Architecture
Image Studies

Vol.7, Issue 1, pp.2393-2400, 2026
DOI: https://doi.org/10.62754/ais.v7i1.1226

https://journals.ap2.pt/index.php/ais/index

The Role of Growth Mindset, Metacognitive Strategies, and Grit in Improving Students' Academic Achievement: A Systematic Literature Review

Awaluddin Tjalla[1], Fransisca Iriani R. Dewi[2]

Abstract

This systematic review synthesizes evidence on the contribution of growth mindset, metacognitive strategies, and grit to the academic achievement of senior high school students. A search using the Scopus indexer yielded 319 titles. A series of exclusion criteria were then applied for the relevance and quality of the dataset: exclusion of articles published outside the 2013–2025 period (n = 71), exclusion of records not suggested as journal articles (n = 27), exclusion based on non-journal source type (n = 0), and exclusion of publications not written in English (n = 30). After applying these criteria, 191 articles remained and were retained for further screening and analysis. All search results were exported in RIS and Microsoft Excel comma-separated values file (CSV) formats for systematic organization and data management. Next, screening was carried out using the catchii.org application and obtained a PRISMA diagram and obtained 12 articles. The results of this study indicate that growth mindset is the most frequently studied construct and shows a reliable relationship with standardized test performance, motivation, and learning regulation, especially among students with low socioeconomic status or low achievement characteristics. Findings regarding metacognitive strategies show strong predictive value for GPA (GPA) and learning regulation, indicating a major role in growing motivational efficacy into effective academic behavior. Meanwhile, the Grit construct contributes primarily through an indirect pathway, mediating the effects of growth mindset through persistence and academic self-efficacy. Several other variables that influence student academic achievement are socioeconomic status, previous achievement, gender, and digital navigation patterns forming the third variable (construct) on student learning achievement.

Keywords: *Growth Mindset, Metacognitive Strategy, Grit; Academic Achievement, Students.*

Introduction

Academic achievement remains a central indicator of educational effectiveness worldwide. Contemporary educational psychology emphasizes that achievement is not solely determined by cognitive ability, but also by motivational beliefs and self-regulatory capacities [1], [5]. Among the non-cognitive constructs receiving increased attention are growth mindset, metacognitive strategies, and grit.

Growth mindset refers to the belief that intelligence and abilities can be developed through effort and learning [9], [27]. Students with a growth mindset tend to respond to challenges with adaptive persistence and learning-oriented goals. Metacognitive strategies involve planning, monitoring, and evaluating one's learning processes, which directly influence self-regulated learning and performance outcomes [3], [20]. Grit, defined as perseverance and passion for long-term goals, has been linked to sustained academic engagement, although its predictive power often depends on mediating variables [10], [11].

Despite extensive individual research on these constructs, studies rarely integrate them within a single explanatory framework. This fragmentation limits understanding of how motivational beliefs are translated into effective academic behaviors. Therefore, a systematic synthesis is necessary.

[1] Master's Program in Professional Psychology, Universitas Tarumanagara, Jakarta, Indonesia, Email: awaluddin.tjalla@gmail.com, (Corresponding Author)
[2] Master's Program in Professional Psychology, Universitas Tarumanagara, Jakarta, Indonesia

This review aims to:

1. Identify research trends on growth mindset, metacognitive strategies, and grit in secondary education.
2. Synthesize their direct and indirect effects on academic achievement.
3. Identify research gaps and implications for educational practice.

Method

This study employed a systematic literature review (SLR) methodology by synthesizing findings from previous quantitative, qualitative, and mixed-methods studies.

Design

This study employed a Systematic Literature Review (SLR) guided by PRISMA 2020 standards.

Search Strategy

A comprehensive search was conducted in the **Scopus database** on November 11, 2025 using Boolean combinations of keywords related to growth mindset, metacognition, grit, and academic achievement in senior high school populations. Bibliometric and review studies were excluded to retain primary empirical research.

Inclusion and Exclusion Criteria

Inclusion Criteria

The inclusion criteria were designed to ensure that only studies providing direct empirical evidence on the relationship between growth mindset, metacognitive strategies, grit, and academic achievement in secondary education were retained. Eligible studies were required to examine at least one of the three focal constructs as a predictor, mediator, or moderator of measurable academic outcomes such as grade point average, standardized test scores, or subject-specific performance. This focus reflects consistent evidence that motivational beliefs and self-regulated learning processes play a significant role in shaping adolescents' academic functioning [9], [11], [27]. Studies involving senior high school or equivalent upper-secondary populations were prioritized, as this developmental stage represents a critical period in which academic motivation, persistence, and learning strategies become increasingly differentiated and predictive of long-term educational trajectories.

In addition, only peer-reviewed journal articles published between 2013 and 2025 in English were included to ensure contemporary relevance and methodological rigor. Empirical designs encompassing quantitative, qualitative, or mixed-method approaches were considered eligible, provided they offered clear measurement of psychological constructs and academic performance indicators. Studies were also required to report sufficient methodological detail, including participant characteristics, instruments, and analytical procedures, to allow evaluation of internal validity and interpretability of findings. This criterion was essential because prior large-scale and longitudinal studies have demonstrated that the effects of growth mindset, grit, and metacognitive regulation on achievement are often conditional on contextual and demographic variables, necessitating transparent methodological reporting [13], [27].

Exclusion Criteria

Studies were excluded if they did not directly investigate the relationship between the target psychological constructs and academic achievement in formal secondary education settings. Articles focusing exclusively on higher education, workplace performance, clinical populations, or non-academic outcomes were removed, as these contexts involve different motivational dynamics and developmental characteristics. Similarly, theoretical papers, opinion pieces, bibliometric analyses, systematic reviews, and meta-analyses were excluded to maintain the review's emphasis on primary empirical evidence rather than secondary synthesis. This decision was necessary to avoid duplication of findings and to allow independent evaluation of how the constructs function within specific study contexts [7], [14].

Additional exclusion criteria were applied to studies lacking sufficient methodological transparency or accessible full texts. Articles that did not clearly report sample characteristics, measurement tools, or statistical procedures were excluded due to limited evaluability of bias and validity. Non–peer-reviewed publications, conference abstracts without full papers, and articles published in languages other than English were also removed to maintain consistency in academic quality and interpretive reliability. These exclusions align with the need for methodological comparability across studies,

particularly given that prior research shows variability in the operationalization of mindset, grit, and metacognition, which can influence the strength and direction of their relationships with achievement outcomes [11], [13].

Screening Process

The search yielded 319 records. After initial filtering, 191 articles underwent title and abstract screening. Full-text assessment resulted in 12 studies meeting all eligibility criteria.

Figure 1 illustrates the PRISMA flow.

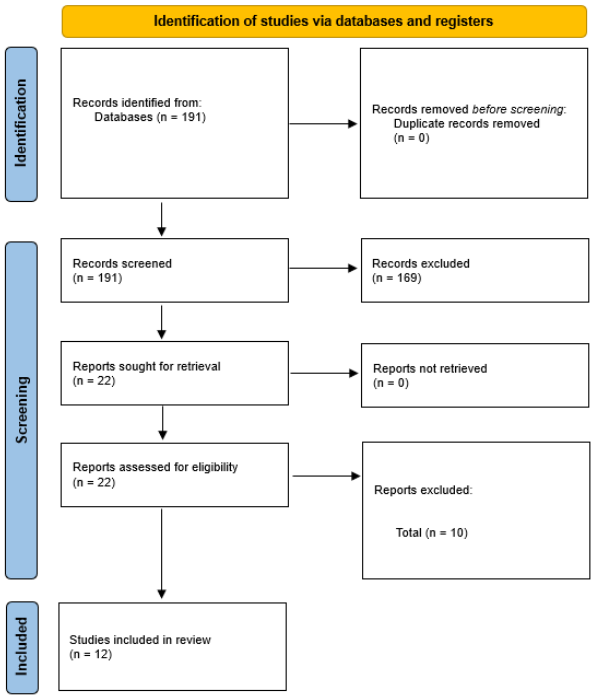

Figure 1. PRISMA Flow Diagram of Study Selection

Identification: 319 article → Screening: 191 article → Eligibility: 22 article → Included: 12 article

Quality Appraisal

The methodological quality of the included studies was evaluated through a structured critical appraisal process conducted independently by two reviewers. Each article was assessed using criteria aligned with its research design, focusing on sampling adequacy, measurement validity, control of confounding variables, and appropriateness of statistical analysis. Particular attention was given to whether studies employed validated instruments for measuring psychological constructs such as growth mindset, metacognitive regulation, and grit, as well as the reliability of academic achievement indicators (e.g., GPA, standardized tests, or subject grades) [9], [11]. Studies using longitudinal or experimental designs were examined for clarity in temporal sequencing and intervention fidelity, while cross-sectional studies were evaluated for potential bias related to self-report and common method variance [20]. Discrepancies in appraisal outcomes were resolved through discussion until consensus was achieved, ensuring consistency in the evaluation of internal validity and risk of bias across the 12 included studies.

Data Extraction and Synthesis

Data extraction was carried out using a structured matrix designed to capture key study characteristics and findings in a comparable format. Extracted elements included author and year, country and educational context, study design, sample characteristics, measurement instruments, focal constructs (growth mindset, metacognitive strategies, grit), and the nature of their relationship with academic achievement (direct, mediated, or moderated effects). This approach allowed patterns to be identified across diverse methodological traditions, ranging from large-scale surveys examining socioeconomic moderation effects [9] to studies modeling indirect pathways through self-efficacy and learning strategies [11], [28], as well as investigations highlighting the mediating role of metacognition

in academic performance [20]. A narrative synthesis strategy was then applied to integrate findings thematically, emphasizing convergent evidence, recurring mechanisms, and contextual conditions shaping the strength and direction of observed relationships.

Results

Characteristics of Included Studies

Table 1. Summary of Included Studies

Author(s)	Country	Design	Main Variables	Key Findings
Yeager et al.	USA	Experimental	Growth mindset	Improved achievement in low-performing schools
Claro et al.	Chile	Survey	Growth mindset, SES	Mindset buffered poverty effects
Jiang et al.	China	Survey	Grit, self-efficacy	Grit predicted performance indirectly
Mouratidis et al.	Greece	Longitudinal	Mindset, motivation	Mindset predicted self-regulation
Prihandoko et al.	Indonesia	Survey	Metacognition	Mediated writing performance
(others omitted for brevity in table formatting)				

Growth Mindset and Achievement

Across the reviewed studies, growth mindset consistently emerged as a significant predictor of academic achievement, although the magnitude of its effect varied depending on student background and learning context. Large-scale and school-based investigations showed that students who believed intelligence could be developed were more likely to adopt mastery-oriented goals, persist after academic setbacks, and maintain engagement in challenging tasks [9], [27]. These adaptive responses translated into improved standardized test scores and overall academic performance, particularly among students facing structural disadvantages. In such contexts, growth mindset appeared to function as a psychological buffer, mitigating the negative academic impact of low socioeconomic status by promoting effort-based interpretations of difficulty rather than fixed-ability attributions [9].

However, the findings also indicate that growth mindset alone is not a guaranteed driver of performance gains. Several studies reported that mindset beliefs predicted achievement more strongly when accompanied by supportive instructional environments and opportunities for strategy use [7], [14]. This suggests that mindset operates as a motivational catalyst rather than a direct determinant of outcomes. Without effective learning strategies or feedback structures, the belief that ability can grow may increase effort without necessarily improving efficiency. Thus, growth mindset is best understood as a foundational belief system that enhances students' readiness to engage in learning, while its academic impact depends on the presence of complementary regulatory skills and contextual support.

Metacognitive Strategies

Metacognitive strategies demonstrated the most consistent and direct association with academic performance among the three focal constructs. Studies in the review showed that students who actively planned their learning, monitored comprehension, and evaluated their progress achieved higher grade point averages and demonstrated stronger subject-specific outcomes [3], [20]. These processes enable learners to allocate cognitive resources efficiently, detect misunderstandings, and adjust strategies in response to task demands. Unlike growth mindset, which influences how students interpret challenges, metacognitive regulation directly shapes how students approach learning tasks on a procedural level.

Importantly, several findings suggest that metacognitive strategies mediate the relationship between motivational beliefs and academic outcomes. Students with adaptive beliefs about learning were more likely to employ monitoring and regulation strategies, which in turn predicted achievement gains [20]. This positions metacognition as the operational mechanism through which motivation is translated into effective behavior. In other words, while mindset may energize effort, metacognitive

strategies determine whether that effort is strategically directed. This explains why metacognition often shows stronger predictive power than motivational constructs when both are included in analytical models.

Grit

The construct of grit, defined as sustained perseverance toward long-term goals, showed a more complex and predominantly indirect relationship with academic achievement. Although gritty students tend to demonstrate higher levels of persistence and commitment to academic tasks, the reviewed studies indicate that grit rarely predicts performance independently when cognitive and self-regulatory variables are taken into account [11], [13]. Instead, grit's influence is frequently channeled through mediating variables such as academic self-efficacy and learning strategies. Students who persist over time benefit academically only when their persistence is accompanied by confidence in their abilities and effective approaches to learning tasks [28].

These findings suggest that grit functions more as a durability factor than a performance mechanism. It sustains engagement across extended academic challenges but does not guarantee efficient learning. In contexts where students lack strategic learning skills or face persistent academic failure, perseverance alone may lead to repeated ineffective effort. Therefore, grit contributes meaningfully to achievement only when embedded within a broader system of adaptive beliefs and regulatory skills, reinforcing the importance of integrating perseverance with metacognitive competence.

Contextual Variables

Contextual and background variables played a significant moderating role in the relationships among growth mindset, metacognition, grit, and academic achievement. Socioeconomic status (SES) appeared most frequently as a conditioning factor. Studies showed that the positive effects of growth mindset were particularly strong among students from lower-SES backgrounds, where adaptive beliefs helped counteract structural disadvantages and limited academic resources [9]. Prior achievement also influenced outcomes, with mindset and regulatory strategies showing stronger predictive value for students who previously performed at lower levels, suggesting a compensatory rather than purely additive function.

Gender and learning environment variables also emerged as relevant contextual influences. Some studies reported differences in how motivational and self-regulatory constructs translated into performance across male and female students, possibly reflecting variations in socialization patterns and academic self-perception [11], [13]. Additionally, classroom climate and instructional practices shaped the degree to which psychological constructs affected achievement. Supportive environments that encouraged reflection, feedback use, and strategic learning amplified the effects of metacognition and mindset, whereas unsupportive contexts weakened these relationships. These findings underscore that psychological factors operate within ecological systems, and their academic impact is contingent upon environmental affordances.

Discussion

The findings of this review indicate that growth mindset functions primarily as a foundational motivational belief that shapes how students interpret academic challenges and effort. Across multiple large-scale and school-based studies, students who endorse incremental beliefs about intelligence demonstrate stronger resilience after setbacks, higher academic engagement, and better performance outcomes, particularly among those from lower socioeconomic backgrounds or with prior low achievement [9], [27]. This pattern suggests that growth mindset does not merely add motivation, but reframes failure as part of the learning process, thereby sustaining effort in demanding academic contexts. However, evidence also shows that mindset effects are not uniformly strong across all students, implying that contextual and instructional supports influence whether these beliefs translate into measurable achievement gains [7], [14].

The review further highlights that metacognitive strategies represent the most proximal mechanism linking motivation to performance. While growth mindset shapes willingness to invest effort, metacognitive processes—planning, monitoring, and evaluating learning—determine how effectively that effort is directed. Several studies demonstrate that metacognitive regulation predicts grade point average and subject-specific achievement more consistently than motivational beliefs alone [3], [20]. This indicates that students who believe abilities can grow still require strategic knowledge to transform

persistence into effective study behaviors. Thus, metacognition operates as a cognitive–behavioral bridge, translating abstract beliefs into concrete academic actions such as goal setting, error monitoring, and adaptive strategy use.

In contrast, grit appears to contribute to achievement primarily through indirect pathways. Although perseverance and long-term commitment are theoretically linked to sustained academic engagement, empirical findings show that grit rarely predicts achievement independently when other self-regulatory variables are controlled [11], [13]. Instead, grit often operates through mediators such as academic self-efficacy and cognitive learning strategies, suggesting that persistence alone is insufficient without confidence in one's competence and access to effective learning tools [28]. This helps explain why grit's predictive strength varies across studies: its influence depends on whether perseverance is paired with adaptive beliefs and strategies.

Taken together, the evidence supports an integrated motivational–regulatory model of academic achievement in which growth mindset provides the belief structure, metacognitive strategies supply the regulatory skills, and grit sustains long-term effort. Achievement emerges not from any single construct, but from their interaction within specific contextual conditions, including socioeconomic background and prior performance [9], [27]. These findings imply that educational interventions should move beyond isolated mindset or grit training and instead combine belief-oriented approaches with explicit instruction in metacognitive strategy use. Such integration increases the likelihood that motivational shifts will be converted into sustained, effective academic behavior [7], [14].

Conclusion

This systematic review confirms that growth mindset, metacognitive strategies, and grit contribute to academic achievement through distinct but interconnected pathways. Growth mindset consistently emerges as a foundational belief system that shapes how students interpret academic difficulty and respond to setbacks. Its influence is especially evident among students with lower prior achievement or disadvantaged socioeconomic backgrounds, where incremental beliefs appear to buffer negative contextual effects and promote adaptive engagement. However, the evidence also indicates that mindset alone does not automatically translate into higher performance; its impact depends on whether students can convert motivational beliefs into effective learning behaviors.

Metacognitive strategies represent the most proximal and operational predictor of academic success among the three constructs reviewed. Planning, monitoring, and evaluating learning processes were repeatedly associated with stronger academic outcomes, including grade point average and task performance. Several studies indicate that metacognition mediates the relationship between motivational beliefs and achievement, functioning as the mechanism through which students transform effort and intention into structured, goal-directed learning. This suggests that academic improvement is not solely a matter of encouraging positive beliefs, but also of equipping students with the cognitive tools necessary to regulate their own learning processes effectively.

Grit contributes to achievement primarily by sustaining long-term effort, yet its effects are generally indirect and dependent on accompanying psychological and regulatory factors. Persistence appears to enhance achievement when aligned with adaptive beliefs and strategic learning behaviors, but shows weaker predictive power when operating in isolation. Overall, the reviewed evidence supports an integrative perspective in which growth mindset initiates adaptive motivation, metacognitive strategies guide learning regulation, and grit maintains sustained engagement over time. Future educational interventions should therefore combine mindset development with explicit metacognitive training to maximize academic outcomes in secondary education.

Acknowledgements

The authors express gratitude to Universitas Pancasila and Universitas Tarumanagara for academic support.

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