.21, indicating that students had a comprehensive understanding of core aviation safety standards and emergency procedures.

"Emergency landing handling capability" and "rescue and evacuation handling" both had an average score of 3.26, reflecting the effectiveness of training institutions conducting simulations of emergency scenarios (such as cabin fires and emergency landings) to enhance training. Repeated drills of such high-risk scenarios not only reinforced students' operational memory but also enhanced their psychological resilience in crises, aligning with Ran (2021)'s industry requirement that "aviation training must cover information security and risk response."

Soft Skills: Communication and Collaboration Abilities Show Significant Advantages

Soft skills included team collaboration ability (3.22), effective communication ability (3.27), and decision-making ability (3.24). Among these, "effective communication ability" ranked at the top with an average score of 3.27, indicating that students demonstrated strong expression and listening skills in cross-departmental collaboration (e.g., communication between the crew and ground control center) and passenger communication (e.g., reassuring anxious passengers). The high score for "team collaboration ability" (3.22) reflected the emphasis placed on the concept of "crew synergy" in training (e.g., through team task simulations and role-playing to cultivate collaborative awareness).

This outcome aligned closely with the aviation industry's "highly collaborative" nature — aviation operations relied on the close coordination of multiple roles such as pilots, cabin crew, and ground staff. The robust development of soft skills laid a solid foundation for students to adapt to industry work in the future.

CONCLUSIONS AND RECOMMENDATIONS

Current Training Effectiveness

Data showed that Beijing Aviation Education Training performed exceptionally well in terms of skills development (overall average of 3.23, "Very Agree"), thanks to three key advantages:Alignment of courses with industry needs: From service etiquette to emergency response, skill metrics were closely aligned with real-world aviation industry work scenarios, demonstrating the training institution's precise understanding of industry requirements (e.g., courses were designed in reference to International Civil Aviation Organization (ICAO) standards);Application of practical teaching methods: The widespread use of methods such as flight simulation and scenario-based exercises had effectively enhanced students' practical skills, validating the effectiveness of the "learning by doing" principle in pragmatist theory;Support from industry-academia collaboration: Aviation companies participated in training processes (e.g., providing equipment support and having frontline staff deliver lectures), helping students translate theory into practice and reducing the "disconnect between learning and application" issue.

Potential areas for improvement

Although the overall performance was good, the data still revealed details that required attention:

Balancing skill differences: The standard deviation in meteorological knowledge analysis was relatively large (0.887), indicating the need to design differentiated course content for different majors (e.g., adding a "real-time meteorological decision-making" module for pilots and focusing on "meteorological impact on equipment" analysis for engineering majors);Deepening of advanced skills: Service etiquette (3.18) was relatively low among all indicators. International high-end aviation service cases (such as five-star airline service standards) could be introduced to enhance students' cross-cultural service capabilities;Strengthening of digital skills: Current indicators did not directly cover the application of digital tools such as blockchain and big data. Ran (2021) noted that the aviation industry was undergoing digital transformation, and future training should include relevant skills to adapt to industry technological upgrades.

In summary, data analysis of the 15 core skills indicated that Beijing aviation education and training had achieved significant results in cultivating professional technical, service, safety and emergency response, and soft skills, with a high degree of alignment between students' skill proficiency and industry demands. This was attributable to the effective implementation of practice-oriented teaching models and school-enterprise cooperation mechanisms. However, the data also highlighted areas for improvement in terms of skill balance, high-end development, and digitalization, providing empirical evidence for future recommendations on course optimization and teaching innovation.

Recommendation

Based on the survey data and literature review, this study provided a comprehensive analysis of the current situation of aviation education and training in Beijing. It identified both strengths and weaknesses within the current curriculum system. Accordingly, the following and implementation plan are design to enhance training quality, optimize educational systems, and improve students' employability.

Table 4. Application and Dissemination Plan

Phase	Time Frame	Activity	Responsible Parties	Objectives
Phase 1	Month 1	Internal presentation of research findings and training needs assessment	Academic Affairs Office, Faculty Members	Raise awareness and identify reform directions

Phase 2	Months 2–3	Optimize curriculum structure (balance between theory and practice)	Curriculum Reform Committee, Industry Experts	Improve practicality and interactivity
Phase 3	Months 4–5	Introduce VR simulations, case-based learning, and situational training	School-Enterprise Cooperation Office, Technology Vendors	Strengthen emergency and real-world response training
Phase 4	Month 6	Faculty development (internal training and guest lectures)	HR Office, External Experts	Enhance teaching capabilities and industry understanding
Phase 5	Months 7–8	Pilot implementation and student feedback collection	Teaching Departments, Student Affairs Office	Monitor effectiveness and student satisfaction
Phase 6	Months 9–10	Final report preparation and dissemination to other institutions	Research Team, Academic Exchange Center	Share outcomes and develop model cases for replication

Expected Outcomes

1. Improved Teaching Quality: Targeted curriculum reforms will significantly enhance students' practical abilities and professional competencies.
2. Enhanced School-Enterprise Collaboration: Strengthened internship and cooperation mechanisms will align training with industry demands.
3. Faculty Capacity Building: A structured development plan will raise faculty members' professionalism and teaching innovation.
4. Policy Support: The study provides valuable data and case references for policy formulation in aviation talent development in Beijing.
5. Academic and Social Value: The research can serve as a model for other aviation training institutions across China, promoting scalable educational innovation.

FURTHER STUDY

Future research is recommended to explore the impact of technological innovation and policy support on the development and competitiveness of the aviation education and training industry in Beijing.

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