



The Mediating-Moderating Role in The Relationship Between Self-Efficacy and Academic Boredom: A Meta-Analytic Approach

Ghozali Rusyid Affandi¹, Cholichul Hadi¹, Nur Ainy Fardana¹, Mohd Nazri Bin Abdul Rahman², Xinyue Yang²

¹Psychology Doctoral Program, Faculty of Psychology, Universitas Airlangga, Indonesia

²Department of Educational Psychology and Counselling, Faculty of Education, Universiti Malaya, Malaysia

*Correspondence to: cholichul.hadi@psikologi.unair.ac.id

Abstract: Academic boredom can adversely affect student motivation and performance, necessitating an exploration of its psychological foundations. This meta-analysis delves into the interplay between self-efficacy and academic boredom, underscoring the significance of mediators and moderators in this dynamic. A systematic review across various databases, including ScienceDirect, Web of Science, SCOPUS, ProQuest, Emerald Insight, and Springer Link, identified 17 relevant studies, encompassing 8631 participants. The quality of these studies was scrutinized using the JBI Critical Appraisal Checklist. The meta-analysis, which utilized a random-effects model, found a noteworthy negative correlation between self-efficacy and academic boredom ($r = -0.34$, $p < 0.05$). The analysis revealed high heterogeneity ($I^2 = 91.49\%$), indicating significant differences among the studies. Additional findings pointed to social interaction and task performance as essential mediators, while factors such as the learning environment and genetics, notably MAOA, served as moderators. This research suggests that self-efficacy can act as a buffer against academic boredom, highlighting the importance of interventions that enhance self-efficacy and promote engaging learning environments. This study contributes to formulating effective strategies to combat academic boredom and improve student educational outcomes by integrating cognitive, emotional, and contextual factors.

Keywords: academic boredom; environmental; meta-analysis; psychological trait; self-efficacy

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INTRODUCTION

Academic boredom is a well-known negative emotion common among students in a learning environment. As a result, boredom can negatively affect students' motivation, concentration, and academic performance. Student boredom is defined as a complex, persistent, and negative emotion they experience during academic activities (Ekatushabe, Kwarikunda et al., 2021a; Martz et al., 2018; Pekrun, 2024; Sharp et al., 2020). Academic boredom can also become a barrier to learning and may lead to the students' academic performance deterioration. It has thus become even more important to tackle this problem as we move forward in an environment where more and more emphasis is placed on education. Research shows that 20% to 66% of students suffer from academic boredom, which affects the quality of learning (Martz et al., 2018; Schwartze et al., 2020). They often complain about the lack of diversity in the teaching approaches, making them feel stuck in a rut. This suggests that academic boredom is not just a personal issue but also a sign of issues within the school (Sharp et al., 2020).

Self-efficacy is one of the most important factors contributing to academic boredom, which means people believe in their abilities to carry out specific objectives. Students must believe in their self-efficacy to learn and not just get bored. The fact that students who have such skills are resistant to boredom leads to further less boredom when facing obstacles (Puente-Diaz & Cavazos-Arroyo, 2017; Sánchez-Rosas, 2015). At least the empirical evidence regarding self-efficacy and academic boredom remains inconclusive as to a conclusive impact. Accordingly, the results of the investigation suggest that increasing self-efficacy reduces boredom (Liu & Lu, 2017; Schwartze et al., 2020). However, numerous research studies have revealed inconsistencies in these outcomes. These differences lead to research speculations that additional factors, social environments, and learning context may significantly affect the development of the students' self-estimate (Fatimah et al., 2024; Liu & Lu, 2017; Sánchez-Rosas, 2015). However, to ascertain the necessity of these components, it is important to analyze them jointly since this could influence the results.

Despite the considerable research undertaken, there remains a deficiency of evidence concerning the mediating and moderating elements in the association between self-efficacy and academic boredom. Some studies indicate that social support, engagement, and task value may moderate or mediate this connection;

nevertheless, the findings are inconsistent (Ekatushabe, Kwarikunda et al., 2021; Zhao & Yang, 2022). Consider the effect of strong social support that can increase students' self-efficacy, which might reduce boredom (Boehme et al., 2017). However, empirical evidence on these factors in the context of academic boredom remains limited. Although there is a scoping review research on the factors that influence academic boredom conducted by Affandi et al. (2023), this research does not explicitly explore the relationship between self-efficacy and boredom and the dynamics between these relationships. Moreover, existing studies lack a systematic synthesis of these relationships, making generalizing findings across different learning environments difficult. Addressing this research gap is essential for developing targeted interventions to improve student motivation and engagement. Consequently, a thorough meta-analysis is essential for exploring the mediating roles of psychological traits in evaluating the moderating relationship between self-efficacy and academic boredom. This meta-analysis is anticipated to provide a much deeper understanding of the processes through which numerous psychological factors function in the educational milieu. However, it will also present practical suggestions for alleviating academic boredom among students—because, although the factors at play are intricate, the insights derived could prove invaluable (Camacho-Morles et al., 2021). Understanding this relationship enables educators and policymakers to develop better ways of enhancing students' motivation and participation.

Although numerous studies have explored self-efficacy and academic boredom separately, few have examined mediating and moderating influences within a single framework. Despite the existence of scoping reviews, they have not explicitly examined the dynamics of the relationship between self-efficacy and academic boredom. This urgently requires a comprehensive meta-analysis consolidating existing evidence and clarifying how psychological traits shape this relationship. This study aims to assess the consistency of the relationship between self-efficacy and academic boredom while identifying psychological traits that mediate or moderate this link. This study aims to inform the development of evidence-based strategies that minimize academic boredom and enhance student learning experiences by addressing these gaps.

METHODS

This research utilizes the systematic review and meta-analysis (SRMA) method, following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al., 2021). The data collection process consisted of several stages. The first stage is keyword compilation. Keywords used were ("self-efficacy" or "academic self-efficacy") and ("academic boredom" or "boredom in school" or "boredom"). The development of these keywords was guided by the PICO framework (Eriksen & Frandsen, 2018), where P (Participant) represents students, I (Intervention) is self-efficacy, C (Comparison) is not applicable as the study did not include group comparisons, and O (Outcome) is academic boredom. The second stage is database search. Five online databases were searched, including Science Direct, Web of Science, SCOPUS, Emerald Insight, and Springer Link. Dissertations or theses taken from ProQuest were also included to minimize publication bias (Sutton, 2009). The search was limited to studies published within the last 5-10 years (2019-2023), except for studies from the Web of Science (2014-2023) to capture the most recent and relevant research. The last stage is discipline scope. The searches spanned several scientific disciplines - psychology, social science, arts, humanities, and education – yielding 681 studies.

This research included original articles, dissertations, and theses that employed quantitative methods. The focus was restricted to studies that examined the relationship between self-efficacy and academic boredom. The population criteria were limited to students within a learning context, and articles published before May 19, 2023, were included. Review articles, abstracts, editorials, qualitative methods, and descriptive studies were excluded. Additionally, articles that did not address the relationship between self-efficacy and academic boredom or did not focus on a student population were excluded. The articles from online databases, totaling 681, were selected using Rayyan.ai (<https://www.rayyan.ai>). All article data entered into the software were screened based on the inclusion and exclusion criteria following the PRISMA 2020 procedure (Page et al., 2021). An illustration of the article selection process is shown in Figure 1, and details of the included studies are listed in Table 7. Of the 681 articles, 50 were identified as duplicates and subsequently removed. The researchers then reviewed the titles and abstracts of the remaining 631 articles. In the next stage, screening based on inclusion and exclusion criteria yielded 155 relevant articles based on the titles and abstracts. From this, the full text was examined, and 127 articles were excluded for not meeting the criteria, leaving 28 eligible articles. In the final selection stage, these 28 articles were reviewed thoroughly, resulting in 17 articles deemed suitable for inclusion in the review process and reporting in this research. The general information extracted from each study included details such as study label, title, context, sample size, and statistical findings regarding the relationship between self-efficacy and academic boredom.

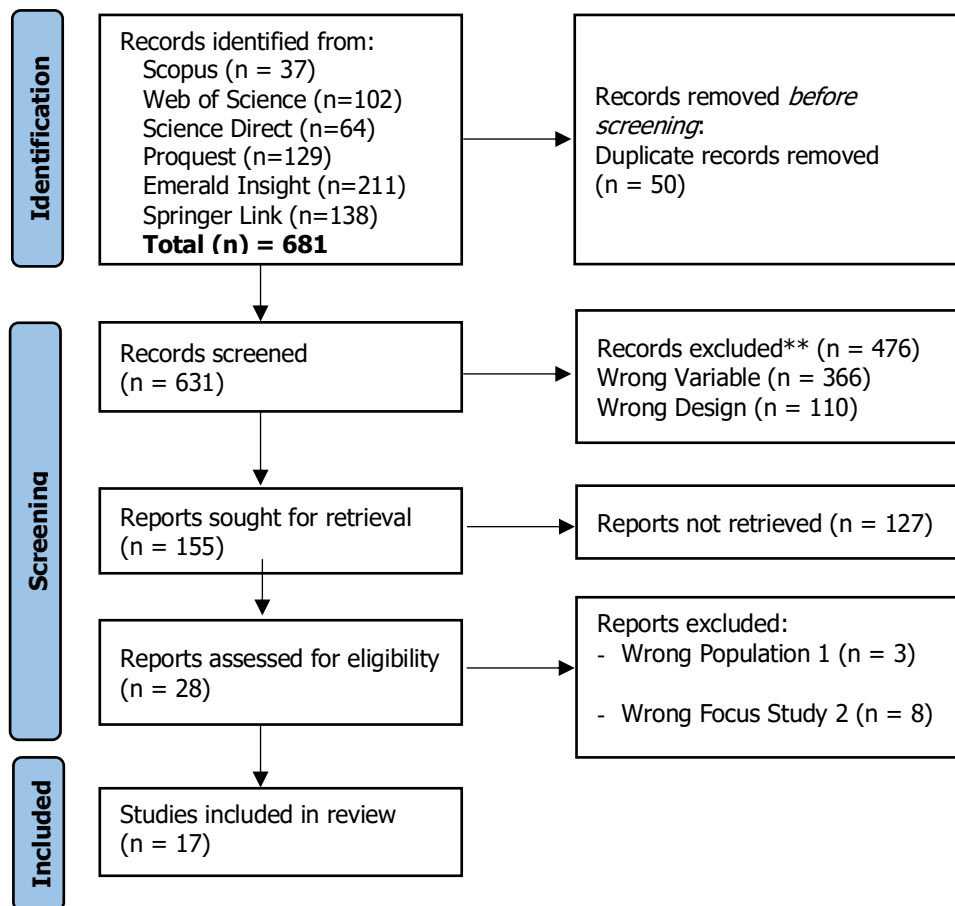


Figure 1. Flow diagram of article selection on the relationship between self-efficacy and academic boredom following PRISMA 2020 guidelines

The risk of bias was assessed using the JBI Critical Appraisal Checklist for Analytical cross-sectional studies (Aromataris & Munn, 2024). The checklist focuses on the methodological quality of the studies and evaluates how well each study addressed potential biases in its design, conduct, and analysis. Using checklists to assess the quality of research, particularly in survey-based studies within psychology, is considered an effective method for evaluating the quality and validity of research findings (Protogerou & Hagger, 2019). The JBI Critical Appraisal Checklist for analytical cross-sectional studies consists of 8 items (Aromataris & Munn, 2024). Each item is scored as follows: Yes = 1, No/ Unclear = 0. The total score is divided by 8 and multiplied by 100% to yield a "quality percentage," which classifies each study into one of the following categories: 1) Good quality study: quality percentage of 66.7% or higher; 2) Sufficient quality study: quality percentage between 50% and 66.6%; and 3) Poor quality study: quality percentage of less than 50% (Boxberger & Reimers, 2019; Newell et al., 2000). To analyze the direction of the relationship and effect size of self-efficacy on academic boredom, the researchers used the Jamovi program (version 2.3.12) with a random-effects meta-analysis model. The synthesis results were displayed in the form of a forest plot. The interpretation of effect size was based on Cohen's guidelines, where $d = 0.2$ represents a small effect, $d = 0.5$ represents a medium effect, and $d = 0.8$ represents a significant effect (Goss-Sampson, 2019). Moderation analysis was carried out to examine variables that could contribute to high heterogeneity among the research results on the relationship between self-efficacy and academic boredom. This study tested categorical moderators, including school-level subgroups and regional subgroups, and continuous moderators, such as the average age of research subjects (Borenstein et al., 2007; Liu & Rahman, 2022). To assess publication bias, the researchers used a potential funnel plot asymmetry test with the Egger test ($p < 0.05$ indicating publication bias). They applied the failsafe (file drawer effect) method to estimate the number of unpublished studies that might lead to non-significant results (Borenstein et al., 2007).

RESULT AND DISCUSSION

Seventeen studies were analyzed using Jamovi software version 2.3.12 to determine the magnitude of the relationship between self-efficacy and academic boredom in the learning context and examine the consistency of effects across studies and mediation-moderation variables (Table 2). The results of the Q test

indicate a high level of heterogeneity ($Q = 188.0657$, $p < 0.0001$), with a tau-squared value of 0.0168 and an I^2 statistic of 91.4923%, suggesting considerable variability between studies. Despite this heterogeneity, the 95% prediction interval for the actual outcome is between -0.6265 and -0.0562, indicating that, while variability exists, the results of these studies are generally consistent with the estimated mean effect. However, given the significant heterogeneity, caution should be exercised when estimating the effect size.

Table 2. List of Studies Included in the Review, Correlation Coefficient, and Mediator-Moderator results

Study Label	Context	n	Raw r	Age	Mediation	Moderation
(Wang et al., 2017)	Junior High School	637	-0.45	14.82	Intrinsic value	-
(Liu et al., 2021)	Junior High School	512	-0.38	12.58	-	Gender
(Liu et al., 2020)	Junior High School	740	-0.07	na	-	Level of Self-regulated learning
(Dong et al., 2020)	Primary and Junior High School	391	-0.36	13.57	-	-
(Dugan et al., 2019)	Undergraduate	289	-0.12	na	-	-
(Liu & Lu, 2017)	Senior High School	514	-0.54	16.62	-	MAOA Gene
(Puente-Diaz & Cavazos-Arroyo, 2017)	Elementary public school	295	-0.18	11.06	-	-
(Membiela et al., 2023)	Undergraduate	3034	-0.42	na	Relevance of science learning for personal goals Interest in a scientific career	-
(Schickel & Ringeisen, 2020)	Undergraduate	158	-0.17	24.3	Presentation competence	-
(Feng et al., 2022)	Undergraduate	139	-0.43	19.87	-	-
(Ekatushabe, Nsanganwimana, et al., 2021)	Undergraduate	587	-0.52	16.99	-	-
(Jiang, 2023)	Undergraduate	272	-0.47	19.64	Cognitive load	-
(Obergruesser & Stoeger, 2015)	Elementary public school	85	-0.361	10.26	-	-
(Buil et al., 2016)	Undergraduate	207	-0.18	19.33	Academic control Value	-
(Kim et al., 2014)	Senior High School	72	-0.45	16.7	-	-
(Ekatushabe, Kwarikunda, et al., 2021b)	Junior High School	375	-0.39	15.03	Cognitive process	-
(Audrin & Hascoët, 2021)	Undergraduate	324	-0.26	na	Value	-

Table 3. Random-effects Model ($k = 17$)

	Estimate	with	With	p	CI Lower Bound	CI Upper Bound
Intercept	-0.341	0.0357	-9.56	< .001	-0.417	-0.266

Note. Tau² Estimator: DerSimonian-Laird. Knapp and Hartung adjustment used.

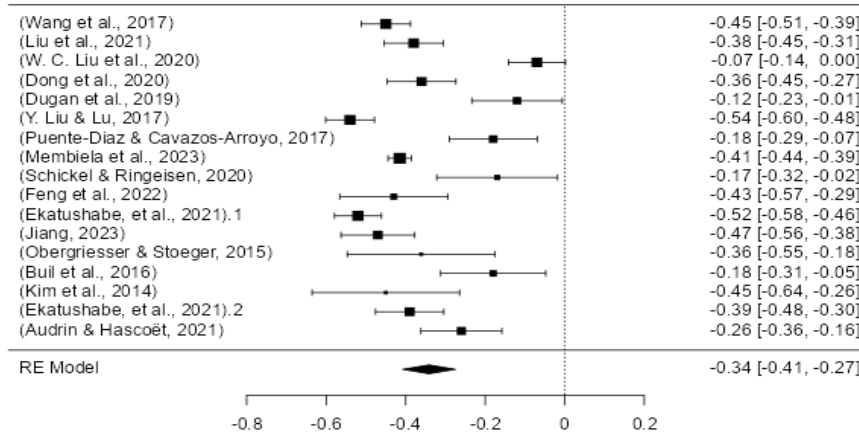


Figure 2. Forest Plot of studies of the relationship between self-efficacy and academic boredom

Based on Table 3, the majority of studies show a negative correlation (100%), providing strong evidence that self-efficacy has a significant negative relationship with academic boredom ($r = -0.34$; $p < 0.05$; 95% CI: -0.4081 to -0.2746). The magnitude of the effect of self-efficacy on academic boredom, as shown in Figure 2, is classified as moderate ($r = -0.34$), according to Cohen's guidelines for effect size. However, some studies report minimal standard errors (SE), such as those conducted by Dugan et al. (2019), Schickel and Ringeisen (2020), and Buil et al. (2016), which may indicate less precise estimates in these particular studies. The analysis of SE reveals that no studies had a value exceeding ± 2.9738 , indicating no outliers in this model. Additionally, based on Cook's distance, none of the studies excessively influenced the results. The funnel plot (see Figure 3), which is used to test for publication bias in this study, forms an asymmetrical shape. This asymmetry indicates the potential for publication bias and warrants further investigation due to the subjective nature of funnel plot interpretation. Including studies with varying quality - good, fair, and poor – may contribute to this asymmetry. Upon conducting further analysis by considering only studies with a score above 50% (8 studies), the Q test results showed no significant heterogeneity in the actual results ($Q(7) = 5.4964$, $p = 0.5996$, $\tau^2 = 0.0006$, $I^2 = 30.0528\%$). The revised funnel plot, which includes only these eight studies, showed less asymmetry. Regarding the fail-safe (file drawer effect), Table 4 shows that if approximately 7.775.000 unpublished studies were included, the correlation between self-efficacy and academic boredom would become insignificant (Borenstein et al., 2007; Fragkos et al., 2014; Rosenthal, 1979).

Table 4. Publication bias assessment

Test Name	value	p
Fail-Safe N	7.775.000	< .001
Begg and Mazumdar Rank Correlation	0.324	0.076
Egger's Regression	1.126	0.278
Trim and Fill in the Number of Studies	0.000	.

Note. Fail-safe N Calculation Using the Rosenthal Approach

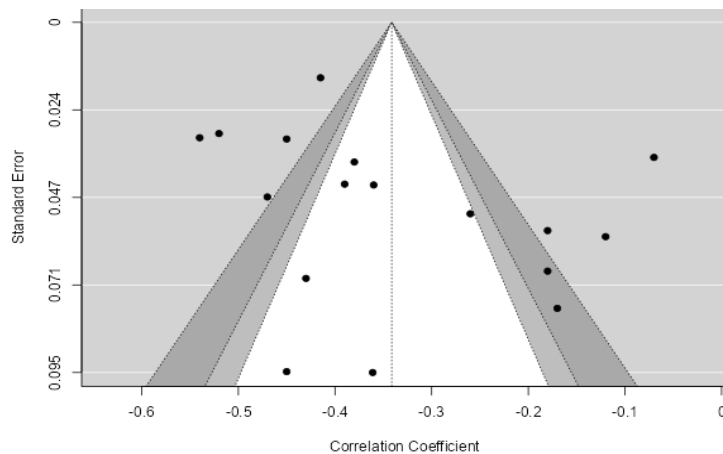


Figure 3. Funnel plot on the relationship between self-efficacy and academic boredom

The results of the risk of bias assessment show that studies on the relationship between self-efficacy and academic boredom in the educational context are divided into three categories. The first category includes high-quality studies (with a score $\leq 66.7\%$), totaling 6. These studies include the research by Wang et al. (2017), Liu et al. (2021), Dong et al. (2020), Feng et al. (2022), Jiang (2023), and Ekatushabe, Kwarikunda, et al. (2021c). Although several criteria were not fully met, which may have introduced bias, these studies achieved a checklist percentage of 75% -88%, indicating relatively high quality. The lowest risk of bias was found in the studies by Ekatushabe, Kwarikunda, et al. (2021c), Jiang (2023), and Feng et al. (2022), with scores of 88%. The second category comprises studies of moderate or adequate quality (with a score between 50%-66.6%) totaling seven studies. These include Liu and Lu (2017), Puente-Diaz and Cavazos-Arroyo (2017), Membiela et al. (2023), Schickel and Ringeisen (2020), Ekatushabe, Nsanganwimana (2021), Kim et al. (2014), and Audrin and Hascoët (2021). These studies noted the average issues related to the research subject, control for confounding variables, and unclear measuring instrument quality as weaknesses. The third category consists of studies classified as high risk, with a percentage of 38%, representing 4 studies. The primary issues in these studies are related to incomplete reporting of subjects and settings, as seen in the studies by Liu et al. (2020), Dugan et al. (2019), and Obergriesser and Stoeger (2015).

Although the studies were categorized based on their risk of bias, the results indicate that when combined using a random effects model, they show a significant negative relationship between self-efficacy and academic boredom. These findings suggest that the higher the level of student self-efficacy, the lower the academic boredom experienced. Despite the effect size being classified as small-medium, this could be attributed to the data analysis not separating studies based on their risk of bias (high, medium, or low) and high heterogeneity. This highlights that, while a relationship exists, the role of self-efficacy in reducing academic boredom requires further clarification and exploration. Self-efficacy plays a direct role in mitigating academic boredom among students (Buil et al., 2016). In other words, students with higher self-efficacy tend to experience academic boredom less frequently. According to the Control-Value Theory of Achievement Emotions (CVTAE), self-efficacy is a mediating factor in the relationship between the learning environment and academic boredom (Pekrun, 2006). A monotonous learning environment can be mitigated by students' adequate self-efficacy, which reduces the likelihood of academic boredom (Ekatushabe, Nsanganwimana et al., 2021).

Regarding effect size, the small-medium results from integrating studies that met the inclusion criteria may be due to the mediating effect in the relationship between self-efficacy and academic boredom. For instance, Liu and Lu (2017) found that the functional polymorphism of the "MAOA" gene moderates the relationship between academic self-efficacy and academic-related boredom, indicating that self-efficacy and genetic factors may interact to influence academic boredom. Furthermore, the nature of the learning situation, whether too challenging or not challenging enough, also impacts academic boredom, as does the task value students assign to the learning process (Acee et al., 2010; Sánchez-Rosas & Esquivel, 2017). Moreover, the small-medium effect size results can also be attributed to the high heterogeneity between studies ($I^2 = 91.4923\%$). The heterogeneity in this study may be due to the wide variation in research subjects, ranging from elementary school to university students. For instance, studies conducted by Buil et al. (2016), Feng et al. (2022), Jiang (2023), and Schickel and Ringeisen (2020) focused on university or secondary school students, while other researchers examined elementary school students as research subjects (Obergriesser & Stoeger, 2015; Puente-Diaz & Cavazos-Arroyo, 2017). According to Golle et al. (2022), age influences academic boredom, with younger students potentially being more prone to boredom in subjects like mathematics and English, while older students may experience boredom due to a lack of challenge. Nevertheless, the overall correlation results support a negative relationship between self-efficacy and academic boredom. This suggests that, despite the variations in research findings, there is consistency in the general conclusion that higher self-efficacy is associated with lower levels of academic boredom. Regarding publication bias, funnel plot analysis may suggest asymmetry or publication bias, potentially due to unpublished studies with insignificant results (Retnawati et al., 2018). However, the regression analysis results, specifically the Egger test ($p = 0.245 > 0.05$), indicate no publication bias in the studies included in the meta-analysis. The non-significant Egger test result indicates no relationship between effect size and study precision, further supporting the absence of publication bias in the studies used in this meta-analysis (Lin & Chu, 2018). Therefore, it can be concluded that the meta-analysis of previous studies regarding the relationship between self-efficacy and academic boredom shows that self-efficacy plays a significant role in reducing academic boredom in students. However, various studies show a lack of consistency in the relationship between self-efficacy and academic boredom. Research suggests that self-efficacy is crucial in the relationship between various factors and academic boredom (Affandi et al., 2023). High self-efficacy can act as a protective buffer against boredom by enhancing students' ability to engage actively with challenging academic material (Luo & Wang, 2023). Students confident in their abilities are more likely to approach tasks enthusiastically and persistently, even when faced with difficulties, reducing the likelihood of experiencing boredom (Liu & Lu, 2017). They may also be more proactive in seeking strategies to overcome boredom, such as seeking help from teachers or peers or finding alternative ways to engage with the material

(Luo & Wang, 2023). Conversely, low self-efficacy can exacerbate the experience of boredom, as students may feel overwhelmed by challenging tasks and perceive themselves as incapable of mastering the material (Luo & Wang, 2023). This sense of helplessness and lack of control can lead to increased feelings of frustration and disengagement, further intensifying the experience of boredom (Luo & Wang, 2023).

While self-efficacy is a key mediator, other factors contribute to the complex relationship between self-efficacy and academic boredom. Intrinsic motivation, the inherent enjoyment and satisfaction derived from engaging in an activity, has been identified as a significant mediator (Liu et al., 2023). Intrinsically motivated students are more likely to find academic tasks engaging and less prone to boredom, even if their self-efficacy levels are not exceptionally high (Liu et al., 2023). Perceived task value, perceived importance, and relevance of an academic task are also significant mediators. Students who believe a task is valuable and meaningful are less likely to experience boredom, regardless of their level of self-efficacy (You, 2012). The role of emotions, such as anxiety and enjoyment, further complicates this relationship (Şimşek et al., 2020). High levels of anxiety can disrupt concentration and engagement, leading to boredom (Şimşek et al., 2020). Conversely, the experience of enjoyment and interest in the subject matter can buffer against boredom (Pekrun & Stephens, 2010). These mediating variables highlight the multifaceted nature of academic boredom and the importance of considering cognitive and affective factors. Genetic factors can also influence the self-efficacy-boredom relationship, acting as moderators that alter the strength of the association (Liu & Lu, 2017). Liu and Lu (2017) demonstrated that the MAOA gene polymorphism moderated the relationship between self-efficacy and academic boredom in Chinese high school students. This finding suggests that genetic differences can influence susceptibility to boredom, even when controlling for self-efficacy levels (Liu & Lu, 2017). This highlights the importance of considering biological factors alongside psychological and environmental influences when studying academic boredom. Further research is needed to replicate this finding in diverse populations and to identify other potential genetic factors that may modulate this relationship.

Beyond individual differences, environmental factors significantly moderate the self-efficacy-boredom link. The teaching style employed by educators plays a critical role (Wang et al., 2017). Teachers who provide autonomy support, creating a supportive and engaging classroom environment, can buffer against boredom, even for students with low self-efficacy (Wang et al., 2017). Conversely, authoritarian teaching styles emphasizing control and compliance can increase boredom, regardless of self-efficacy levels (Ekatushabe, Kwarikunda, et al., 2021a). Curriculum design is another crucial moderator (Arafa & Jondi, 2024). A monotonous or unchallenging curriculum can lead to increased boredom, even for students with high self-efficacy, while a stimulating and engaging curriculum can reduce boredom, even for students with low self-efficacy (Arafa & Jondi, 2024). The learning environment itself (online versus traditional) also acts as a moderator (Lu & Rameli, 2023). While offering flexibility, online learning can also contribute to feelings of isolation and lack of interaction, potentially increasing boredom (Lu & Rameli, 2023). The level of social support and the quality of peer relationships also moderate the relationship, with supportive social contexts mitigating the negative impact of low self-efficacy on boredom (Pongoh & Palangda, 2023; Zhen et al., 2017).

This research offers fresh perspectives on the interplay between self-efficacy and academic boredom by methodically examining mediating and moderating elements that previous studies have primarily disregarded. Although earlier investigations have looked into the direct impacts of self-efficacy on academic boredom, they have not thoroughly explored how factors such as social interaction, task performance, and environmental contexts interrelate within this paradigm (Buil et al., 2016; Ekatushabe, Kwarikunda, et al., 2021b; Jiang, 2023; Membiela et al., 2023). The recognition of MAOA as a genetic moderator marks a significant addition to the field (Liu & Lu, 2017), as earlier research has mainly concentrated on environmental and psychological factors. Moreover, this study addresses discrepancies in earlier findings by illustrating that social support and engagement act as vital mediators, highlighting the significance of incorporating external influences in conjunction with individual psychological characteristics. This research enhances the field of educational psychology by presenting a more cohesive understanding of the processes through which self-efficacy affects academic boredom. The meta-analytic methodology bolsters the credibility of these results, offering empirical data that can guide future theoretical frameworks regarding student motivation and engagement. Furthermore, the findings have practical repercussions for educational policymakers and practitioners, underscoring the necessity for initiatives that boost self-efficacy and cultivate supportive educational settings. By pinpointing essential mediators and moderators, this research establishes a foundation for more focused approaches to alleviate academic boredom, ultimately enhancing student well-being and academic performance. The limitations of this research arise from several factors. First, the studies included in this meta-analysis span a maximum of 10 years, with some studies being limited to the last 5 years. This decision was made to prioritize recent empirical evidence; however, excluding studies before these time frames may have omitted valuable data that could have further strengthened the research findings. Furthermore, the analysis was conducted by a single researcher, which may limit the diversity of perspectives in evaluating the results.

CONCLUSION

This study highlights the complex relationship between self-efficacy and academic boredom by demonstrating the significant roles of mediators and moderators. The meta-analysis revealed a negative correlation between self-efficacy and academic boredom, indicating that students with higher self-efficacy are less likely to experience boredom. However, the effect size is classified as small-medium. Further analysis identified social interaction and task performance as key mediators, suggesting that fostering collaborative and goal-oriented learning environments can enhance self-efficacy and reduce boredom. Additionally, moderating factors such as the learning environment and genetic influences (MAOA) highlight the need for a more individualized approach to addressing academic disengagement. These findings contribute to educational psychology by offering a comprehensive framework for understanding how psychological and contextual factors influence student motivation. Applying these insights in educational settings can help develop targeted interventions, such as self-efficacy training and adaptive teaching strategies, to create more engaging learning environments. By integrating cognitive, social, and environmental factors, this research provides a foundation for improving student engagement, reducing boredom, and ultimately enhancing academic performance. Future research should explore additional contextual variables and intervention strategies to further our understanding of academic boredom and its long-term effects on learning outcomes. Besides that, future research should explore the interplay of multiple mediating and moderating variables simultaneously, moving beyond simple bivariate analyses to develop more sophisticated models that capture the complex interplay of these factors.

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