

Academic coherence in a dual curriculum system: A longitudinal analysis of school and boarding academic performance



Mohamad Ali ^{1,*}, Aji Rizqi Ramadhan ², Dinda Riska Ariningsih ¹, Nur Rizqi Febriandika ³

¹Department of Islamic Religious Education, Faculty of Islamic Studies, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

²Department of Arabic Language Education, Faculty of Islamic Education, Institut Muslim Cendekia, Sukabumi, Indonesia

³Department of Management, Business School, University of Newcastle, Newcastle, Australia

ARTICLE INFO

Article history:

Received 23 February 2026

Received in revised form

1 July 2026

Accepted 6 July 2026

Keywords:

Dual curriculum education

Islamic boarding schools

Academic coherence

Longitudinal academic performance

Cross-domain learning

ABSTRACT

Islamic boarding schools (*pesantren*) in Indonesia commonly implement a dual curriculum that combines nationally recognized schooling with internally structured religious education. Despite its widespread adoption, empirical evidence on the academic relationship between these two educational domains remains limited. This study investigates academic coherence within a dual curriculum system by examining the relationship, longitudinal stability, and predictive interaction between school and boarding academic performance. A longitudinal quantitative design was employed using report card data from 62 students across four consecutive semesters. The data were analyzed using descriptive statistics, Pearson correlation, longitudinal stability analysis, regression modeling, and moderation analysis. The results revealed strong positive correlations between school and boarding academic achievement across semesters ($r = 0.604-0.915$, $p < 0.001$), together with high temporal stability, indicating consistent learning trajectories. Regression analyses demonstrated bidirectional predictive relationships, with school performance explaining 67.2% of the variance in boarding outcomes and boarding performance explaining 45.0% of the variance in school outcomes. Academic track specialization did not significantly moderate these relationships. The findings suggest that the dual curriculum supports strong academic coherence between school and boarding education, contributing to international discussions on cross-domain academic integration in faith-based educational settings. However, the findings should be interpreted as context-specific results from a single institution and require further confirmation using larger, multi-institutional samples.

© 2026 The Authors. Published by IASE. This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Islamic boarding schools or *Pesantren* represent one of the oldest and most influential Islamic educational institutions in Indonesia (Anam et al., 2019). Historically, *pesantren* have functioned as centers for the transmission of Islamic knowledge, moral development, and the formation of religious and social character (Bahri et al., 2026). Over time, *pesantren* have evolved beyond their role as purely traditional educational institutions and have

transformed into integrated educational systems that combine formal and non-formal learning within a single institutional framework (Febriandika et al., 2024).

This transformation has been marked by the adoption of the national education curriculum alongside internally developed religious curricula (Ali et al., 2025). According to Hanif et al. (2024) many *pesantren* now provide formal education aligned with national standards, allowing their graduates to obtain state-recognized certificates. At the same time, *pesantren* continue to preserve their internal curricula, which emphasize the study of classical Islamic texts and character development grounded in *pesantren* traditions (Rahmadani and Raharja, 2025). A consequence of this system is the emergence of two parallel domains of academic evaluation. Students receive school report cards representing academic achievement in general

* Corresponding Author.

Email Address: ma122@ums.ac.id (M. Ali)

<https://doi.org/10.21833/ijaas.2026.07.004>

 Corresponding author's ORCID profile:

<https://orcid.org/0009-0000-1205-6501>

2313-626X/© 2026 The Authors. Published by IASE.

This is an open access article under the CC BY-NC-ND license

(<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

subjects based on the national curriculum, as well as *pesantren* report cards reflecting religious learning outcomes and competencies distinctive to the *pesantren* educational tradition. Administratively, these function as separate assessment systems; however, institutionally they are assumed to contribute to the formation of an integrated student profile (Silahuddin et al., 2025).

Conceptually, the integration of general and religious curricula is often understood as a form of holistic education that simultaneously develops intellectual and spiritual dimensions (Martanti et al., 2025). However, assumptions regarding such integration tend to be more normative than empirical. It remains unclear whether structural curriculum integration is also reflected in the integration of academic performance at the individual student level. In educational literature, studies on academic achievement across subjects are commonly discussed within the framework of cross-domain academic achievement (Sattler and Gershoff, 2019). Some theoretical perspectives emphasize the existence of domain-general abilities that underlie performance across different fields of study. In contrast, other approaches highlight the domain-specific nature of academic achievement, suggesting that competencies in different subject areas may develop relatively independently (Chen, 2024).

In the context of Indonesian *pesantren*, existing studies have predominantly focused on character education (Jusubaidi et al., 2024), religious moderation (Athoillah et al., 2024), *kiai* leadership (Hamdanah et al., 2025), community empowerment, and the social contributions of *pesantren* (Mashuri et al., 2024). Research addressing academic achievement has generally concentrated on evaluating educational program effectiveness or providing descriptive comparisons of learning outcomes, rather than examining the structural relationships between academic performance across curricular domains.

This condition indicates the presence of a research gap at the level of academic analysis. Although *pesantren* have implemented integrated educational systems, empirical evidence regarding how these two academic systems interact at the individual student level remains limited. In particular, few studies have examined whether the two academic evaluation systems produce coherent achievement profiles or instead reflect fragmentation in learning performance. Moreover, most previous studies have employed cross-sectional designs, which are insufficient to explain the stability of academic relationships over time. In fact, the *pesantren* educational system operates continuously and provides opportunities for longitudinal analysis to better understand the dynamics of students' academic development.

Based on this background, this study aims to analyze the relationship between school report card grades and *pesantren* report card grades in each semester, examine the longitudinal stability of this relationship across four semesters, and evaluate

patterns of students' academic relationships within a *pesantren* educational system implementing a dual-curriculum structure.

2. Literature review

2.1. Academic coherence in dual curriculum education

The implementation of a dual curriculum system results in the simultaneous operation of two academic domains. The first domain follows the national education curriculum, emphasizing general subjects such as mathematics, science, language, and social studies (Ihsan et al., 2024). The second domain consists of internal *pesantren* learning programs that focus on Islamic theology, Arabic studies, Qur'anic learning, and moral education rooted in *pesantren* traditions. Rather than replacing traditional education, the formal school system operates in parallel with the boarding curriculum.

From an institutional perspective, the dual curriculum model is commonly framed as an integrated educational system designed to develop balanced intellectual and spiritual competencies (Haryanto et al., 2025). Educational discourse often assumes that students' academic development across religious and general domains progresses harmoniously. However, such integration is frequently treated as a normative expectation rather than an empirically tested assumption. According to Sabri et al. (2008), integration between religious and academic domains may not always be harmonious and may depend on individual experiences as well as personal adaptation mechanisms.

Within this context, academic achievement is widely recognized in educational research as a multidimensional construct rather than a single unified outcome. Students' academic performance reflects the interaction of cognitive ability, learning engagement, instructional environment, assessment practices, and disciplinary characteristics (Carrillo-López et al., 2022; Erdogdu and Erdogdu, 2025). Consequently, academic achievement may manifest differently across learning domains depending on the nature of instructional objectives and evaluation systems.

Educational assessment literature emphasizes that academic scores are not merely indicators of individual intelligence but representations of performance within specific learning contexts. Variations in curriculum structure, teaching approaches, and evaluation criteria may produce different achievement patterns even among the same group of students (Vashe et al., 2019). For this reason, comparing academic outcomes across distinct educational domains requires careful examination of how achievement is operationalized and measured.

From a theoretical perspective, academic achievement across multiple domains can either reflect a shared underlying competence or indicate differentiated learning outcomes shaped by domain-

specific demands (Sewasew and Schroeders, 2019). If students' academic abilities operate as a unified construct, performance consistency should emerge across educational settings. Conversely, divergent achievement patterns would suggest that academic success is strongly influenced by contextual learning structures rather than generalized competence. This distinction is further elaborated in educational psychology through the domain-general and domain-specific perspectives (Wilkey, 2023). These perspectives provide a theoretical foundation for understanding whether academic success reflects a unified competence or a set of specialized abilities developed within particular learning contexts.

The domain-general ability perspective argues that students possess underlying cognitive competencies that influence performance across multiple subjects and learning environments (Brandt et al., 2020). Research on general academic ability suggests that learners who demonstrate strong achievement in one academic domain tend to perform consistently well in other domains due to shared cognitive resources such as reasoning ability, learning strategies, self-regulation, and motivation (Garner and Robison, 2026). From this viewpoint, academic performance is expected to exhibit positive correlations across different educational settings. In contrast, the domain-specific perspective proposes that academic achievement develops independently according to Academic Self-Concept and noncognitive factors (Mosewich et al., 2021). Different learning environments may cultivate distinct competencies; therefore, high achievement in one domain does not necessarily guarantee similar performance in another (Geary et al., 2017).

In the context of dual curriculum education, these competing perspectives raise an important empirical question: whether academic performance across school and boarding domains reflects a unified competence or operates as separate learning outcomes. Examining the relationship between school academic performance and boarding academic performance therefore provides a direct test of academic coherence within the dual curriculum system. Based on this theoretical reasoning, the following hypotheses are proposed:

H1: School academic performance is positively related to boarding academic performance.

2.2. Longitudinal stability and cross-domain academic dynamics

Academic achievement is not only evaluated through cross-sectional performance but also through its stability over time. Longitudinal perspectives in educational assessment argue that consistent achievement across semesters indicates the presence of stable academic competence rather than temporary performance fluctuations (McCoach et al., 2017). Students who demonstrate strong achievement at one point in time are generally expected to maintain comparable performance levels

in subsequent academic periods. Stability in achievement therefore serves as an important indicator of persistent learning capability and academic adaptation within a given educational system.

In addition to stability, studies on academic development suggest that early academic achievement often serves as a strong predictor of subsequent performance (Bruce et al., 2023). Prior learning experiences shape students' cognitive strategies, learning habits, and academic confidence, which in turn influence later academic outcomes (Taub et al., 2014). From this perspective, academic achievement is not merely a static condition but a dynamic process that unfolds over time.

Within a dual curriculum system, predictive relationships between school and boarding academic performance provide critical insight into the degree of educational integration. If both learning domains operate as mutually reinforcing systems, performance in one domain should contribute to subsequent achievement in the other. For example, competencies developed through formal schooling may support students' success in religious learning contexts. Likewise, disciplined learning routines and intensive study practices cultivated within boarding education may enhance students' academic performance in formal school subjects.

Examining both longitudinal stability and predictive relationships therefore provides a stronger test of academic integration, as it captures not only whether domains are related, but also whether they evolve together over time. Based on this theoretical framework, the following hypotheses are proposed:

H2: Academic performance remains stable across semesters in both school and boarding domains.

H3: School and boarding academic performance exhibit reciprocal predictive relationships over time.

2.3. Academic track differences

Academic tracks, such as science and social science streams, are designed to provide differentiated learning experiences aligned with students' academic preferences and future educational pathways (Goyibova et al., 2025). Students enrolled in science tracks are often exposed to learning environments emphasizing analytical reasoning, problem-solving, and structured academic tasks (Martínez-Torregrosa et al., 2025). In contrast, social science tracks may involve broader interpretative learning approaches and different assessment emphases. These variations can shape how students respond to academic demands and may influence the consistency of performance across learning domains.

Within a dual curriculum setting, academic track differences may affect the strength of the relationship between school and boarding academic performance. Students in different tracks may allocate study time differently, prioritize distinct

academic competencies, or experience varying levels of academic pressure. As a result, the degree of alignment between formal school achievement and boarding academic performance may not be uniform across academic streams.

Testing academic track as a moderating variable allows the study to determine whether cross-domain academic coherence represents a universal pattern or whether it varies according to students' academic specialization. Incorporating moderation analysis therefore provides a more nuanced understanding of how institutional curriculum structures interact with student academic pathways. Based on this reasoning, the following hypothesis is proposed:

H4: Academic track moderates the relationship between school and boarding academic performance.

3. Methods

This study employed a quantitative approach using a longitudinal correlational design to examine the structure of academic performance within a dual curriculum education system implemented in an Islamic boarding school. The study aimed to investigate whether academic achievement across school and boarding educational domains demonstrates coherence, stability, and predictive relationships over time.

An ex post facto research design was applied because the study utilized existing academic records without experimental manipulation (Vignetti et al., 2020). A longitudinal framework was adopted by analyzing students' academic performance across four consecutive semesters. This approach allowed the examination of cross-domain relationships as well as temporal stability of achievement.

The research model conceptualizes academic performance as a multidimensional construct consisting of two parallel domains: school academic performance and boarding academic performance. The model assumes that academic outcomes may reflect shared competencies across learning contexts while also being influenced by academic specialization. The model includes three analytical components:

1. Cross-domain relationship between school and boarding academic performance.
2. Longitudinal stability of achievement across semesters.
3. Predictive and moderating mechanisms, where early academic performance predicts subsequent outcomes and academic track acts as a moderating factor.

The unit of analysis in this study was individual students enrolled in a dual curriculum Islamic boarding school. Participants consisted of 62 students from 3 academic tracks. The dataset was derived from institutional academic records comprising students' report card averages across 4

semesters. Each student possessed two forms of academic evaluation:

1. School report representing achievement in nationally standardized subjects.
2. Boarding report representing achievement in internal religious learning programs.

The academic performance of both schools and boarding schools is measured using the same assessment report, which combines written midterm and final exams, activeness, and attendance. The boarding school curriculum consists of several religious subjects, such as Quran memorization, *Hadith*, *Balaghah*, *Nahwu*, and *Shorof*, all taught in Arabic. In terms of teaching roles, the school and boarding systems are administratively integrated but pedagogically distinct. Although some teachers may be involved in both domains, assessments are conducted independently.

Academic performance was operationalized as semester average scores obtained from both evaluation systems. The study variables, their types, and measurement methods are presented in Table 1.

Table 1: Study variables and their measurements

Variable	Type	Measurement
School academic performance	Independent variable	Semester average score (school report)
Boarding academic performance	Dependent variable	Semester average score (boarding report)
Academic track	Moderating variable	3 classes
Time	Longitudinal factor	Semester 1–4

Data analysis was performed using IBM SPSS 25 following a sequential analytical strategy aligned with the proposed hypotheses. The analysis began with descriptive statistics to summarize students' academic performance across school and boarding domains over four semesters. Mean scores, standard deviations, and score distributions were examined to provide an initial overview of academic achievement patterns.

Prior to hypothesis testing, statistical assumptions were evaluated. The normality of score distributions was assessed using the Shapiro–Wilk test to determine the suitability of parametric statistical procedures. The results indicated that the data met the assumptions required for correlation and regression analyses.

To examine cross-domain academic relationships (H1), Pearson correlation analysis was conducted between school academic performance and boarding academic performance within each semester. The correlation coefficient was calculated using the Pearson product–moment correlation formula:

$$r = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum(X - \bar{X})^2 \sum(Y - \bar{Y})^2}} \quad (1)$$

where, X represents school academic performance, and Y represents boarding academic performance. This analysis assessed the existence, direction, and

statistical significance of the relationship between the two academic domains.

Longitudinal stability of academic achievement (H2) was then examined by correlating students' performance across consecutive semesters within each domain. Stability coefficients were estimated as correlations between academic performance at time t and time $t+1$, expressed as:

$$r_{t,t+1} = \text{Corr}(\text{Academic Performance}_t, \text{Academic Performance}_{t+1}) \quad (2)$$

This procedure evaluated whether students' academic achievement followed consistent trajectories over time. To investigate predictive relationships between academic domains (H3), linear regression analysis was conducted. Two predictive models were estimated. The first model examined whether earlier school academic performance predicted subsequent boarding academic performance:

$$\text{Boarding}_{t+1} = \beta_0 + \beta_1 \text{School}_t + \varepsilon \quad (3)$$

The second model tested the reverse prediction, where boarding academic performance predicted later school academic performance:

$$\text{School}_{t+1} = \beta_0 + \beta_1 \text{Boarding}_t + \varepsilon \quad (4)$$

These models allowed evaluation of functional integration between the two educational domains. Finally, moderation analysis (H4) was performed using hierarchical regression to examine whether academic track influenced the strength of the relationship between school and boarding academic performance. An interaction term between school

performance and academic track was included in the regression model:

$$\text{Boarding} = \beta_0 + \beta_1 \text{School} + \beta_2 \text{Track} + \beta_3 (\text{School} \times \text{Track}) + \varepsilon \quad (5)$$

A significant interaction coefficient indicated the presence of a moderating effect. All statistical tests were evaluated at a significance level of $p < 0.05$, and effect sizes were reported to support substantive interpretation of the findings.

4. Results

This section presents the statistical findings examining academic performance across school and boarding education within the dual curriculum system. The analyses were conducted sequentially, beginning with descriptive statistics, followed by assumption testing, correlation analysis, longitudinal stability examination, regression modeling, and moderation testing. Descriptive statistics, along with distribution characteristics (skewness and kurtosis), summarizing students' academic performance across four semesters are presented in Table 2.

According to Table 2, mean academic performance in school education increased steadily from $M = 81.23$ (Semester 1) to $M = 84.32$ (Semester 4), indicating progressive improvement over time. Boarding achievement remained relatively stable, fluctuating within a narrow range between $M = 79.87$ and $M = 81.65$. While mean achievement levels across both domains were comparable, boarding scores demonstrated larger variability (SD up to 6.49) compared to school performance (SD ≈ 2.09 –2.85), suggesting differences in evaluation dynamics rather than achievement level.

Table 2: Descriptive statistics and distribution characteristics of academic performance (N = 62)

Variable	Min	Max	Mean	SD	Skewness	Kurtosis
School semester 1	77	87	81.23	2.27	0.384	-0.236
School semester 2	75	86	81.98	2.51	-0.233	-0.292
School semester 3	74	88	82.71	2.85	-0.800	0.899
School semester 4	80	89	84.32	2.09	0.002	-0.809
Boarding semester 1	72	96	80.56	5.36	0.447	-0.129
Boarding semester 2	69	90	79.87	5.48	0.067	-0.991
Boarding semester 3	73	93	81.65	5.82	0.178	-1.086
Boarding semester 4	72	95	81.56	6.49	0.223	-1.294

Beyond descriptive statistics, skewness and kurtosis values were analyzed to evaluate the characteristics of the data distribution. Skewness values ranged from -0.800 to 0.447 , and kurtosis values ranged from -1.294 to 0.899 , demonstrating that all variables fell within the acceptable range of -2 to $+2$. These results indicate that the data distributions were approximately normal. To verify statistical assumptions, normality testing using the Shapiro-Wilk statistic was conducted, as shown in Table 3.

As presented in Table 3, several variables deviated from normality ($p < 0.05$), particularly in School Semester 3 and Boarding Semesters 3 and 4. However, skewness and kurtosis values remained within acceptable ranges, indicating that the

deviations were not substantial. Given the sample size ($N = 62$) and the robustness of parametric tests to moderate violations of normality, Pearson correlation and regression analyses were retained. Cross-domain relationships between school and boarding academic performance were analyzed using Pearson correlation, presented in Table 4.

According to Table 4, correlations ranged from $r = 0.604$ to $r = 0.915$, all statistically significant ($p < 0.001$). The strongest association emerged in Semester 4 ($r = 0.915$), indicating a very strong alignment between school and boarding academic outcomes. To further assess the robustness of the correlation results under non-normal conditions, additional analysis using Spearman's rho was conducted. The results are presented in Table 5.

Table 3: Normality test results (N = 62)

Variable	Sig.	Interpretation
School semester 1	0.089	Normal
School semester 2	0.069	Normal
School semester 3	0.011	Non-normal
School semester 4	0.050	Normal
Boarding semester 1	0.111	Normal
Boarding semester 2	0.071	Normal
Boarding semester 3	0.016	Non-normal
Boarding semester 4	0.001	Non-normal

Table 4: Cross-domain correlations

Semester	r	Sig.
School 1 – boarding 1	0.866	0.000
School 2 – boarding 2	0.604	0.000
School 3 – boarding 3	0.802	0.000
School 4 – boarding 4	0.915	0.000

Table 5: Spearman correlation results

Semester	r_s	Sig.
School 1 – boarding 1	0.853	0.000
School 2 – boarding 2	0.601	0.000
School 3 – boarding 3	0.865	0.000
School 4 – boarding 4	0.915	0.000

As shown in Table 5, Spearman correlation results were consistent with the Pearson analysis, with coefficients ranging from $r_s = 0.601$ to 0.915 ($p < 0.001$). This confirms that the observed relationships are robust and not sensitive to violations of normality assumptions. These values demonstrate substantial cross-domain coherence rather than independent academic development. Longitudinal stability analysis was subsequently conducted to examine temporal consistency of academic achievement. Results are presented in Table 6.

Table 6: Longitudinal stability across semesters

Semester	r	Sig.
School 1 – School 2	0.781	0.000
School 2 – School 3	0.792	0.000
School 3 – School 4	0.816	0.000
Boarding 1 – Boarding 2	0.766	0.000
Boarding 2 – Boarding 3	0.833	0.000
Boarding 3 – Boarding 4	0.874	0.000

Table 6 indicates strong temporal stability across both domains, with coefficients ranging from $r = 0.766$ to $r = 0.874$. Boarding performance demonstrated slightly higher stability over time, suggesting consistent academic trajectories across semesters. Regression analysis was conducted to evaluate predictive relationships between domains. Results are summarized in Table 7.

Table 7: School performance predicting boarding achievement

Predictor	B	Beta	t	Sig.
School semester 1	2.350	0.820	11.082	0.000

R: 0.820; R^2 : 0.672; F: 122.803

As shown in Table 7, school performance significantly predicted boarding achievement ($\beta = 0.820$, $p < 0.001$), explaining 67.2% of the variance, indicating a strong predictive relationship. A reciprocal regression model was then estimated, reported in Table 8.

Table 8 shows that boarding performance significantly predicted later school performance ($\beta =$

0.671, $p < 0.001$), accounting for 45.0% of variance, confirming reciprocal academic influence between learning domains. Finally, moderation analysis was conducted to examine whether academic track influenced the relationship between school and boarding academic achievement. The results are presented in Table 9.

Table 8: Boarding performance predicting School achievement

Predictor	B	Beta	t	Sig.
Boarding semester 1	0.261	0.671	7.006	0.000

R: 0.671; R^2 : 0.450; F: 49.087

Table 9: Moderation analysis of academic track

Predictor	B	Beta	t	Sig.
School performance	3.561	1.242	5.439	0.000
Academic track	48.503	5.873	1.907	0.061
Interaction term	-0.596	-5.677	-1.895	0.063

According to Table 9, the interaction effect was not statistically significant ($p = 0.063$), indicating that academic specialization track did not moderate the relationship between school and boarding performance. The academic relationship therefore appears consistent across student tracks.

5. Discussion

The present study examined whether academic achievement in a dual curriculum system operates as independent learning domains or reflects an integrated academic structure. The findings consistently indicate strong academic coherence between school and boarding education, suggesting that students' learning performance develops within a unified educational ecosystem rather than separate instructional environments.

The descriptive findings demonstrated comparable mean achievement levels between school and boarding curricula across four semesters. School performance showed gradual improvement over time, while boarding achievement remained relatively stable. This pattern suggests that academic development in *pesantren* does not create cognitive overload despite students participating in two parallel evaluation systems. Instead, the stability of boarding performance alongside increasing school achievement indicates adaptive learning regulation among students.

According to Horwitz (2021), religious engagement may positively influence students' academic persistence and achievement. Integrated Islamic education has also been reported to reduce the traditional dichotomy between religious and general knowledge while maintaining educational progress. These findings further align with comparative studies showing that academic outcomes in faith-based schooling environments remain comparable to those in secular institutions (Agirdag et al., 2017). These findings can also be understood in the context of learning in Islamic boarding schools, where students undergo a structured daily routine and combine formal

education with religious studies. The consistency of academic achievement in various fields appears to be influenced not only by general abilities such as self-regulation, but also by disciplinary learning habits formed through directed learning sessions, collective routines, and teacher guidance in a dormitory environment.

The correlation analysis revealed strong cross-domain relationships ranging from $r = 0.604$ to $r = 0.915$, indicating substantial alignment between academic achievement in school and boarding education. The robustness of these findings is further supported by additional non-parametric analysis using Spearman's rho, which produced results consistent with the Pearson correlations. These findings suggest that students' academic performance develops through interconnected learning processes rather than isolated instructional systems.

The strong association between the two report systems challenges the assumption that religious and general education compete for students' cognitive resources. Instead, students appear to transfer learning competencies across educational contexts. Galoyan and Betts (2021) conceptualized this process through the Integrative Transfer of Learning model, emphasizing that knowledge and skills move across learning environments through interacting task, personal, contextual, and pedagogical dimensions. From this perspective, the dual curriculum structure may function as complementary learning spaces that reinforce shared academic competencies.

Beyond individual learning transfer, the findings also reflect institutional coherence within the educational environment. Moon et al. (2022) demonstrated that instructional program coherence is positively associated with student academic achievement. The strong correlations observed in this study indicate that *pesantren* education may operate under a coherent instructional logic despite employing two distinct assessment systems. When instructional expectations, learning routines, and evaluation practices remain aligned, students are able to maintain consistent performance across different academic domains (Fiani et al., 2025).

At the curriculum level, coherence has similarly been identified as a critical mechanism supporting learning outcomes. Curriculum alignment among goals, content, and assessment structures contributes to improved academic performance and educational equity. The dual reporting system in *pesantren* does not necessarily represent curricular fragmentation; rather, it may embody an integrated curriculum structure in which religious and general knowledge mutually reinforce students' academic development.

As discussed by Adler-Kassner (2017), debates surrounding transfer of learning ultimately relate to education's broader purpose of preparing learners to apply knowledge across diverse contexts. The present findings therefore suggest that academic success in dual curriculum environments emerges

not from curricular separation but from coherent integration that enables transferable learning competencies.

The longitudinal stability analysis further strengthens the interpretation of academic coherence observed in this study. High stability coefficients ($r = 0.766$ – 0.874) indicate that students' academic achievement remains consistent across semesters in both school and boarding contexts, suggesting that performance differences are shaped more by enduring developmental trajectories than by curriculum type alone. Longitudinal research has demonstrated that academic achievement typically follows stable pathways across schooling years, where students entering with stronger competencies tend to maintain their relative academic standing over time (McCoach et al., 2017).

From a learning perspective, such stability reflects the development of self-regulated learning capacities. Self-regulated learners continuously set goals, monitor their progress, and refine learning strategies, allowing academic performance to remain stable despite variations in instructional settings. Students with stronger self-regulation gradually consolidate effective study strategies, supporting the view that consistent achievement reflects adaptive learner characteristics rather than curricular similarity.

At the institutional level, stability in academic performance is also influenced by the learning environment in which students are embedded. Studies on authoritative school climate indicate that structured environments combined with strong student support foster sustained engagement and higher academic achievement (Konold et al., 2018). Within *pesantren* education, structured daily routines, continuous supervision, and intensive teacher–student interaction may provide a comparable institutional framework that reinforces consistent learning behavior. Evidence from residential education research further supports this interpretation, showing that boarding environments promote both cognitive and non-cognitive development through intensified academic interaction and increased student effort (Lin et al., 2025). Accordingly, the stability observed across semesters may reflect a reinforcing educational ecology in which learner self-regulation and institutional structure interact to sustain academic performance over time.

Regression analyses provide additional insight into the directionality of academic relationships. School performance explained 67.2% of the variance in boarding achievement, while boarding performance accounted for 45.0% of subsequent school outcomes, indicating reciprocal predictive effects between the two educational domains. These findings suggest that academic development in *pesantren* operates through mutual reinforcement rather than hierarchical influence. Research on reciprocal effects models has long proposed bidirectional relationships between psychological and academic variables, although empirical support

varies depending on methodological approaches (Ehm et al., 2019).

Nevertheless, longitudinal evidence demonstrates that reciprocal relations between achievement-related constructs tend to reach developmental equilibrium across time, remaining stable across different academic tracks and assessment forms (Arens et al., 2017). The present findings extend this perspective by showing reciprocity not only within a single subject domain but across institutional learning systems. From a broader educational viewpoint, such mutual prediction may reflect a learning ecology in which multiple learning contexts interact dynamically to shape learner development. Ranieri et al. (2019) argued that learning outcomes emerge from interconnected formal and informal environments where diverse experiences, social interactions, and institutional expectations collectively influence learning trajectories. Within *pesantren* education, the coexistence of school and boarding curricula may therefore create a symbiotic educational ecosystem in which cognitive, moral, and disciplinary learning processes continuously reinforce one another.

Interestingly, moderation analysis revealed that academic track did not significantly influence the relationship between school and boarding achievement ($p = 0.063$), indicating that academic coherence operates consistently across science and social science streams. The absence of moderation effects suggests that dual curriculum integration functions at the level of transferable learning processes rather than disciplinary specialization. Cross-disciplinary learning theory proposes that students activate, transform, and integrate knowledge resources drawn from different domains to construct understanding in new learning contexts (Borda et al., 2022). Such processes enable learners to apply competencies across subject boundaries, supporting consistent academic performance regardless of academic track orientation. Empirical studies have further shown that learning approaches encouraging connections between disciplines enhance learning outcomes and promote integrative problem-solving skills across fields (Tang et al., 2025).

Conceptually, the findings support the notion of dual curriculum academic coherence, whereby religious and general education function as mutually reinforcing domains shaping unified academic development. The *pesantren* model illustrates that faith-based education systems are capable of sustaining academic performance comparable to conventional schooling while simultaneously maintaining religious educational commitments. These challenges dichotomize views separating religious and secular education and instead position *pesantren* as an example of integrated learning institutions within contemporary education systems.

Although the findings suggest a strong academic coherence between school and boarding performance, several alternative explanations may need to be considered. The observed relationship

may be influenced by assessment practices. If evaluation standards, teacher expectations, or similar institutional assessment practices are applied in both domains, this may contribute to aligned academic outcomes regardless of the actual integration of learning. It also allows for consistency of performance across domains that reflects stable individual learner characteristics rather than curriculum-level effects. Students who are generally more diligent and disciplined, or who have higher levels of self-regulation, may perform well across a variety of academic contexts regardless of the specific curriculum structure. In addition, shared environmental factors within the *pesantren* environment, such as systematic daily routines, strict teacher supervision, intensive learning schedules, and the prohibition of smartphone use, can contribute to consistent academic performance across multiple domains. These contextual influences suggest that the observed coherence may result from a combination of individual and institutional factors rather than from curriculum integration alone.

This study contributes to educational research in several ways. First, it extends *pesantren* scholarship beyond dominant sociocultural and character education perspectives by providing empirical evidence of measurable academic integration. Second, the findings support the concept of cross-domain academic coherence, demonstrating that religious and general education share underlying learning competencies. Third, by employing longitudinal and predictive analyses, the study advances methodological approaches in Islamic education research, which have largely relied on descriptive or qualitative designs. The results position *pesantren* as integrated learning ecosystems capable of sustaining academic alignment across diverse knowledge traditions.

The findings offer important implications for educational policy and institutional practice. For policymakers, the results suggest that integrating religious and general education within a single institutional framework does not compromise academic achievement. Instead, dual curriculum systems may enhance learning continuity and reinforce students' academic development. For educators and *pesantren* administrators, the study highlights the importance of maintaining structured learning environments that support consistent academic engagement across curricular domains. Strengthening collaboration between school teachers and boarding instructors may further enhance academic coherence.

6. Conclusions

This study investigated academic coherence within a dual-curriculum system at an Indonesian Islamic boarding school. The results indicate that academic achievement in both school and boarding education is highly interconnected, remains stable over time, and is mutually predictive. Students who

excel in formal school subjects also tend to perform well in *pesantren* learning environments, suggesting that academic competence extends across institutional boundaries rather than arising from isolated curricular structures. Longitudinal data demonstrated consistent achievement patterns across semesters, and regression analyses showed reciprocal reinforcement between the two educational domains. The lack of moderation by academic track further implies that academic coherence may be driven by transferable learning processes rather than by disciplinary specialization.

In addition to describing student performance patterns, this study contributes to international discourse on integrated education by offering context-specific empirical evidence that dual curriculum systems can support coherent academic development. The findings indicate that religious and general education do not necessarily compete for cognitive resources, but may instead function as complementary learning processes within a structured institutional context. *Pesantren* education can thus be conceptualized as a coherent learning ecosystem where cognitive, moral, and disciplinary learning interact within a unified framework. Nevertheless, these findings are based on a relatively small sample from a single institution and should be interpreted with caution. Further research involving larger, multi-institutional samples is necessary to confirm the generalizability of these results.

7. Limitations and future research

Several limitations should be acknowledged. First, the study was conducted within a single institutional context, which may limit generalizability to other educational settings. Second, academic performance was measured using report scores, which may reflect institutional assessment practices rather than standardized achievement measures. Third, the study focused exclusively on quantitative academic outcomes without examining psychological or motivational factors that may influence learning integration. Future research may explore multi-institutional datasets, incorporate qualitative perspectives, or examine mediating variables such as learning motivation, self-regulation, or institutional culture to further understand mechanisms underlying academic coherence in dual curriculum education.

List of abbreviations

B	Unstandardized regression coefficient
F	F-statistic
M	Mean (average score)
N	Number of participants
R	Multiple correlation coefficient
r	Pearson correlation coefficient
R ²	Coefficient of determination
r _s	Spearman correlation coefficient
SD	Standard deviation
Sig.	Significance level (p-value)

Compliance with ethical standards

Ethical considerations

This study was conducted in compliance with ethical standards for social science research in Indonesia. The research procedures adhered to the principles outlined in the Indonesian National Guidelines for Research Ethics (Pedoman Etika Penelitian Nasional) issued by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

- Adler-Kassner L (2017). Transfer and educational reform in the twenty-first century: College and career readiness and the common core standards. In: Bass R and Moore JL (Eds.), *Understanding writing transfer: Implications for transformative student learning in higher education*: 15–26. 1st Edition, Routledge, New York, USA.
<https://doi.org/10.4324/9781003448518-3>
- Agirdag O, Driessen G, and Merry M (2017). The Catholic school advantage and common school effect examined: A comparison between Muslim immigrant and native pupils in Flanders. *School Effectiveness and School Improvement*, 28(1): 123–135. <https://doi.org/10.1080/09243453.2016.1251469>
- Ali M, Apriantoro MS, and Fauzi IAH (2025). Institutionalization and renewal of traditional Islamic education in Surakarta, Indonesia (1905-1942). *Journal of Islamic Thought and Civilization*, 15(2): 327-347.
<https://doi.org/10.32350/jitc.152.18>
- Anam S, Degeng INS, Murtadho N, and Kuswandi D (2019). The moral education and internalization of humanitarian values in pesantren: A case study from Indonesia. *Journal for the Education of Gifted Young Scientists*, 7(4): 815-834.
<https://doi.org/10.17478/jegys.629726>
- Arens AK, Marsh HW, Pekrun R, Lichtenfeld S, Murayama K, and vom Hofe R (2017). Math self-concept, grades, and achievement test scores: Long-term reciprocal effects across five waves and three achievement tracks. *Journal of Educational Psychology*, 109(5): 621–634.
<https://doi.org/10.1037/edu0000163>
- Athoillah M, Rahman AS, Firdaus AS, and Septiadi MA (2024). Policies and practices religious moderation in pesantren. *Jurnal Pendidikan Islam*, 10(2): 387-396.
<https://doi.org/10.15575/jpi.v10i2.27543>
- Bahri R, Hilmy M, Mukhlisah, Kurniawan R, Niam K, Warits A, and Paisun (2026). Moral leadership development in Indonesian Islamic boarding schools: A comparative study of two pesantren. *British Journal of Religious Education*.
<https://doi.org/10.1080/01416200.2026.2627921>
- Borda E, Haskell T, and Boudreaux A (2022). Cross-disciplinary learning: A framework for assessing application of concepts across science disciplines. *Journal of College Science Teaching*, 52(1): 83-92.
<https://doi.org/10.1080/0047231X.2022.12315664>
- Brandt ND, Lechner CM, Tetzner J, and Rammstedt B (2020). Personality, cognitive ability, and academic performance: Differential associations across school subjects and school tracks. *Journal of Personality*, 88(2): 249-265.
<https://doi.org/10.1111/jopy.12482> PMID:31009081

- Bruce J, Mabizela SE, and Tshabalala AM (2023). Selection tests and their predictive value in university nursing students' success in the first year of study. *BMC Medical Education*, 23: 176. <https://doi.org/10.1186/s12909-023-04140-4> **PMid:36949484 PMCID:PMC10035252**
- Carrillo-López PJ, Constante-Amores A, Arroyo-Resino D, and Sánchez-Munilla M (2022). Self-concept and academic achievement in primary school: A predictive study. *International Journal of Education in Mathematics, Science and Technology*, 10(4): 1057-1073. <https://doi.org/10.46328/ijemst.2303>
- Chen YC (2024). The critical yet overlooked spatial competence in learning astronomy: Decoding semantic spatial information in pictures. *Journal of Baltic Science Education*, 23(6): 1134-1151. <https://doi.org/10.33225/jbse/24.23.1134>
- Ehm JH, Hasselhorn M, and Schmiedek F (2019). Analyzing the developmental relation of academic self-concept and achievement in elementary school children: Alternative models point to different results. *Developmental Psychology*, 55(11): 2336-2351. <https://doi.org/10.1037/dev0000796> **PMid:31535896**
- Erdogdu F and Erdogdu E (2025). Beyond rankings: A multidimensional analysis of factors shaping student achievement in the PISA 2022 dataset. *Educational Review*, 77(5): 1585-1626. <https://doi.org/10.1080/00131911.2025.2506807>
- Febriandika NR, Ihsan MZN, Inayati NL, and Ramadhan AR (2024). Determinants of students' learning motivation in Islamic boarding schools: A structural equation modeling approach. *International Journal of Advanced and Applied Sciences*, 11(11): 10-18. <https://doi.org/10.21833/ijaas.2024.11.002>
- Fiani T, Jasiah J, Ramdhani MT, Syarif A, and Khoerunnisa N (2025). Exploring the impact of Qur'anic recitation intensity on the spiritual intelligence of female Islamic boarding school students. *Suhuf: International Journal of Islamic Studies*, 37(1): 131-138. <https://doi.org/10.23917/suhuf.v37i1.10105>
- Galoyan T and Betts K (2021). Integrative transfer of learning model and implications for higher education. *The Journal of Continuing Higher Education*, 69(3): 169-191. <https://doi.org/10.1080/07377363.2020.1847970>
- Garner LD and Robison MK (2026). To what extent do cognitive abilities, conscientiousness, and physical activity predict academic performance? *Acta Psychologica*, 262: 106097. <https://doi.org/10.1016/j.actpsy.2025.106097> **PMid:41601096**
- Geary DC, Nicholas A, Li Y, and Sun J (2017). Developmental change in the influence of domain-general abilities and domain-specific knowledge on mathematics achievement: An eight-year longitudinal study. *Journal of Educational Psychology*, 109(5): 680-693. <https://doi.org/10.1037/edu0000159> **PMid:28781382 PMCID:PMC542417**
- Goyibova N, Muslimov N, Sabirova G, Kadirova N, and Samatova B (2025). Differentiation approach in education: Tailoring instruction for diverse learner needs. *MethodsX*, 14: 103163. <https://doi.org/10.1016/j.mex.2025.103163> **PMid:39897653 PMCID:PMC11786651**
- Hamdanah H, Baharun H, Najiburrohman N, Thohir PFDM, and Sanjani MAF (2025). The role of kiai leadership and service quality in shaping the reputation of pesantren. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, 6(4): 695-709. <https://doi.org/10.31538/munaddhomah.v6i4.1785>
- Hanif M, Suwito H, Mubaroq AC, and Dharin A (2024). Pesantren resistance to Indonesia's national curriculum to defend its curriculum model. *Revista de Gestão Social e Ambiental*, 18(7): e05473. <https://doi.org/10.24857/rgsa.v18n7-049>
- Haryanto S, Sukawi S, and Muslih M (2025). Uniting tradition and modernity: Scientific paradigms of pesantren-based universities. *Nazhruna: Jurnal Pendidikan Islam*, 7(3): 684-704. <https://doi.org/10.31538/nzh.v7i3.48>
- Horwitz IM (2021). Religion and academic achievement: A research review spanning secondary school and higher education. *Review of Religious Research*, 63(1): 107-154. <https://doi.org/10.1007/s13644-020-00433-y>
- Ihsan I, Pabbajah M, Abdullah I, and Hidayati H (2024). The contestation of national and religious curricula in Indonesia's madrasas since the passage of the UUSPN. *Educational Studies*, 50(4): 434-447. <https://doi.org/10.1080/03055698.2021.1958757>
- Jusubaidi J, Lindgren T, Mujahidin A, and Rofiq AC (2024). A model of transformative religious education: Teaching and learning Islam in Pondok Modern Darussalam Gontor, Indonesia. *Millah: Journal of Religious Studies*, 23(1): 171-212. <https://doi.org/10.20885/millah.vol23.iss1.art6>
- Konold T, Cornell D, Jia Y, and Malone M (2018). School climate, student engagement, and academic achievement: A latent variable, multilevel multi-informant examination. *AERA Open*, 4(4). <https://doi.org/10.1177/2332858418815661>
- Lin J, Wang C, Xu S, Zhang L, and Zhang Y (2025). Boarding education and children's human capital development. *Journal of Economic Behavior & Organization*, 232: 106948. <https://doi.org/10.1016/j.jebo.2025.106948>
- Martanti F, Shobirin MA, Fatkhurronji M, and Surjanto A (2025). Integration of learning, innovation, and SDGs value in pesantren: Sustainable Islamic education development. *Profetika: Jurnal Studi Islam*, 26(2): 457-470. <https://doi.org/10.23917/profetika.v26i02.11553>
- Martínez-Torregrosa J, Sarriugarte P, Rosa-Cintas S, and Guisasaola J (2025). A circular motion problem to encourage deep understanding and use of scientific practices. *Physics Education*, 60(4): 045032. <https://doi.org/10.1088/1361-6552/addc2c>
- Mashuri S, Futaqi S, and Sulhan A (2024). Spiritual base of pesantren for building multicultural awareness in Indonesia context. *Jurnal Ilmiah Islam Futura*, 24(1): 1-20. <https://doi.org/10.22373/jiif.v24i1.17141>
- McCoach DB, Yu H, Gottfried AW, and Gottfried AE (2017). Developing talents: A longitudinal examination of intellectual ability and academic achievement. *High Ability Studies*, 28(1): 7-28. <https://doi.org/10.1080/13598139.2017.1298996>
- Moon JM, Camburn EM, and Sebastian J (2022). Streamlining your school: Understanding the relationship between instructional program coherence and school performance. *School Effectiveness and School Improvement*, 33(2): 260-279. <https://doi.org/10.1080/09243453.2021.2011750>
- Mosewich AD, Dunn JGH, Causgrove Dunn J, and Wright KS (2021). Domain-specific grit, identity, and self-compassion in intercollegiate athletes. *Sport, Exercise, and Performance Psychology*, 10(2): 257-272. <https://doi.org/10.1037/spy0000267>
- Rahmadani LS and Raharja S (2025). Revitalizing Islamic education: The role of management and curriculum design in addressing social change in pesantren. *Fikri: Jurnal Kajian Agama, Sosial Dan Budaya*, 10(1): 368-382. <https://doi.org/10.25217/jfv.10i1.6166>
- Ranieri M, Giampaolo M, and Bruni I (2019). Exploring educators' professional learning ecologies in a blended learning environment. *British Journal of Educational Technology*, 50(4): 1673-1686. <https://doi.org/10.1111/bjet.12793>
- Sabri D, Rowland C, Wyatt J, Stavrakopoulou F, Cargas S, and Hartley H (2008). Faith in academia: Integrating students' faith stance into conceptions of their intellectual development. *Teaching in Higher Education*, 13(1): 43-54. <https://doi.org/10.1080/13562510701794043>
- Sattler K and Gershoff E (2019). Thresholds of resilience and within-and cross-domain academic achievement among children in poverty. *Early Childhood Research Quarterly*, 46:

87-96.

<https://doi.org/10.1016/j.ecresq.2018.04.003>

PMid:30739988 PMCID:PMC6364857

Sewasew D and Schroeders U (2019). The developmental interplay of academic self-concept and achievement within and across domains among primary school students. *Contemporary Educational Psychology*, 58: 204-212.

<https://doi.org/10.1016/j.cedpsych.2019.03.009>

Silahuddin S, Saiful S, Ikhwan M, Zulfikar T, and Sh H (2025). Looking inside traditional Islamic schools: Concerns and prospects of learning culture. *Jurnal Ilmiah Peuradeun*, 13(1): 1-22. <https://doi.org/10.26811/peuradeun.v13i1.1179>

Tang JT, Lin MH, Jau YY, Lan WC, and Chou HL (2025). Integrating science education through cross-disciplinary digital picture books. *Science & Education*, 34: 2525-2551.

<https://doi.org/10.1007/s11191-024-00567-3>

Taub M, Azevedo R, Bouchet F, and Khosravifar B (2014). Can the use of cognitive and metacognitive self-regulated learning

strategies be predicted by learners' levels of prior knowledge in hypermedia-learning environments? *Computers in Human Behavior*, 39: 356-367.

<https://doi.org/10.1016/j.chb.2014.07.018>

PMCID:PMC8368490

Vashe A, Devi V, Rao R, Abraham RR, Pallath V, and Umakanth S (2019). Using an integrated teaching approach to facilitate student achievement of the learning outcomes in a preclinical medical curriculum in India. *Advances in Physiology Education*, 43(4): 522-528.

<https://doi.org/10.1152/advan.00067.2019> **PMid:31642706**

Vignetti S, Giffoni F, Pancotti C, and Pagliara F (2020). Analytical framework for ex-post evaluation of transport projects: Lessons learnt on retrospective CBA. *Papers in Regional Science*, 99(3): 683-703. <https://doi.org/10.1111/pirs.12501>

Wilkey ED (2023). The domain-specificity of domain-general: Attention, executive function, and academic skills. *Mind, Brain, and Education*, 17(4): 349-361.

<https://doi.org/10.1111/mbe.12373>