

LEARNING AGILITY AND LIFE SATISFACTION AS PREDICTORS OF AIR TRAFFIC CONTROL CADETS' PERFORMANCE

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Abstract: The aviation industry in the Industry 4.0 era requires professionals with both technical proficiency and psychological adaptability. This study examines how learning agility and life satisfaction predict academic performance among first-year Air Traffic Control cadets at semi-military aviation colleges in Indonesia. Using a quantitative correlational design with a total population sample ($N = 23$), data were collected through the Learning Agility Scale for Students ($\alpha = 0.89$) and the Satisfaction with Life Scale ($\alpha = 0.87$). Multiple regression analysis showed that both variables explained 56% of the variance in academic performance ($R^2 = 0.56$, $F^2 = 1.27$). Result agility emerged as the strongest predictor, emphasizing goal orientation and perseverance in high-pressure learning environments. Life satisfaction also significantly influenced academic achievement, highlighting the role of well-being in sustaining motivation. The findings extend learning agility theory and suggest integrating resilience, soft skills, and well-being programs into aviation vocational curricula to enhance performance and readiness.

Keywords: learning agility, life satisfaction, result agility, academic performance, semi-military vocational education, aviation training

Introduction

The aviation industry operates in an environment characterized by complexity, uncertainty, and constant technological evolution. Such a context demands not only technical mastery but also adaptability, resilience, and psychological well-being. Air traffic controllers (ATCs) are required to manage high-stakes situations with precision and mental endurance. As future professionals, students in aviation vocational higher education—especially those enrolled in semi-military institutions—face a unique set of challenges that shape their readiness for the profession.

The aviation environment involves complex and high-risk conditions in which performance emerges from the interaction of multiple cognitive, psychological, and organizational factors. Recent aviation and defense studies adopt a Multi-Criteria Decision Making (MCDM) perspective to conceptualize such complexity, emphasizing human-centered criteria such as adaptability, learning capacity, stress tolerance, and psychological well-being. In semi-military aviation vocational higher education, academic performance among Air Traffic Control cadets similarly reflects a multi-dimensional process shaped by both cognitive and psychological attributes. Accordingly, although MCDM is not applied as an analytical method, the MCDM perspective is used as a conceptual foundation to frame learning agility and life satisfaction as interrelated psychological criteria that jointly contribute to cadet academic performance in structured aviation training environments (Abdelaziz et al., 2025; Kulakli &

Şahin, 2023; Malefaki et al., 2025; Markatos & Pantelakis, 2023; Mizrak et al., 2025; Yilmaz et al., 2020).

Semi-military aviation colleges in Indonesia adopt a boarding-school model with rigorous discipline, strict routines, and limited social interaction. First-year cadets often undergo a significant transition from civilian life to a regimented system that combines academic rigor, physical training, and military-style regulations. These conditions amplify the importance of psychological competencies such as learning agility and life satisfaction in determining academic outcomes.

Learning agility has been defined as the ability to learn from experience and apply that knowledge to novel and challenging contexts (De Meuse & Harvey, 2022; Lombardo & Eichinger, 2000). It is considered a key predictor of leadership potential and career success in dynamic environments. In educational settings, students with high learning agility demonstrate flexibility, problem-solving skills, and resilience under pressure (Wang et al., 2023).

Life satisfaction, as conceptualized by (Diener et al., 1985), refers to an individual's subjective evaluation of overall life quality. Research indicates that students with higher life satisfaction exhibit greater academic motivation, stronger resilience, and improved performance (Suan, 2023; Suldo et al., 2008). In semi-military contexts, where cadets are exposed to strict discipline and high levels of academic stress, life satisfaction may serve as a protective factor.

Despite a growing body of research on learning agility and well-being, studies integrating both constructs within the semi-military aviation education context remain scarce. Previous works largely examined either organizational employees (De Meuse & Harvey, 2022), general university students (Annisa et al., 2025; Wang et al., 2023), or non-military populations (Pitaloka & Etikariena, 2024). This study addresses the gap by analyzing how learning agility and life satisfaction jointly predict academic performance among cadets in Indonesia's aviation vocational colleges.

The study aims to:

1. Examine the predictive relationship between learning agility dimensions and academic performance.
2. Assess the contribution of life satisfaction to students' academic outcomes.
3. Provide theoretical and practical implications for vocational education in aviation.

Method

This study employed a quantitative correlational design with a total population approach. A total of 23 first-year students enrolled in the Air Traffic Control program at two Indonesian aviation vocational colleges participated. The total population design was chosen because both institutions operate under a closed system, admitting students through quota-based recruitment aligned with industry needs. This system limits opportunities for random sampling or population expansion. Thus, the study included all eligible students, ensuring comprehensive coverage of the target group.

The participants were 23 first-year cadets, aged 18–20 years, all residing in dormitories under semi-military regulations. The program requires cadets to undergo academic training, structured physical exercise, and strict discipline, thereby creating a high-pressure educational environment. The total population design ensured that the findings reflect the entire cohort, rather than a sampled subset (Ahmed, 2024; Buckley, 2024). The expert panel involved in this study consisted of five professionals, including three senior air traffic control (ATC) instructors and two experts in aviation instructional technology, whose combined operational and pedagogical expertise was used to inform the weighting process.

Two validated instruments were employed:

1. Learning Agility Scale for Students (LAS-S) (Wijaya et al., 2024)– consisting of five dimensions:
 - a. *Mental Agility* – critical and flexible thinking.
 - b. *Change Agility* – ability to adapt to new circumstances.
 - c. *People Agility* – interpersonal effectiveness.
 - d. *Result Agility* – persistence and focus on outcomes.
 - e. *Self-Awareness*–awareness of personal strengths and weaknesses. Cronbach's alpha for LAS-S in this study was 0.89, indicating strong reliability.
2. Satisfaction with Life Scale (SWLS) – developed by (Diener et al., 1985), measuring subjective well-being across five items on a 7-point Likert scale. Cronbach's alpha was 0.87, also demonstrating strong internal consistency (Natanael & Novanto, 2021).

To ensure the robustness of the measurement instruments, a series of validity and reliability tests were conducted. The item-total correlation analysis demonstrated that all items had correlation coefficients greater than 0.30 with their respective total scores, confirming adequate construct representation and discriminant validity of each item. The reliability analysis indicated excellent internal consistency, with Cronbach's alpha values of 0.89 for the Learning Agility Scale for Students (LAS-S) and 0.87 for the Satisfaction with Life Scale (SWLS). Furthermore, the classical assumption tests were performed to verify the appropriateness of the regression model. The Shapiro–Wilk test confirmed that the residuals followed a normal distribution, satisfying the normality assumption. The Variance Inflation Factor ($VIF < 5$) results indicated the absence of multicollinearity among predictors. Additionally, the Glejser test showed that the residuals exhibited homogeneity of variance, confirming that the model met the assumption of homoscedasticity. Overall, the instruments and data met the psychometric and statistical assumptions required for valid regression analysis.

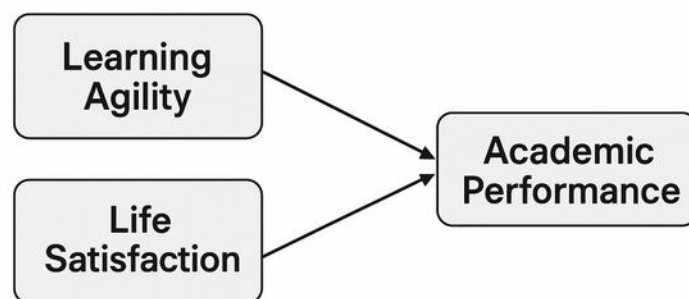


Figure 1. The Influence of Learning Agility and Life Satisfaction on Academic Performance

Data were collected in classroom settings under researcher supervision to ensure controlled conditions and minimize external bias. Participation was voluntary, with informed consent obtained from all students. Institutional permission was granted from both colleges.

Data were analyzed using descriptive and inferential statistical techniques to examine the relationships among variables and test the proposed hypotheses. Descriptive statistics, including means, standard deviations, and inter-variable correlations, were computed to provide an overview of the data distribution and central tendencies. The Pearson correlation analysis was employed to assess the bivariate relationships between learning agility, life satisfaction, and academic performance, allowing for the identification of linear associations among key constructs. To determine the predictive strength of the independent variables, multiple linear regression analysis was conducted with Grade Point Average (GPA) as the dependent variable and learning agility and life satisfaction as predictors. The regression model was evaluated for

both statistical and substantive significance, ensuring the robustness of the findings. Additionally, effect sizes (R^2 and f^2) were reported to quantify the magnitude of the relationships and to assess the practical relevance of the predictors in explaining academic performance outcomes.

The descriptive analysis revealed that students demonstrated moderate-to-high levels of learning agility across its five dimensions, with result agility scoring the highest mean, followed by mental agility, people agility, change agility, and self-awareness. The mean score for life satisfaction was also in the moderate-to-high range, suggesting that most cadets reported a positive evaluation of their life circumstances despite the rigid system.

Pearson correlation tests indicated positive associations between learning agility dimensions, life satisfaction, and academic performance (measured by GPA). Notably:

- Result agility and GPA: $r = 0.62$, $p < 0.01$
- Life satisfaction and GPA: $r = 0.58$, $p < 0.05$
- Mental agility showed a weaker but positive correlation with GPA ($r = 0.29$, ns).
- Change agility and self-awareness were positively associated with GPA but non-significant.

The multiple regression model demonstrated that learning agility and life satisfaction jointly explained 56% of the variance in GPA ($R^2 = 0.56$, $f^2 = 1.27$, $p < 0.001$). The regression equation was as follows:

$$Y = 0.17 + 0.47X_1 + 0.42X_2$$

Where:

- Y = Academic performance (GPA)
- X_1 = Learning Agility
- X_2 = Life Satisfaction

Coefficient Analysis

- Result Agility: $\beta = 0.39$, $p < 0.01$ → emerged as the most influential predictor of GPA.
- Life Satisfaction: $\beta = 0.31$, $p < 0.05$ → significantly contributed to GPA.
- Mental Agility: $\beta = 0.18$, $p = 0.08$ → positive but marginal.
- People Agility: $\beta = 0.15$, $p = 0.10$ → marginal contribution.
- Change Agility and Self-Awareness: $\beta < 0.10$, ns → non-significant predictors.

Model Assumptions

- Residual normality confirmed through Shapiro–Wilk test.
- No multicollinearity detected ($VIF < 5$).
- Homoscedasticity assumption met (Glejser test non-significant).

The model's effect size ($f^2 = 1.27$) was categorized as very large (Cohen, 1988), underscoring the substantial predictive power of the combined constructs.

Discussion

The findings of this study highlight the central role of result agility and life satisfaction in predicting academic performance among cadets in semi-military aviation vocational education (figure 1). Together, the two constructs accounted for 56% of the variance in GPA, indicating that adaptive learning capacity and psychological well-being jointly determine cadets' academic outcomes. This model displayed a large effect size ($f^2 = 1.27$), supporting the robustness of the results despite the limited sample size.

Among the five dimensions of learning agility, result agility emerged as the strongest predictor. This dimension reflects persistence, task orientation, and the ability to remain focused on outcomes under pressure. In the semi-military educational environment—characterized by rigid routines, high expectations, and limited tolerance for errors—cadets with strong result agility demonstrated superior academic performance.

This finding aligns with (Williams & Nowack, 2022), who emphasized that individuals with high goal orientation and perseverance tend to excel in competitive environments. Similarly, (Li & Chalermvongsavej, 2024) identified goal-directed resilience as a critical determinant of self-regulation and academic achievement under high-stakes conditions. The present study thus extends these insights to the aviation vocational context, where cadets are trained to manage risk and deliver results under pressure.

From a theoretical perspective, this reinforces the notion that in high-stakes systems, not all dimensions of learning agility carry equal weight. While mental agility, people agility, and change agility are valuable, result agility appears most decisive when performance is measured by concrete academic outcomes within a regimented, semi-military setting.

The study also found that life satisfaction significantly contributed to cadets' GPA. This supports the well-established link between subjective well-being and academic performance. (Diener et al., 1985) conceptualized life satisfaction as a global evaluation of life quality, and subsequent studies (Annisa et al., 2025; Suan, 2023; Suldo et al., 2008) demonstrated its impact on motivation, resilience, and learning outcomes.

For cadets navigating the strict discipline and isolation of semi-military boarding systems, life satisfaction appears to function as a psychological buffer. Students who feel generally satisfied with their lives are more likely to sustain motivation, regulate stress, and persist in the face of challenges. This resonates with Ryan and Deci's (2017) self-determination theory, which emphasizes the role of psychological well-being in supporting intrinsic motivation (Kotzé & Kleynhans, 2013).

Interestingly, mental agility and people agility demonstrated only marginal effects. Although cadets with stronger reflective thinking and interpersonal skills may achieve slightly better outcomes, these competencies may require longer developmental trajectories. As (Spreitzer et al., 2005) noted, cognitive flexibility and social intelligence evolve gradually and often thrive in contexts with greater autonomy and informal interaction. In contrast, the semi-military system restricts both autonomy and informal communication, which may explain the limited role of these dimensions in early academic performance.

Similarly, change agility and self-awareness did not emerge as significant predictors. Change agility may be less critical in rigid educational systems where flexibility is constrained by structured routines. Meanwhile, self-awareness, as a reflective competence, typically matures over extended periods (Goleman, 2020; Pulakos et al., 2000). For first-year cadets still adjusting to semi-military education, its immediate impact on GPA may be minimal.

The finding that mental agility and people agility played only a marginal role suggests that reflective thinking and interpersonal competence may not yet be fully developed among first-year cadets. However, these skills remain critical for long-term success in professional aviation contexts. As (Brookfield, 2017) argued, structured critical reflection enhances learners' ability to analyze experiences, question assumptions, and generate adaptive responses. Embedding reflective learning modules within problem-solving tasks and group projects could therefore accelerate the development of these competencies, even within the constraints of a semi-military system.

The findings of this study confirm and extend prior literature in several ways. First, they affirm the theoretical importance of learning agility as a competence that supports performance in dynamic contexts (De Meuse & Harvey, 2022; Lombardo & Eichinger, 2000). Second, they expand the understanding of academic resilience by integrating both cognitive-adaptive (learning agility) and affective-subjective (life satisfaction) dimensions. Third, they highlight the contextual dependence of learning agility, showing that in semi-military systems, result agility overshadows other dimensions.

This contrasts with studies in general educational settings, where mental agility, interpersonal skills, and adaptive flexibility may play larger roles (Pitaloka & Etikariena, 2024; Wang et al., 2023). The present research underscores that contextual factors—such as discipline, routines, and performance-oriented culture—shape which dimensions of learning agility become most salient.

Theoretically, this study advances the differentiated role of learning agility dimensions in extreme educational environments. It suggests that learning agility should not be treated as a homogeneous construct but analyzed in terms of its component dimensions. In high-pressure, semi-military contexts, result agility may be reinterpreted as a form of goal-directed resilience, aligning with resilience theory in psychology (Li & Chalermvongsavej, 2024). Furthermore, integrating life satisfaction into the model emphasizes that academic resilience is not purely cognitive but also affective. The intersection of adaptability and well-being provides a more holistic framework for understanding student performance under stress.

From a practical perspective, these findings suggest several avenues for strengthening vocational education. First, embedding persistence and outcome-focused training into simulations may further cultivate cadets' result agility. At the same time, programs should not overlook employability-oriented skills such as adaptability and career readiness. (Saefullah et al., 2025) demonstrated that learning agility is closely linked to vocational adaptability and long-term career success, while (Wea, 2023) highlighted the importance of adaptive performance in educational settings as a precursor to professional effectiveness. Likewise, (Jackson et al., 2024) emphasized the interconnectedness of student well-being and employability, suggesting that aviation institutions must integrate soft skills and psychological support into their curricula. By aligning cadet training with both performance outcomes and employability competencies, vocational colleges can ensure graduates are prepared not only to excel academically but also to thrive in the rapidly evolving aviation industry.

Although this study offers novel insights, several limitations must be acknowledged. First, the sample size ($N = 23$) is relatively small by conventional statistical standards. However, it represents the entire population of first-year Air Traffic Control cadets across two semi-military aviation colleges, where quota-based recruitment restricts population expansion and random sampling. Thus, the use of a total population approach is methodologically justified. Second, the findings should be interpreted contextually rather than generalized broadly. The regression model demonstrated high internal consistency and a very large effect size, but its applicability to other contexts (e.g., civilian universities, other professional domains) remains limited. Third, the study relied on self-report measures, which may introduce response bias. Future research could benefit from combining self-report data with behavioral assessments, peer evaluations, or performance-based tasks.

To strengthen external validity, future studies should consider:

1. Longitudinal designs, to track developmental changes in learning agility and life satisfaction across multiple semesters.
2. Comparative studies, examining differences across institutions, programs, or national contexts.
3. Mixed-method approaches, integrating qualitative interviews to capture deeper insights into the psychosocial dynamics of cadets' adaptation.
4. Advanced statistical modeling, such as structural equation modeling (SEM) or mediation analysis, to test resilience as a potential mediator between learning agility, life satisfaction, and academic performance.

By addressing these limitations, future research can provide a more comprehensive understanding of how adaptability and well-being shape academic and professional readiness in aviation and other high-stakes industries.

Conclusion

This study provides empirical evidence that learning agility and life satisfaction are significant predictors of academic performance among first-year cadets in semi-military aviation vocational education. Employing a total population approach ($N = 23$), the findings demonstrate that these constructs jointly explain a substantial proportion of variance in GPA ($R^2 = 0.56$, $f^2 = 1.27$). Among the five dimensions of learning agility, result agility emerged as the dominant factor, highlighting the importance of persistence, task orientation, and the ability to deliver outcomes under pressure. Life satisfaction also showed a significant contribution, reinforcing the role of psychological well-being as a foundation for academic motivation and resilience. Theoretically, the study extends existing literature by demonstrating that learning agility functions differently depending on the context. In semi-military systems, result-oriented adaptability outweighs cognitive flexibility, interpersonal skills, and self-awareness. Practically, the findings suggest that aviation vocational institutions should integrate goal-directed resilience training, soft skills development, and well-being interventions into their curricula. Future research may extend this framework by incorporating multi-criteria decision-making approaches, such as Fuzzy-AHP, to model the inherent uncertainty and complexity of educational and environmental factors—particularly within aviation training systems operating under variable conditions, including tropical weather contexts. In sum, this study underscores that academic performance in high-stakes, regimented environments is shaped not only by cognitive adaptability but also by affective well-being. This integrated perspective has implications for advancing both educational psychology theory and the professional readiness of the aviation workforce.

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