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Effect of Scenario Simulation Method on Aviation Service Ability of Third-Year Students

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Abstract

Background and Aims: The aviation industry requires cabin crew with service competencies beyond technical skills, while traditional lecture-based instruction has limitations in developing such abilities. This study aimed to 1) compare students' aviation service ability before and after learning through the scenario simulation method; 2) provide instruction with a predetermined criterion of 70%; and 3) assess students' satisfaction with the scenario simulation method.

Methodology: This study employed a quasi-experimental research design using a one-group pretest–posttest approach. The sample consisted of 30 third-year students majoring in Aviation Service at Yunnan College of Foreign Affairs and Foreign Languages, selected by cluster random sampling. The research instruments included lesson plans, an aviation service ability test, a performance assessment rubric, and a student satisfaction questionnaire. Data were analyzed using descriptive statistics, paired-samples t-tests, and one-sample t-tests.

Results: The results revealed that 1) after learning through the scenario simulation teaching method, students' aviation service ability was significantly higher than before the intervention at the .001 level of statistical significance (t_{29} = 63.77, p = .000); 2) students' aviation service ability after instruction was significantly higher than determined criterion of 70% at the .001 level of statistical significance (t_{29} = 23.53, p = .000); and 3) students' satisfaction with the scenario simulation teaching method was at a very high level (M = 4.58, SD = 0.49).

Conclusion: This study demonstrates that the scenario simulation method is an instructional innovation that bridges the gap between academic learning and industry-required aviation service competencies by embedding authentic cabin service scenarios that integrate theory with professional practice.

Keywords: Scenario Simulation Method; Aviation Service Ability; Cabin Service Education

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Introduction

In recent years, with the continuous expansion of China's civil aviation industry, aviation service has become a critical component of airlines' core competitiveness. Existing studies indicate that under the strategic goals of building a strong civil aviation sector and developing intelligent aviation systems, service capability has been elevated to a key indicator of industry development. Passengers' expectations have gradually shifted from basic service assurance to a greater emphasis on service quality, experiential value, and emotional engagement (Huang, 2021). Additionally, aviation service is no longer just about following set procedures; it now requires service staff to use their judgment, adapt to different situations, and communicate well in complicated service situations to meet the needs of high-quality aviation development. (Han & Zhu, 2025).

However, existing aviation service education in many vocational and undergraduate institutions remains dominated by traditional lecture-based instruction, which emphasizes theoretical knowledge while providing limited opportunities for authentic practice (Xie, 2016; Jiang, 2022). As a result, students often encounter difficulties transferring classroom knowledge to real cabin service contexts, particularly when handling unexpected situations or diverse passenger needs (Hu, 2018).

In aviation service education, establishing a clear proficiency benchmark is essential for evaluating whether students meet industry expectations. Previous studies have identified performance thresholds derived from occupational standards and service quality management systems as indicators of basic professional competence. Hu (2018) proposed a professional literacy framework for aviation service students based on industry expert surveys, while Wei (2016) demonstrated that airline service quality management systems aligned with ISO9001 require measurable performance criteria. Based on these industry-referenced standards, this study adopts a 70 percent criterion as a minimum proficiency benchmark for aviation service ability.

Scenario simulation teaching has emerged as an innovative pedagogical approach to address these limitations. Grounded in constructivist and experiential learning theories, this method emphasizes learning through active participation in realistic scenarios (Piaget, 1952; Kolb, 1984). By recreating authentic cabin service environments and engaging students in role-play and interactive practice, scenario simulation enables learners to integrate theoretical knowledge with practical application (Jonassen, 1994). Empirical studies have demonstrated that simulation-based teaching enhances student engagement, professional skills, and learning transfer (Misfeldt, 2015; Wu et al., 2022). Therefore, investigating the effectiveness of scenario simulation teaching in aviation service education is both timely and necessary.

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Objectives

1. To compare students' aviation service ability before and after learning through the scenario simulation method.

2. To compare students' aviation service ability after learning through the scenario simulation method with a predetermined criterion of 70 percent.

3. To examine students' satisfaction with the scenario simulation method.

Literature Review

Scenario simulation teaching is firmly rooted in constructivist learning theory, which posits that learners actively construct knowledge through interaction with their environment rather than passively receiving information (Piaget, 1952; Kanselaar et al., 2001). In addition, experiential learning theory emphasizes the cyclical process of concrete experience, reflective observation, abstract conceptualization, and active experimentation, providing a strong theoretical foundation for simulation-based instruction.

In service-related disciplines, scenario simulation teaching has been widely applied to bridge the gap between theory and practice. Fang (2024) proposed a structured simulation teaching process that includes situation creation, role-play, practice, and evaluation, demonstrating its effectiveness in enhancing students' professional etiquette and problem-solving skills. Similarly, Huang (2022) reported that scenario simulation improved learners' practical abilities and engagement in service-oriented courses.

Within aviation service education, authentic cabin scenarios reflecting real operational tasks have been shown to enhance students' understanding of service procedures, safety regulations, and communication strategies (Hu, 2018; Jiang, 2022). By engaging in role-play as flight attendants and passengers, students can practice professional behaviors, manage emotions, and respond appropriately to service challenges (Lu, 2023).

Student satisfaction is another important indicator of instructional effectiveness. Research has shown that interactive and immersive teaching methods significantly increase students' learning satisfaction and motivation (Gray & DiLoreto, 2016; Mihanović et al., 2016). High satisfaction levels are closely associated with greater engagement and improved learning outcomes, suggesting that scenario simulation teaching may contribute positively to both cognitive and affective domains of learning (Hu, 2018).

This study was guided by a conceptual framework in which scenario simulation teaching served as the independent variable, while students' aviation service ability and learning satisfaction were the dependent variables. Aviation service ability was operationalized through multiple dimensions, including service interpretation ability, empathy ability, inquiry and design

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skills, and learning transfer ability, as defined in the aviation service competency framework (Hu, 2018). Scenario simulation teaching was designed to influence these abilities through realistic scenarios, role allocation, interactive drills, feedback, and reflection (Fang, 2024).

Summary

In summary, based on the research findings, this study confirms that the scenario-based teaching method using simulations has a significant positive effect on students' aviation service ability and learning satisfaction. The literature review and theoretical foundation of the study indicate that scenario simulation teaching is an instructional approach grounded in experiential learning and constructivist theory. The experimental data further demonstrate that students' aviation service ability after receiving scenario simulation instruction is significantly higher than before the intervention, and that overall performance meets and exceeds the predetermined evaluation criterion of 70%, thereby verifying the effectiveness and feasibility of this teaching method in the Cabin Service Course.

Conceptual Framework

Contemporary educational theories that emphasize innovative, experience-centered pedagogies inform the conceptual framework of this study. Experience-centered pedagogies. Specifically, the framework examines the systemic relationship between the scenario-based simulation method (Xie, 2016; White, 2020; Rossler, 2013) and the development of aviation service ability (Teng, 2008; Wang, 2022; Huang, 2021). Scenario-based simulation is rooted in Kolb's Experiential Learning Theory (1984), which asserts that learners acquire and internalize knowledge through iterative cycles of concrete experience, reflective observation, abstract conceptualization, and active experimentation. By engaging learners in realistic and dynamic cabin-service scenarios, this instructional approach bridges theoretical understanding and practical execution, thereby cultivating key professional competencies required in aviation service contexts.

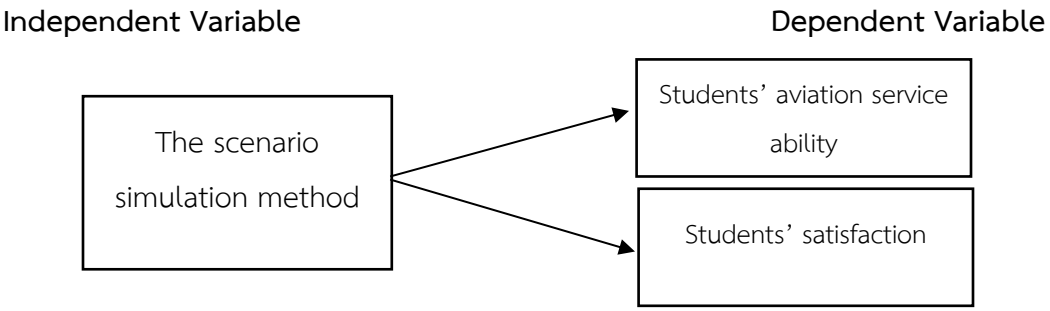


Figure 1 Conceptual framework

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Methodology

1. Research Design

The research design of the Effect of Scenario Simulation Method on Aviation Service Ability of Third-Year students is an experimental research design.

This study adopts the one-group pretest-posttest design (Campbell and Stanley, 1963), which was used as a procedure to investigate the effectiveness of curriculum implementation, as shown in the following figure:

Group	Pretest	Treatment	Posttest
Experimental	O_1	X	O_2

Figure 2 The experimental design

O_1 was a measurement of students' aviation service ability before the experiment.

X was the implementation of the scenario simulation method.

O_2 was a measurement of students' aviation service ability and students' satisfaction.

2. Population and sample

1. The population of this study consists of 90 third-year students (3 classes) from Yunnan College of Foreign Affairs & Foreign Languages.

2. The sample of this study is 30 third-year students from one class at Yunnan College of Foreign Affairs & Foreign Languages, which was derived from the cluster random sampling method.

3. Research instruments

Research instruments which are used in this study were as follows:

1. Lesson plans: The Cabin Service Course was implemented through six simulation-based lesson plans totaling 12 class hours, with two hours of instruction per week. The lesson plans were developed through a systematic process that included clarifying instructional objectives and content, selecting appropriate teaching resources, designing scenario simulation activities, determining assessment methods, and planning teaching strategies, aids, schedules, and feedback mechanisms. The six lesson plans covered key topics, namely pre-flight preparation, passenger boarding service, in-flight cruise service, descent phase service, post-landing service, and communication and emergency response. The draft lesson plans were reviewed by three experts in civil aviation education, cabin service training, and instructional design using a five-point Likert scale to evaluate appropriateness and alignment between objectives, content, activities, and assessment. Based on Best's (1977) criteria, the overall appropriateness of the lesson plans was

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rated at a very high level (*M* = 4.51, *SD* = 0.34), and revisions were made according to expert feedback before implementation.

2. A student's aviation service ability test: The student aviation service ability test was systematically developed by defining evaluation dimensions, constructing a test blueprint aligned with course objectives, and drafting 30 multiple-choice items covering six cabin service components. Content validity was examined by three experts using the Index of Item Objective Congruence (IOC), and the results indicated that all test items were appropriate for use. The test was piloted with 30 students outside the experimental group to conduct item analysis, which showed acceptable item difficulty (p = 0.23–0.80) and item discrimination (r = 0.20–0.87). Reliability analysis using the Kuder–Richardson Formula 20 revealed high internal consistency (KR-20 = 0.85), indicating that the test was suitable for the study.

3. A performance assessment rubric: The performance assessment rubric was systematically developed based on the Cabin Service Course objectives and aviation service competency standards. It was designed as a practical, observation-based assessment to evaluate six components of aviation service ability: aviation service knowledge, service skills, interpretation and response ability, empathy ability, inquiry and design skills, and learning transfer and adaptability. A structured rating scale with three performance levels (3–1 points) and clearly defined behavioral descriptors was employed to assess students' performance during scenario simulation activities. Content validity was examined by three experts using the Index of Item Objective Congruence (IOC), and the results indicated that all rubric items were appropriate and suitable for use. Inter-rater reliability was assessed by two specialists who independently evaluated the performances of 30 students, yielding a high Pearson correlation coefficient (r = 0.873), confirming that the rubric was reliable and appropriate for the study.

4. A student satisfaction questionnaire: The students' satisfaction questionnaire toward scenario simulation teaching in cabin service was developed through a systematic process. The questionnaire consisted of two sections: basic information and a quantitative evaluation section comprising 15 items rated on a five-point Likert scale, along with one open-ended question to capture qualitative feedback. The items focused on key aspects of scenario simulation teaching, including authenticity of scenarios, instructional clarity, learning motivation, professional skill development, integration of theory and practice, teamwork and communication, and the effectiveness of feedback and reflection. Content validity was examined by three experts using the Index of Item Objective Congruence (IOC), and all items were found appropriate and retained. The revised questionnaire was pilot-tested with 30 students outside the main study sample, and reliability analysis using Cronbach's alpha indicated satisfactory internal consistency (α = 0.75), confirming that the questionnaire was suitable for use in the study.

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4. Data Collection

The procedures of data collection were as follows:

1. The sample was given the pretest by measuring aviation service ability.
2. The sample was taught using the scenario simulation teaching method based on six lesson plans of cabin service.
3. After finishing the instruction, the samples received the posttest by using the same instrument that was used in the pretest.
4. The samples were also given the students' satisfaction questionnaire to evaluate their perceptions and attitudes toward the scenario simulation teaching.

5. Data Analysis

In this study, data were analyzed using the statistical program according to the research objectives.

1. Compare students' aviation service ability before and after learning through the scenario simulation method by using the t-test for dependent samples.
2. Compare students' aviation service ability after learning through the scenario simulation method with the determined criterion set at 70 percent by using a t-test for one sample.
3. Assess students' satisfaction with the scenario simulation teaching method by using the arithmetic mean and standard deviation. The data are interpreted by comparison with the following criterion (Best, 1977)

Results

The results were presented according to the research objectives as follows:

1. Research results comparing students' aviation service ability before and after learning through the scenario simulation method

This section compares the average scores of students' aviation service ability before and after applying the scenario simulation teaching method. The following table shows the descriptive statistics and t-tests analyzed by the statistical package program. This table aims to answer the research question of whether the scenario simulation teaching method can improve students' aviation service ability.

Table 1 Comparison of aviation service ability before and after scenario simulation method

Group	Full scores	n	Pre-test scores		Posttest scores		*t*	*p*
			M	*SD*	*M*	*SD*		
Aviation service ability test scores								
Experimental group	30	30	23.30	2.59	27.57	1.79	17.47**	.000

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Group	Full scores	n	Pre-test scores		Posttest scores		*t*	*p*
			M	*SD*	*M*	*SD*		
Aviation service ability observation scores								
Experimental group	70	30	47.97	2.68	58.97	2.28	44.99**	.000
Aviation service ability overall scores								
Experimental group	100	30	71.27	5.07	86.53	3.85	63.77**	.000

** The significance level: $p < 0.01$.

As presented in Table 1, the mean pre-test score of students' aviation service ability was 23.30 (*SD* = 2.59), while the mean post-test score was 27.57 (*SD* = 1.79). The results indicated that after the implementation of cabin service courses based on the scenario simulation teaching method, students' post-test scores were significantly higher than their pre-test scores at the .01 level of statistical significance (t_{29} = 17.47, p = .000), as determined by a paired samples t-test. This finding demonstrates that the scenario simulation teaching method significantly improved students' aviation service ability.

The mean pre-observation score of students was 47.97 (*SD* = 2.68), while the mean post-observation score increased to 58.97 (*SD* = 2.28). The results of the paired samples t-test indicated that students' post-observation scores were significantly higher than their pre-observation scores at the .01 level of statistical significance (t_{29} = 44.99, p = .000), demonstrating a significant positive effect of the instructional intervention on students' observed performance.

The overall students' aviation service ability scores, which were derived by combining the scores from the students' aviation service ability test and the performance assessment rubric. The mean overall pre-test score was 71.27 (*SD* = 5.07), while the mean overall post-test score increased to 86.53 (*SD* = 3.85). The paired samples t-test results indicated that students' post-test overall scores were significantly higher than their pre-test scores at the .01 level of statistical significance (t_{29} = 63.77, p = .000). These findings demonstrate that the instructional intervention had a significant positive effect on students' aviation service ability, as reflected in both cognitive achievement and observed performance.

2. Results comparing aviation service ability with the 70% criterion

The results compare students' aviation service ability after scenario simulation teaching with the 70% criterion. The following table presents the descriptive statistics and t-tests analyzed by the statistical package program. This table aims to address the research objective of whether the scenario simulation method can improve students' aviation service ability to meet or exceed the 70% criterion.

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Table 2 Comparison of post-test aviation service ability scores with the 70% criterion

Group	n	Full score	criterion score	*M*	*SD*	*t*	*p*
Aviation service ability test scores							
Experimental group	30	30	21	27.57	1.79	20.05**	.000
Aviation service ability observation scores							
Experimental group	30	70	49	58.97	2.28	23.93**	.000
Aviation service ability overall scores							
Experimental group	30	100	70	86.53	3.85	23.53**	.000

* *The significance level: $p < 0.01$

As presented in Table 2, the mean score of students' aviation service ability after scenario simulation teaching was 27.57 (out of a full score of 30), with a standard deviation of 1.79. The criterion score (70% of the full score) was 70. The results indicate that the post-test mean score was statistically significantly higher than the 70% criterion (t_{29} = 20.05, p = .000). When the significance level is set at 0.01, the p-value (Sig. = .000) is less than .01, confirming that students' aviation service ability after the scenario simulation teaching has reached and significantly exceeded the 70% criterion.

The mean score of students' aviation service ability observation after learning through the scenario simulation teaching method was 58.97 from a possible full score of 70, with a standard deviation of 2.28, which was statistically higher than the criterion of 70 percent at the .01 level of statistical significance (t_{29} = 23.93, p = .000).

The overall students' aviation service ability scores were derived from the combined results of the aviation service ability test and the performance assessment rubric. The mean overall post-test score was 86.53 (SD = 3.85), which was statistically higher than the 70 percent criterion at the .01 level of statistical significance (t_{29} = 23.53, p = .000), indicating that students' aviation service ability after learning through the scenario simulation teaching method significantly exceeded the established proficiency criterion.

3. Findings on students' satisfaction with the scenario simulation method

This section presents the findings of students' satisfaction with the scenario simulation teaching method, assessed through a satisfaction questionnaire. The following table shows the descriptive statistics (mean scores and standard deviations) for each questionnaire item, along with the corresponding satisfaction level. This aims to address the research objective of evaluating students' subjective perceptions of the teaching method.

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Table 3 Average score and satisfaction level of students' satisfaction

Items	*M*	*SD*	Satisfaction level
1. The organization and content of the scenario simulation course, including pre-flight preparation and passenger boarding service, are appropriate and satisfactory.	4.37	0.49	High level
2. The scenario simulation course covers relevant topics that align with professional interests in aviation service.	4.77	0.43	Very high level
3. The scenario simulation course materials, such as textbooks, videos, and images, are clearly presented and easy to understand.	4.43	0.50	High level
4. The scenario simulation course appropriately challenges my understanding of aviation service practical routines.	4.67	0.48	Very high level
5. The scenario-setting activities and conceptual explanations used in the simulation teaching are effective.	4.40	0.50	High level
6. I actively participate in scenario simulation class discussions and role-play activities.	4.70	0.47	Very high level
7. The simulation activities deepen my understanding of aviation service skills.	4.50	0.51	Very high level
8. The instructor actively encourages student participation and engagement during scenario simulation class sessions.	4.73	0.45	Very high level
9. The scenario simulation teaching method used in this class is more effective than traditional aviation service instruction.	4.50	0.51	Very high level
10. The learning resources used in the scenario simulation course, such as the simulation cabin, VR equipment, and worksheets, are helpful and appropriate.	4.60	0.50	Very high level

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Items	*M*	*SD*	Satisfaction level
11. The provided materials and learning aids contribute to improving my understanding of aviation service practical operations.	4.57	0.50	Very high level
12. The scenario simulation course materials effectively support my understanding of aviation service activities and routines.	4.70	0.47	Very high level
13. The assessment activities in the scenario simulation course clearly reflect the course content and learning objectives.	4.37	0.49	High level
14. The assessment and evaluation criteria for the scenario simulation course are clear and understandable.	4.73	0.45	Very high level
15. I am satisfied with the evaluation methods used after the scenario simulation class.	4.60	0.50	Very high level
Overall	**4.58**	**0.49**	**Very high level**

As presented in Table 3, among the 15 items of the satisfaction questionnaire, the lowest mean score was 4.37 (*SD* = 0.49), and the highest mean score was 4.77 (*SD* = 0.43). The overall mean score of students' satisfaction was 4.58 (*SD* = 0.49). This result indicates that students' satisfaction with the scenario simulation teaching method reached a very high level.

Discussion

1. Students' aviation service ability was higher after learning through the scenario simulation teaching method than before. The findings support the assumption that scenario simulation teaching leads to a significant improvement in students' aviation service ability by transforming learning from passive knowledge reception to active situational performance. Unlike traditional lecture-based instruction, which often emphasizes memorization of service procedures, the simulation design required students to interpret service contexts, prioritize actions, and respond appropriately to passenger needs within realistic cabin environments. This instructional shift appears to play a critical role in enhancing students' ability to apply service knowledge in practice.

From a cognitive perspective, repeated engagement in authentic cabin service scenarios facilitated the transition from declarative knowledge to procedural and conditional knowledge,

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enabling students to integrate technical procedures with communication, teamwork, and situational decision-making. This learning process aligns with experiential learning theory, which emphasizes concrete experience, reflection, and re-application as drivers of skill development (Kolb, 1984), as well as constructivist theory, which views learning as the active construction of knowledge through contextualized and social interaction (Piaget, 1952; Jonassen, 1994).

In addition, the design features of the scenario simulation—such as role assignment, time constraints, peer interaction, and immediate instructor feedback—likely increased cognitive engagement and situational awareness, closely mirroring the demands of real cabin service work. These findings are consistent with previous studies indicating that simulation-based and situational teaching methods effectively enhance professional competence and learning transfer in aviation service education by addressing limitations of traditional instruction, particularly limited practice opportunities and low student participation (Fang, 2020).

2. Students' aviation service ability after instruction exceeded the 70% proficiency criterion. Exceeding the predetermined 70% criterion indicates that scenario simulation teaching effectively supported students in reaching a minimum level of professional readiness aligned with industry expectations. This outcome suggests that the instructional approach enabled students to integrate multiple aviation service competencies—operational accuracy, communication, teamwork, and emergency handling—within unified performance contexts. From a competency-based education perspective, such integration is essential, as professional competence in aviation service is demonstrated through performance rather than isolated knowledge acquisition (Teng, 2008; Huang, 2021).

The effectiveness of the instructional intervention can be interpreted through the lens of industry-oriented training and school–enterprise cooperation models, which emphasize close alignment between educational tasks and occupational requirements to enhance professional readiness and employability (Chen, 2020). By engaging students in simulated real-world cabin service environments, the instructional design exposed them to task complexity and performance expectations similar to those encountered in actual aviation operations, thereby supporting the development of essential aviation service competencies, including operational accuracy, communication, teamwork, and emergency handling, in accordance with industry standards (Hu, 2018; Jiang, 2022).

From a situated learning perspective, embedding learning activities in authentic contexts facilitates knowledge transfer and professional preparedness, as learners construct meaning through participation in contextually relevant practices rather than abstract instruction (Lave & Wenger, 1991). This interpretation is consistent with previous studies on simulation-based learning

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in aviation and vocational education, which have shown that authentic scenario design plays a critical role in preparing students for industry-aligned performance (Trasberg, 2023).

3. Students reported a very high level of satisfaction with the scenario simulation teaching method. The very high satisfaction level observed suggests that scenario simulation positively influenced students' affective learning outcomes, including motivation, engagement, and perceived relevance of learning. Unlike traditional lecture-based instruction, scenario simulation situates learning in authentic service contexts, allowing students to experience the roles and responsibilities of cabin crew directly. This authenticity likely strengthened students' professional identity and confidence, which are key contributors to learning satisfaction in applied professional education.

Previous research has shown that student satisfaction is closely related to engagement and perceived learning effectiveness, particularly in experiential and interactive learning environments (Gray & DiLoreto, 2016; Mihanović et al., 2016). Moreover, by enabling students to experience service situations from the passenger's perspective, scenario simulation fosters service awareness and empathy—core attributes of high-quality aviation service. This aligns with studies emphasizing that experiential and role-based learning is critical for cultivating customer-centered service mindsets and improving service quality in the aviation industry (Li, 2020; Wang, 2018). Nevertheless, novelty effects associated with simulation-based instruction may partially influence satisfaction ratings, highlighting the need for future research to examine whether these affective benefits persist over time.

In summary, the findings demonstrate that scenario simulation teaching functions as an instructional innovation that effectively bridges the gap between academic learning and industry-required aviation service competencies. By embedding authentic cabin service scenarios into instruction, this approach enables students to integrate theoretical knowledge with professional practice, leading to improved service ability, attainment of industry-referenced proficiency standards, and positive learning experiences. These results support the systematic integration of scenario simulation teaching into aviation service curricula and its broader application in service-oriented professional education.

Recommendation

Recommendations for Practical Application

1. Strengthen school–enterprise cooperation by jointly developing industry-aligned simulation scenarios, supporting work-integrated learning, and involving industry experts in teaching and evaluation.

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2. Enhance teaching resources through increased investment in simulation cabins, VR technologies, and digital platforms to support immersive and repeated practice.

3. Improve the teaching evaluation system by integrating process-based and outcome-based assessment and involving multiple evaluators, including instructors, industry mentors, and peers.

4. Develop teacher competencies by providing professional training in scenario simulation pedagogy and promoting dual-qualified teaching teams with industry experience.

5. Address individual differences by designing differentiated simulation tasks and providing targeted support based on students' ability levels.

6. Expand the application of scenario simulation to related aviation service courses to establish a systematic, competency-based teaching model.

7. Strengthen theory–practice integration through structured reflection, industry visits, and real-world service activities.

Recommendations for Future Research

1. Expand sample size and research scope across institutions and regions to improve generalizability.

2. Conduct longitudinal studies to examine long-term effects on graduates' professional performance and career development.

3. Examine different scenario designs in terms of type, complexity, and presentation format to optimize learning outcomes.

4. Investigate blended instructional approaches by combining scenario simulation with methods such as project-based or case-based learning.

5. Explore psychological factors, including self-efficacy, professional identity, and learning motivation, to better understand learning mechanisms.

6. Study cross-disciplinary applications of scenario simulation in other service-oriented fields.

7. Examine the role of emerging technologies such as artificial intelligence and big data in enhancing personalized simulation and instructional effectiveness.

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