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Advance Qualification Program Integration in Aviation Higher Education

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The Federal Aviation Administration's 2004 introduction of the Advanced Qualification Program (AQP) was introduced to provide an alternative approach to pilot training and evaluation. This study evaluates the impact of AQP-centered aviation education on student performance, specifically in advanced jet transport systems course. Building on Karp's integrated aviation learning model, which seamlessly combines various instructional methods, the research utilizes one-way ANOVA to compare student academic performance in AQP-centered, traditional classroom, and blended learning environments. The findings of this study revealed that students with the AQP-centered approach in this advanced jet transport system course benefited from higher academic performance than those with a traditional or blended delivery.

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Introduction

The Federal Aviation Administration (FAA) serves a crucial role in regulating aviation operations and maintaining aviation safety in the United States. Safety remains the top priority for the FAA in all aspects of aviation operations. In 2004, the FAA introduced the Advanced Qualification Program (AQP), an innovative initiative offering an optional systematic training program for pilot training. The AQP training methodology was incorporated into Title 14 of the Code of Federal Aviation Regulations (CFRs) N.58 (FAA, 2004). Although AQP training is generally used by airlines or operators to train their pilots, little to no research has evaluated the impact of AQP in aviation-focused higher education institutions.

The significance of aviation education at aviation-centered higher education institutions cannot be overstated. Aviation-focused higher education prepares future aviation professionals with essential skills to thrive in the industry and, most importantly, enhance safety. As the aviation industry has evolved, advancements in flight simulations and a greater emphasis on diversity, equity, and inclusion (DEI) have significantly enhanced training programs. AQP offers an innovative alternative to traditional aviation training methods in this context. This study aimed to assess the impact of AQP training methodology in an aviation higher education institution on student performance in the context of an advanced jet transportation systems course. The course has four measurable learning objectives: (1) applying air carrier systems knowledge to operational procedures, (2) describing the complex systems of jet transport aircraft, (3) analyzing developments in aircraft systems design, and (4) evaluating the evolution of jet transport aircraft system designs.

Advancements in Aviation Education

In recent years, additional advanced simulation technologies and DEI have been integrated into aviation education. Aviation simulation technology, including virtual and augmented reality, has improved the immersive experience by enhancing situational awareness and decision-making (Thomas et al., 2021; Thomas et al., 2022). The integration of DEI principles in the aviation workforce underscores the importance of diverse perspectives in the aviation industry. The infusion of diverse perspectives has enriched the industry and has improved safety outcomes (Albelo et al., 2023), maintaining a strong aviation safety culture.

AQP Overview

The AQP systematic methodology fundamentally aligns training and evaluation activities to develop skills in specific operational aviation roles (Federal Aviation Administration, 2004; Federal Aviation Administration, 2022; Longridge, 1997). It identifies essential skills, knowledge, and abilities relevant to various demands of operational roles, including normal, abnormal, and emergency scenarios. This structured approach is based on a thorough job task analysis detailing the necessary competencies for pilots in diverse flight phases (Esser, 2006). Unlike traditional training frameworks found in Title 14 of the CFR for Part 121 (Domestic, Flag, and Supplemental Operations) and Part 135 (Commuter and On-Demand Operations), this program offers a systematic approach to pilot training driven by data analysis and scenario-based training and evaluation (FAA, 2022).

Theoretical Framework

This study employs Karp's (2000) integrated aviation learning model as a theoretical foundation. The model incorporates a learning framework designed for the aviation context to improve effectiveness, understanding, and safety in aviation training programs. It incorporates a range of instructional methods, such as theoretical study, practical exercises, simulation training, and real-world applications, enabling learners to comprehend aviation principles thoroughly. Additionally, integrating initiatives like AQP into Karp's framework enables aspiring aviation professionals to apply their knowledge effectively, enhance problem-solving skills, and respond accurately to emerging situations.

Methods

The present study used a quantitative approach to assess the integration of AQP training methodologies and the impact on student academic performance in the advanced jet transportation systems higher education course. The study used archival data from four academic semesters at Embry-Riddle Aeronautical University, focusing on AS 411, a course designed to introduce students to complex jet transport systems. A purposeful sampling technique was used to acquire data from three professors who have taught the course in either an AQP-centered structure, traditional, or blended format. This purposeful sampling ensured that the data accurately reflected the effectiveness of each teaching approach.

The primary data included students' final grades in the AS 411 course, which evaluates their understanding of complex jet transport systems and operational techniques. A total of 398 grades were collected for analysis. After a comprehensive descriptive statistics analysis was used to detect outliers, eight outliers were removed. The independent variables were identified as the education experience (AQP-centered, traditional, and blended education). The dependent variable, on the other hand, was recognized as the student's academic performance. A one-way ANOVA was used to analyze the mean scores among the three groups, examining the relationship between the type of educational experience and student performance. Normality was assessed using the Shapiro-Wilk test, and homogeneity of variances was tested with Levene's test. Post hoc comparisons were conducted using Tukey's HSD to explore specific differences between groups.

Results

The ANOVA analysis revealed statistically significant differences in academic performance among the three groups ($F(2, 387) = 12.356$, $p < 0.001$). Traditional and blended groups showed no significant deviations from normality, while the AQP group did exhibit a considerable deviation.

- Traditional: $W(131) = 0.982$, $p = 0.077$
- Blended: $W(124) = 0.984$, $p = 0.146$
- AQP: $W(135) = 0.971$, $p = 0.005$.

The AQP group demonstrated a mean score of 85.35 (SD = 2.59), significantly outperforming both the traditional group (M = 83.63, SD = 7.94, p = 0.037) and the blended group (M = 81.85, SD = 5.20, p < 0.001). Assumption of homogeneity, Levene's test, revealed no significant differences among group variances F(2,387) =58.445, p < 0.001.

Conclusions

The study's findings demonstrated the effectiveness of AQP in enhancing academic performance in an aviation higher education course. The AQP utilizes a systematic approach that aligns training and evaluation with specific operational roles and requirements. It offers an alternative to traditional aviation training by integrating informed decision-making skills into the training process while promoting academic success and enhancing aviation safety. The findings of this study suggest that aviation training programs consider the incorporation of AQP in their curricula as an alternative to traditional training. As the aviation industry evolves, academic institutions must evaluate alternatives to enhance students' learning experiences and academic performance.

Future studies should explore the effectiveness of the AQP approach in other aviation higher education institutions and courses. To validate the findings of this study, other institutions should evaluate the AQP approach to student academic performance. An essential aspect of this integration involves examining students' perspectives regarding AQP. Understanding how students perceive knowledge retention and their overall experience with AQP could significantly enhance their learning outcomes. Furthermore, additional research could focus on incorporating artificial intelligence into AQP training to improve personalization and effectiveness in skill development.

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