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The Effectiveness of Project-Based Learning on EFL Learners' Writing Performance across Educational Levels: A Meta-Analysis

Ken Kumala[1], Mujiono[2*], Uun Muhaji[3]

English Education Department, Universitas PGRI Kanjuruhan Malang[1,2,3]
kumalakena@gmail.com[1], moejie_nova@unikama.ac.id[2], uun.muhaji@unikama.ac.id[3]

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Abstract

Project-Based Learning (PjBL) is widely investigated in EFL writing instruction, but the differences among the various grade levels are still not addressed. This study adds to the current evidence and explores whether or not education levels might act as a moderating variable. After PRISMA 2020, a search was conducted in Scopus, Crossref, and Google Scholar, and a total of 20 studies involving a total of 1,377 learners across junior high school, senior high school, and university levels were identified. Hedges' g effect size estimates revealed a favourable overall effect for PjBL (g = 2.28, 95% CI [1.76, 2.80]) with high heterogeneity (I^2 = 93%). Subgroup analysis did not identify significant differences by level of education (p = .26); however, the numbers in each of the subgroups were small, and conclusions of equivalent benefits could not be drawn. The synthesis also provides an updated evaluation of writing outcomes and the average levels of instructional benefits for those outcomes, as well as evidence of no statistically significant differences between the examined educational-level subgroups. Results are consistent with a socially mediated approach to writing development (although the mechanisms remain unidentified), but are supportive of using projects, explicit instruction, and scaffolding to meet learners' needs. There are limitations of interpretation due to a nonrandomized design and some comparator and extraction inconsistencies. Further studies of eligibility and estimates of effects are needed before definite conclusions can be drawn regarding the magnitude, robustness, or generalizability of the benefits from PjBL in writing instruction.

Keywords: educational level, EFL writing performance, meta-analysis, Project-Based Learning

1. Introduction

PjBL has been widely used in EFL writing education in the last few years, but research evidence suggests that the effect of such instruction has not been consistent. Research on middle school, secondary school, and university students shows writing benefits, but is highly varied in terms of the subjects of the studies, the learners, the writing genres studied, the length of the instruction, the comparison condition used, and the project design. Thus, the focus is no longer only on whether PjBL has the potential to enhance EFL writing, but also on whether the size of its impact is systematic in different educational contexts. This orientation is especially significant in the case of writing, where a learner needs to be able to generate and organize ideas, select language to use, produce coherent text, and revise written products for specific communicative purposes. PjBL can be used to make writing part of an extended project where learners research a theme, discuss meaning, develop a product, and share the conclusions. The evidence syntheses done in recent years reveal that PjBL has increasingly been used in English writing instruction, and that it has been reported to be beneficial for the writing growth of learners while being problematic for implementation (Chao et al., 2025; Rosli et al., 2024). Preliminary research in various EFL contexts also shows that PjBL positively contributes to students' mastery of creative, narrative, persuasive, descriptive, and academic writing after PjBL implementation (Abdelazim et al., 2022; Alotaibi, 2020; Asrul et al., 2021; Irwandi et al., 2024). However, the diversity of these findings raises a more specific question concerning whether the magnitude of PjBL's effect on EFL writing performance differs across educational levels.

Primary studies have reported positive outcomes among middle school students Aldiansyah et al., (2024), secondary school students working on narrative, persuasive, descriptive, and creative writing (Alotaibi, 2020; Asrul et al., 2021; Qomariah et al., 2025; Rahmawati et al., 2025), and university students engaged in creative or academic writing (Abdelazim et al., 2022; Irwandi et al., 2024). Nevertheless, these findings represent different learner populations and instructional conditions rather than a directly comparable pattern of effectiveness. Differences in intervention duration, writing genres, project characteristics, technological integration, assessment procedures, and learner characteristics may also contribute to variation in reported outcomes. Consequently, findings from separate educational contexts cannot establish whether educational level itself accounts for differences in effect sizes. This distinction increases the need to shift away from statements of effectiveness based on context and toward the quantitative analysis of variation across levels.

It is important to know if there is a difference in the effectiveness of PjBL for learners from different levels of education, since it could mean that the learners at different educational levels might face significantly different linguistic, cognitive, metacognitive, and instructional demands. The level of scaffolding needed to plan projects, organize information, collaborate, and revise extended texts may be higher for younger or less experienced learners, and more advanced learners may have less need for scaffolding, or may be more capable of using their language skills and experience in autonomous academic writing. On the other hand, more complex writing assignments might have more demanding linguistic and disciplinary requirements and make the completion of the project more complicated. These possibilities render educational level of interest in theory, but do not yet determine upon which level, a priori, this interest should be greatest. For this reason, educational level should be examined as a potential moderator rather than treated as a predetermined source of advantage. Any apparent differences between educational levels therefore require formal meta-analytic comparison rather than conclusions drawn from separate study findings.

Constructivist principles offer a broad description of the processes of PjBL, how it can promote the development of writing through inquiry, collaboration, production, feedback and reflection. However, the mechanisms can be conditioned by the educational level: learners have selected different linguistic resources; they have different metacognitive regulation or writing experience, different levels of autonomy, and different needs of instructional scaffolding. Educational level is therefore theorized as a proxy contextual variable that changes the way that project-based writing activities can impact the gains that learners make when engaging with writing. In the context of EFL writing, project work can link these processes to ongoing occurrences of idea development, drafting, peer participation, feedback, revising, and meaningful communication. The processes can be taken as proof that PjBL can enhance writing performance because, through the process, the learners are not just practicing the language form but also creating knowledge through language and getting meaningful products. A study of PjBL in English writing in recent years also finds that these are the main elements involved in writing development: active participation, collaboration, creativity, authentic language use, and learning from experiences (Chao et al., 2025; Rosli et al., 2024). These mechanisms are consistent with empirical findings. For instance, Abdelazim et al., (2022) obtained a significant improvement in the EFL creative-writing skill of the English major without any significant difference between PjBL and non-PjBL groups and Asrul et al., (2021) stated a higher achievement in English writing skills for narrative writing for the PjBL group at class X. The findings support the theoretical plausibility of the relationship between PjBL and writing performance, while also demonstrating that improvement in writing does not necessarily establish a greater effect than a comparison condition. This reinforces the need to examine whether the mechanisms underlying PjBL operate similarly across educational levels.

Despite individual studies about PjBL gains being reported across all genres and tiers, results around effect sizes and study credibility are still very heterogeneous in the current empirical literature (Higgins et al., 2011; Inthout et al., 2016). There is evidence of writing benefits across secondary and tertiary contexts (empirical findings), with reported standardized effect sizes across a wide range (Abdelazim et al., 2022; Alotaibi, 2020). Different methodologies, such as baseline equivalence, sample size, control condition, intensity of instruction, and scoring systems, hinder assuming equivalent instructional efficacy (Cahyono et al., 2024; Rosli et al., 2024). Such methodological and contextual variations indicate that the direction of reported findings alone cannot establish the consistency of effect magnitudes. A meta-analysis can address this limitation by estimating the overall effect of PjBL while examining whether study-level characteristics, particularly educational level, account for variation in the reported effects (Higgins et al., 2011; Page et al., 2021; Zhang et al., 2023).

Other evidence, albeit more recent, from other EFL settings supports this trend while also highlighting the limitations of relying on individual studies. Andargie et al., (2025) found that EFL learners' writing was improved after PjBL with the Ethiopian undergraduates, and Fongod et al. (2025) explored the role of PjBL in learning English writing with secondary school learners in Cameroon. Maalfi et al. (2026) also found that Moroccan secondary students under PjBL had significantly greater performance in writing when compared to secondary students in a control group. The geographical distribution of these studies is significant as it shows that the positive evidence is not limited to a single national educational system. The studies are, however, context-bound, so there are some differences in characteristics of samples, educational stage, duration of intervention, writing outcomes, and research design. For instance, Andargie et al., (2025) employed an interrupted pre-test–post-test time-series design with a single group of 23 third-year undergraduates, which is only to a limited extent able, on its own, to claim cross-level generalizability. Given this context, the recent evidence around PjBL thus bolsters the empirical evidence for PjBL, without in itself answering the issue of effect heterogeneity.

A quantitative synthesis of the most direct relevance is an important starting point for grasping the strengths and weaknesses of the evidence base. In a meta-analysis of 11 studies over the course of 2013 to 2023, Cahyono et al., (2024) showed that PjBL in EFL writing had a significant positive overall effect. For the present study, it is of note that the authors put forward sample size, group size, research design, and intervention duration as potential moderators of the link between educational level and results. They determined the latter to be the chief moderator; educational level was not so clear as the key factor in accounting for the variation in PjBL effects. This should not be taken as proof of the irrelevance of educational level but rather as a reflection of the paucity of studies then on hand to support firm cross-level conclusions. Subsequent primary research has been done at the middle, secondary and tertiary levels in Indonesia (Aldiansyah et al., 2024), Ecuador (Rivera et al., 2025), Ethiopia (Andargie et al., 2025), Cameroon (Fongod et al., 2025) and Morocco (Maalfi et al., 2026). With this expanded body of evidence, there is cause to revisit the moderator question instead of just rehashing the prior estimate of the PjBL effect.

To make the contribution of this review plain, the primary studies have been set against those in Cahyono et al., (2024). Of the 20 in the current meta-analysis, seven are common with the earlier work (Aghayani et al., 2019; Alotaibi, 2020; Asrul et al., 2021; Cahyaningrum et al., 2020; Pohan, 2020; Sa'diyah et al., 2019; Sadeghi et al., 2016) and 13 are new (Abdelhalim et al., 2026; Aldiansyah et al., 2024; Fongod et al., 2025; Gao et al., 2024; Irwandi et al., 2024; Maalfi et al., 2026; Qomariah et al., 2025; Rahmawati et al., 2025; Rivera et al., 2025; Safitri et al., 2026; Setiawan et al., 2026; Susanti et al., 2020; Yang et al., 2025). Four from the earlier review were dropped for failing to satisfy the eligibility requirements here. The grounds for their exclusion were matters of statistical data for effect-size calculation, the reporting of writing-specific results, the language or outcome under examination, and the educational setting. It is not merely a case of upping the count from 11 to 20 studies; by using explicitly defined criteria, the present review puts in place a more focused evidence base for looking at PjBL and EFL writing performance. That said, having more studies does not in itself ensure a stronger inference on the part of the moderator, which is also a function of how the studies are distributed across the different levels of education.

The phenomenon under investigation is the as yet unexplained influence of educational level on PjBL's effectiveness in the writing of EFL learners. While past work has shown a mostly positive correlation between PjBL and writing achievement, and systematic reviews have noted the growing literature on PjBL and L2 writing (Chao et al., 2025; Rosli et al., 2024), the current meta-analysis of writing found that the number of studies was not large enough to single out educational level as the main source of variation in effect sizes (Cahyono et al., 2024). Empirical work has since put much more evidence on the table from other countries and levels of schooling. The question is no longer whether PjBL can be put to use to improve EFL writing but to what degree, when one takes a quantitative view of the various studies. An answer is required since an overall pooled effect can obscure the differences in instructional conditions and learner populations. Without moderator analyses the findings on PjBL might be read as meaning equivalent results in equivalent educational contexts.

This review updates (Cahyono et al., 2024) to re-examine the differences across educational levels by reassessing the eligible studies and explicitly examining study design, comparators, and effect-size extraction. The present study reconsiders the potential of educational level to explain meaningful variation in PjBL-related writing outcomes by the inclusion of primary study publications after the earlier synthesis, an explicit and standardized effect-size procedure, the assessment of between-study heterogeneity, formal testing of possible differences between subgroups, and methodological robustness (Page et al., 2021).

Theoretical, empirical, and practical contributions are expected. Theoretically, it investigates if the learning mechanisms of project-based instruction (PBI) – active knowledge construction, cooperation, finding out, purposeful communication, making things, and reflection – are also related to gains in writing in a consistent manner across education levels. This offers a more nuanced assessment of the theoretical premise that the affordances of PjBL can be used for language development with all learners. Empirically, the study builds on and updates the quantitative evidence base with newer primary studies and tests whether educational level accounts for differences in the effect size. In a practical aspect, it can help EFL teachers and curriculum designers to decide whether PjBL can be adopted at educational levels with largely similar expectations or if adaptations in the instruction are advisable. Where a significant moderation effect is found in the level of education, the evidence would warrant further investigation into project complexity, scaffolding, writing expectations, and learner support. If the moderator is not significant, the results would suggest that other features of the implementation of PjBL might offer more likely explanations for the between-study variation. In this sense, the contribution is not only to attest to the effectiveness of PjBL but to provide information about the regularity of the benefits of PjBL to writing across learning contexts.

Hence, the general aim of the current study is to find the overall effect of Project-Based Learning on EFL learners' writing performance and to investigate the significance of the impact of PjBL in this field according to educational level. The study presents empirical studies that have directly compared PjBL to non-PjBL or other instructional conditions and estimates the combined effect of PjBL on writing. It then explores if there are systematic differences in effect sizes as a function of education. On the basis of this purpose, the study poses two research questions: What is the general effect of Project-Based Learning (PjBL) on EFL learners' writing performance, and does the educational level significantly moderate the effect of Project-Based Learning (PjBL) in EFL learners' writing performance? These analyses are designed to provide more than a statement of the effectiveness of PjBL; they attempt to describe more specifically in which conditions PjBL fosters EFL writing development.

2. Literature Review

2.1 Project-Based Learning in EFL Instruction: Construction of a schema and the development of proficiencies in the target language.

Project-Based Learning (PjBL) in theory incorporates social constructivist theory and second language acquisition theory in the form of authentic communication, collaboration, negotiation, and the development of the communicative product through iterations (Rosli et al., 2024; Zhang et al., 2023). In this synthesis, we assess writing outcomes and not the cognitive mechanisms of planning, collaboration, feedback, and revision that PjBL may include in supporting writing. While many primary research studies show good results on the effectiveness of PjBL in writing skills, there are variations in the level of effectiveness based on the length of PjBL intervention, technology integration, and teaching and learning environments (Cahyono et al., 2024; Irwandi et al., 2024). These sorts of differences in the primary empirical studies highlight the need to consider the moderating effect of education level when interpreting the overall effect size of PjBL on EFL writing performance.

2.2 EFL Writing Performance

EFL writing performance is a complex and multidimensional construct, not just about grammatical correctness, but also includes rhetorical organization, linguistic correctness, and metacognitive operations (Elfiyanto et al., 2020; Guo et al., 2024). In the process of writing text, language learners need to coordinate four things: idea generation, discourse organization, lexical

selection, and the control of syntactic structure, while engaging in these operations under great cognitive demands (Arochman et al., 2024; Han, 2024). These complex cognitive demands make written products extremely sensitive to the task situation, feedback systems, and self-regulation abilities at various developmental stages (Chao et al., 2025; Gao et al., 2024). Therefore, the quality of writing in general is determined by the level of mediation of cognitively complex components in writing in the form of structured pedagogical frameworks, both through peer collaboration and continuous loops of feedback (Andargie et al., 2025; Rosli et al., 2024). Such conceptual understanding points to the need to consider the systematic mediation of specific cognitive aspects of EFL writing performance under the umbrella of PjBL. It is generally accepted that project-based learning is a useful approach in developing the writing competence of EFL students.

The PjBL and EFL writing performance overlap through similar compositional phases, from topic investigation to group negotiation to artifact publication, as Andargie et al., (2025) pointed out. The effectiveness of this mechanism relies on the learners' capacity to manage project tasks, engage in cognitive and linguistic activities regarding the target language (Gao et al., 2024; Irwandi et al., 2024). Learner autonomy and instructional scaffolding in this context can be interpreted as a balance that varies from one educational level to another (Wijnia et al., 2024; Zhang et al., 2023); thus, possibly, educational levels can be considered an important contextual moderator. This theoretical basis provides a legitimate argument for applying this concept in an empirical study of different outcomes in different academic levels and not simply assuming uniform instructional benefits (Cahyono et al., 2024; Rosli et al., 2024). These theoretical mechanisms should be quantitatively synthesized to see how effective PjBL is in improving EFL writing.

2.3 Empirical Evidence Related to Project-based Learning and Writing Performance.

Empirical studies have consistently shown the positive impacts of PjBL on EFL writing skills, with varying reported effect sizes in individual studies (Cahyono et al., 2024; Rosli et al., 2024). In contrast, several experiments reported significant improvements in descriptive, narrative, and argumentative writing, but the results of these studies often rely on the length of intervention and incorporation of digital technology (Alotaibi, 2020; Gao et al., 2024). This creates divergent findings because the level of self-regulation of learners at different education levels varies, as do the levels of learning support they need (Irwandi et al., 2024; Karim et al., 2024). However, the empirical evidence synthesized indicates that writing outcomes vary and depend on writing readiness and task design (Wijnia et al., 2024; Zhang et al., 2023). An examination of these empirical differences offers a valuable empirical rationale for the need to carry out a meta-analysis of EFL writing performances.

2.4 PjBL at different levels of education

The use of PjBL in junior high, senior high, and university has its own dynamics in the learning process (Cahyono et al., 2024; Rosli et al., 2024). The level of education is not used as a direct indicator of the maturity or self-regulation of the learner, but as a contextual grouping variable, so that the differences occurring in the subgroups must be interpreted with caution (Cuijpers et al., 2021). The academic discourse structures in these texts might also need to be synthesized by younger learners, necessitating explicit scaffolding from the teacher in terms of linguistic accuracy and planning of the task, while, on the other hand, other contexts, such as universities, may expect students to synthesize the academic discourse structures on their own (Aldiansyah et al., 2024; Gao et al., 2024). A comparison between cross-grades provides a theoretical basis for comparing PjBL outcomes between junior high, senior high, and university groups.

3. Research Methods

3.1 Research Approach and Design

This study aimed to identify, evaluate, and quantitatively synthesize empirical evidence to determine the efficacy of Project-Based Learning (PjBL) for increasing EFL learners' writing performance at different levels of education through a systematic review and meta-analysis approach. A systematic review was used as a methodological tool in the systematic search of relevant studies, record screening, eligibility evaluation, methodological quality assessment and extraction of evidence from the eligible studies, and the quantitative results of the eligible studies were statistically synthesized by the meta-analysis.

To improve transparency in the process of conducting the review, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines were adhered to (Page et al., 2021). Review Manager (RevMan) version 5.4 was used for the statistical synthesis. This design allowed for the availability of the information in each study to be considered together while providing an open framework of study selection, data extraction, and subsequent quantitative analysis.

3.2 Search Strategy

A systematic search was performed from inception to 03 November 2026 without the year-of-publication restriction in the three databases, namely Scopus, Crossref and Google Scholar, in order to avoid temporal selection bias (Page et al., 2021; Rosli et al., 2024). Details of specific search terms, search dates, included/excluded criteria, and Google Scholar screening methods are described in the supplementary materials and protocol. Amendments are made available upon request as per PRISMA 2020 guidelines (Page et al., 2021).

3.3 Eligibility Criteria

The PjBL-versus-non-PjBL comparisons were undertaken as part of the primary synthesis, and the other variants (PjBL vs. PjBL) examined an implementation issue and did not form part of the primary effect estimation (Page et al., 2021; Rosli et al., 2024). Population (P) included EFL learners in formal education at any level. The interventions (I) comprised Project-Based Learning (PjBL) in English writing instruction. The Comparison (C) is the use of non-PjBL in conventional, teacher-centred, or textbook-based instruction for the comparison group; and PjBL for the experimental group. Outcome (O) was QUANTITATIVE and encompassed a measure of English writing performance, achievement, proficiency, skill, or improvement.

3.4 Study Selection Process

The selection of studies was carried out according to the PRISMA 2020 framework, which includes identification, screening, eligibility assessment, and inclusion (Page et al., 2021). Two reviewers independently screened titles and abstracts, and then independently evaluated potentially eligible full texts, following removal of duplicate records. If there were any disputes, they were settled by discussion and, if needed, by a third reviewing participant. Exclusion reasons were provided and added to the PRISMA flow diagram.

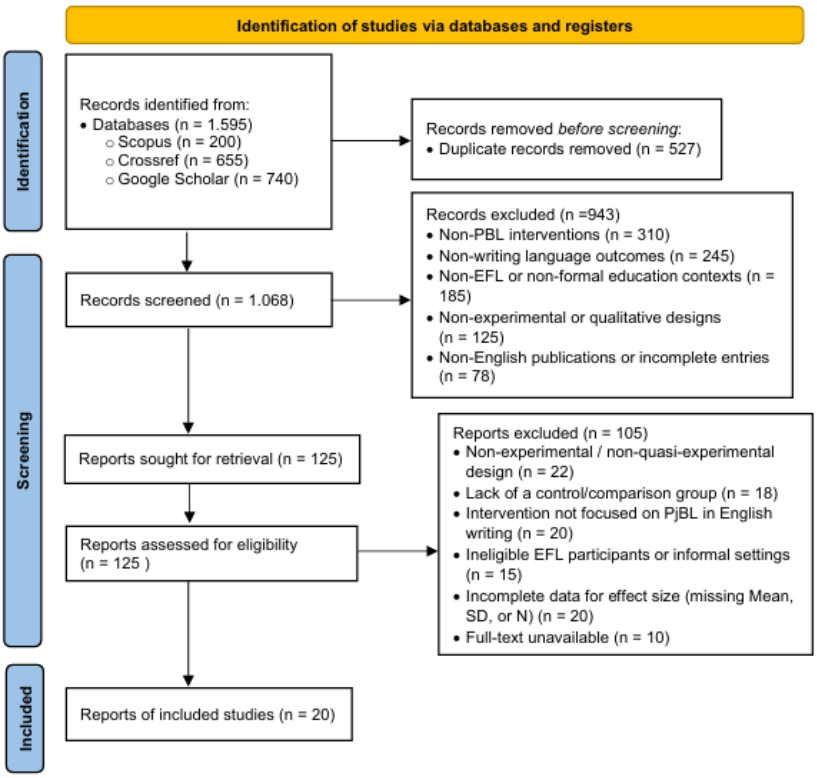


Figure 1. PRISMA Flow Diagram of Article Selection Reporting.

As presented in Figure 1, the selection procedure followed a structured sequence from record identification through screening and full-text eligibility assessment. Studies were included when they satisfied the predefined PICOS eligibility criteria and provided sufficient quantitative information for effect-size calculation. This procedure established a transparent basis for identifying the studies included in the meta-analysis of PjBL and EFL learners' writing performance across educational levels.

3.5 Characteristics of Included Studies

Participant totals and educational-level assignments are reported from a verified extraction dataset, with selected comparison arms distinguished from total study enrolment (Page et al., 2021). The 20 primary empirical trials incorporated into this meta-analysis encompass an aggregated selected comparison sample of N = 1.377 EFL learners (N = 689 experimental participants and N = 688 control participants across selected comparison arms). These studies were conducted across eight geographical contexts: Indonesia, Iran, China, Cameroon, Morocco, Saudi Arabia, Ecuador, and Bangladesh. They present three distinct educational levels: junior high school (7 studies), senior high school (9 studies), and university level (4 studies).

Table 1. Characteristics of Included Studies

No	Study (Author & Year)	Sample Size & Groups	Participant Characteristics	Intervention	Control Group	Score (Mean & SD)	Measurement Tools	Duration
1	Aghayani et al. 2019	N = 28 (Exp = 14 , Ctrl = 14)	Intermediate EFL learners (100% male, aged 14–16, native Persian speakers) in Iran.	Project-Based Learning (PjBL) following Maftoon et al. (2013) 7-step collaborative model.	Traditional teaching instruction is delivered by the same instructor.	Post-test Mean (SD): Exp: 17.93 (1.54) Ctrl: 15.71 (1.68) Pre-test: Exp = 15.79, Ctrl = 15.93	Oxford Placement Test (OPT); Pre/post-test essay writing tasks.	10 sessions (conducted over 2 months).
2	Aldiansyah et al. 2024	N = 42 (Exp = 21 , Ctrl = 21)	7th-grade middle school students at SMP IT Daarul Istiqlal Marindal I, Indonesia (sampled 33% of the total population).	Project-Based Learning (PjBL) using a comic story model.	Traditional daily journal writing without visual aids.	Post-test Mean (SD): Exp: 80.00 (2.83) Ctrl: 70.00 (3.64) Pre-test: Exp = 67.00, Ctrl = 67.00	Pre/post-test descriptive writing task evaluated using an analytic rubric.	Single PjBL intervention session.
3	Rahmawati et al. 2025	N = 60 Exp (X-3): n = 30 Ctrl (X-5): n = 30	10th-grade high school students at SMAN 1 Baros, Indonesia (Merdeka Curriculum).	PjBL model (wall magazine production and oral presentation)	Conventional teacher-centered instruction.	Post-test Mean (SD): Exp: 77.17 (3.49) Ctrl: 65.97 (3.01)	Post-test descriptive paragraph writing task evaluated via Brown's (2007) analytic rubric.	Several instructional sessions.
4	Asrul et al. 2021	N = 44 Exp (X IPS 2): n = 22 Ctrl (X IPS 1): n = 22	10th-grade social science students at SMA Pangeran Antasari Medan, Indonesia (experimental group selected due to initial low achievement).	Project-Based Learning (PjBL) model for narrative text writing.	Conventional/traditional teaching method.	Post-test Mean (SD): Exp: 80.16 (8.73) Ctrl: 74.06 (9.87) Pre-test: Exp = 56.05, Ctrl = 62.14	Pre/post-test narrative text writing tasks.	5 semesters, Academic Year 2021/2022.
5	Gao et al. 2024	N = 50 (Exp = 25 , Ctrl = 25)	Undergraduate students in China	PjBL Class Model for argumentative essay writing.	Conventional Presentation, Practice, Production (PPP) model.	Post-test Mean (SD): Exp: 96.32 (2.48) Ctrl: 77.36 (1.41)	Cambridge C1 Placement Test; Pre/post-test CET-4 argumentative writing test.	6 weeks of instruction.

No	Study (Author & Year)	Sample Size & Groups	Participant Characteristics	Intervention	Control Group	Score (Mean & SD)	Measurement Tools	Duration
						Pre-test: Exp = 72.08, Ctrl = 72.48		
6	Fongod et al. 2025	N = 242 (Exp = 121 , Ctrl = 121)	Form Four English Language secondary students in Fako, Cameroon.	Project-Based Learning (PjBL) instructional strategy.	Conventiona l teaching strategy.	Post-test 2 Mean (SD): Exp: 56.45 (11.63) Ctrl: 35.04 (8.10) Pre-test: Exp = 25.50, Ctrl = 32.85	The English Language Written Test (ELWT) was evaluated using a 4-indicator guide.	12 weeks (3 testing phases: pre-test, post-test 1, post-test 2).
7	Maalfi et al. 2026	N = 67 (Exp = 34 , Ctrl = 33)	Common Core high school students at Al Mowahidine High School, Morocco.	PjBL (creating video clips, posters, menus, and PowerPoint presentations).	Traditional textbook-based instruction.	Post-test Mean (SD): Exp: 7.29 (1.48) Ctrl: 5.79 (2.03) Pre-test: Exp = 4.53, Ctrl = 4.92	Pre/post-test writing task scored composition Profile rubric (0–10 scale).	8 weeks.
8	Irwandi et al. 2024	N = 118 (Exp = 59 , Ctrl = 59)	3rd-semester undergraduate English Education students at Universitas Muhammadiya h Mataram, Indonesia.	Digital media-integrated PjBL (Google Classroom, digital mind-mapping, blog/vlog publishing).	Traditional textbook-based writing instruction.	Post-test Mean (SD): Exp: 73.02 (9.31), Ctrl: 67.75 (9.61) Pre-test: Exp = 62.71, Ctrl = 64.2)	Pre/post-test argumentative essay writing task scored using an analytical rubric.	1 semester (Academic Writing course).
9	Alotaibi 2020	N = 59 (Exp = 30 , Ctrl = 29)	12th-grade male EFL secondary school students in Taif District, Saudi Arabia (aged 17–18).	6-phase PjBL model (motivation, modeling, planning, execution, evaluation, publication).	Traditional textbook-based instruction led by the main teacher.	Post-test Mean (SD): Exp: 20.62 (2.33) Ctrl: 10.32 (3.20) Pre-test: Exp = 8.34, Ctrl = 8.60	Pre/post-test persuasive essay task (200–250 words) evaluated via Rachlin's (2008) rubric.	4 weeks of interventio n.
10	Qomariy ah et al.	N = 72 (Exp = 36 ,	11th-grade high school	Project-Based	Conventiona l teacher-	Post-test Mean	60-minute creative	Instruction al program

No	Study (Author & Year)	Sample Size & Groups	Participant Characteristics	Intervention	Control Group	Score (Mean & SD)	Measurement Tools	Duration
	2025	Ctrl = 36)	students at SMAN 1 Gunungsari, West Lombok, Indonesia.	Learning (PjBL) for creative narrative writing.	centered instruction.	(SD): Exp: 85.67 (5.92), Ctrl: 70.25 (6.40) (Post-test Control Group design)	narrative writing post-test evaluated using Torrance's creativity rubric.	interventio n.
11	Sadeghi et al. 2016	N = 36 (Exp = 18 , Ctrl = 18)	Intermediate EFL male learners (100% male, aged 16–23, mean age = 19) in Iran.	Project-Based Learning (PjBL) in small collaborative groups.	Teacher-centered textbook-based instruction (Paragraph Writing).	Post-test Mean (SD): Compariso n: Exp = 8.44 (1.46), Ctrl = 6.34 (1.36) Contrast: Exp = 8.88 (1.40), Ctrl = 6.51 (1.03)	Oxford Placement Test (OPT); 45-minute comparison and contrast writing task (Soleimani et al., 2008 rubric).	10 weeks (20 sessions: 16 instruction al sessions of 90 mins).
12	Cahyanin grum et al. 2020	N = 96 Exp 1 (PjBL): n = 32 , Ctrl: n = 32	8th-grade junior high school students at SMP N 2 Kalasan, Sleman, Yogyakarta, Indonesia.	Exp 1: Project-Based Learning (PjBL) for recount/narr ative text. Exp 2: Problem-Based Learning (PjBL).	Conventiona l learning method.	Post-test Mean (SD): Exp 1 (PjBL): 31.63 (3.37) Ctrl: 27.47 (4.19) Pre-test: Exp 1 = 25.47, Ctrl = 25.66	Responsive essay writing test (recount and narrative, min 50 words) with inter-rater scoring.	Academic Year 2014/2015.
13	Pohan 2020	N = 50 (Exp (X IPA 2)= 25 , Ctrl (X IPA 1) = 25)	10th-grade science stream students at SMA Negeri 21 Batam, Kepulauan Riau, Indonesia.	Project-Based Learning (PjBL) model for simple recount text writing based on real experiences.	Conventiona l teaching strategy.	Post-test Mean (SD): Exp: 82.88 (4.81) Ctrl: 76.80 (5.44) Pre-test: Exp = 66.44, Ctrl = 67.04	Pre/post-test simple recount text writing test.	4 meetings (2 hours per meeting, total 8 hours).
14	Susanti et al. 2020	N = 60 Exp: 30 Ctrl: 30	7th-grade EFL junior high school students in	PjBL (creating a mini magazine for	Conventiona l / traditional teaching method	Exp: Mean = 84.83 (SD = 10.19)	Descriptive text writing composition test (t-test &	8 meetings

No	Study (Author & Year)	Sample Size & Groups	Participant Characteristics	Intervention	Control Group	Score (Mean & SD)	Measurement Tools	Duration
			Surabaya, Indonesia	descriptive text writing)		Ctrl: Mean = 64.60 (SD = 10.87)	Eta Squared)	
15	Yang et al. 2025	N = 92 Exp: 45 Ctrl: 47	7th-grade EFL students in a rural boarding middle school in Hainan, China	PjBL (2 projects: Class Roster & Family Tree Picture Book)	Traditional teacher-centered, lecture-based instruction	Exp: Mean = 4.36 (SD = 3.00) Ctrl: Mean = 1.54 (SD = 1.53)	Standardized academic performance test & thematic writing task	8 weeks
16	Rivera et al. 2025	N = 60 Exp: 30 Ctrl: 30	10th-grade EFL high school students (A2.1 level), Ecuador	PjBL applied to writing projects (posters, comics, articles, essays)	Traditional instructional	Exp: Mean = 3.93 (SD = 0.73) Ctrl: Mean = 1.94 (SD = 1.51)	Pre-test & post-test email writing task (Wilcoxon & Mann-Whitney U)	Project unit cycle
17	Abdelhalim et al. 2026	N = 53 Exp: 28 Ctrl: 25	1st-year female CS undergrads (A2/B1 level), Saudi Arabia	GenAI PjBL (using ChatGPT, Copilot, Canva AI, Narakeet)	Traditional instruction	Exp: Mean = 31.50 (SD = 2.50) Ctrl: Mean = 23.28 (SD = 5.88) (Writing: Exp 3.82 vs Ctrl 1.40)	Parallel achievement tests & Learner Autonomy survey	12 weeks
18	Sa'diyah et al. 2019	N = 41 Exp: 19 Ctrl: 22	4th-semester EFL undergrads, East Java, Indonesia	PjBL through blogging (argumentative writing)	Conventional process writing approach	Exp: Mean = 79.16 (SD = 7.03) Ctrl: Mean = 68.59 (SD = 6.92)	Argumentative essay writing test & self-efficacy survey	9 sessions
19	Setiawan et al. 2026	N = 70 Exp: 35 Ctrl: 35	8th-grade EFL junior high school students, Tulungagung, Indonesia	PjBL (descriptive text writing across 6 stages)	Conventional teacher-centered instruction	Exp: Mean = 86.09 (SD = 5.22) Ctrl: Mean = 71.63 (SD = 6.21)	Descriptive writing performance test (Brown, 2010 rubric)	5 meetings
20	Safitri et al. 2026	N = 69 Exp: 35 Ctrl: 34	10th-grade EFL high school students, Riau, Indonesia	PjBL (collaborative scrapbook projects for historical recount text)	Conventional teacher-centered writing instruction	Exp: Mean = 78.82 (SD = 1.47) Ctrl: Mean = 58.68 (SD = 2.56)	Recount text writing test (Hyland, 2016 rubric)	4 meetings

3.6 Risk of Bias

Risk of bias was assessed based on specific study designs as appropriate for the mixed evidence base (Higgins et al., 2011; Sterne et al., 2016). For nonrandomized studies, ROBINS-I was used, with domain-level judgements based on evidence from the study about confounding, selection, intervention classification, deviations, missing data, measurement and reporting (Sterne et al., 2016). Randomized controlled trials were assessed using each of the Cochrane Risk of Bias domain structure. These domains include confounding, population selection, intervention category, deviations from interventions, missing data, outcome measurement and selective reporting (Inthout et al., 2016; Sterne et al., 2016). The methodological limitations of quasi-experiments can be avoided by adapting the instruments to adjust to the methodological design and by providing a credibility assessment for secondary and tertiary contexts (Cahyono et al., 2024; Zhang et al., 2023). It is crucial to build the risk-of-bias (RoB) assessment in accordance with the design to establish if the primary studies in this review are methodologically valid or not in examining the effects of Project-Based Learning (PjBL) on EFL learners' writing performance at different educational levels (Aldiansyah et al., 2024; Rosli et al., 2024).

3.7 Data Analysis Techniques

The eligible studies were statistically synthesized using Review Manager (RevMan) version 5.4 from their quantitative data. The analysis included three steps: pooled overall effect, between-study heterogeneity, and subgroup analyses according to educational level. Pooled analysis, which calculated an overall estimate across the eligible evidence, and heterogeneity assessment, which assessed variation across the effect estimates from the various studies. A subgroup analysis was conducted to test whether differences across the educational contexts represented in the data set moderated observed effects, but this analysis was conducted only at the level of education. The procedures were detailed prior to the interpretation of findings to differentiate the methodological aspects of the study from the numerical results presented in the results portion of the study.

3.7.1 Overall Effect

Effect sizes were recalculated from the means, standard deviations, and sample sizes provided in the sources, with extreme values being screened for possible errors in extraction or scaling (Hedges, 1981). The standardized mean difference (SMD, also known as Hedges' adjusted g) was used to synthesize the effects, given that the included studies used various scoring instruments and scales for assessing writing performance. Positive values of SMD showed better writing performance in the PjBL group, while negative values showed better performance in the control group. Where compatible data were available, baseline-sensitive standardized differences of the post-test were considered with caution in nonrandomized studies. The effects were combined using inverse-variance weighting, and the pooled effect was presented with 95% confidence interval. The extraction protocol includes: the selected outcome, the assessment occasion, the comparison arms, and the unit of allocation for each study, along with the procedures for handling dependent estimates and clustered intact classroom designs (Page et al., 2021).

3.7.2 Heterogeneity Analysis

Because of the presence of substantial heterogeneity (I^2 = 93%, τ^2 = 1.25), interpretations are based on the pooled confidence interval, the between-study variance, and a predicted interval as well as the mean effect (Inthout et al., 2016). Sensitivity analyses were performed to explore how robust pooled estimates are against the changes in eligibility, extreme effect values, baseline score imbalances, and serious risk-of-bias judgments.

3.7.3 Subgroup Analysis by Educational Level

A prespecified exploratory moderator of the effect of PjBL on EFL learners' writing was investigated, namely, educational level. Based on the reported educational levels in the included studies, studies were categorized and pooled SMDs with 95% CIs were computed for each category. As there were only 20 studies in the evidence base, subgroups were interpreted with caution as there may be low statistical power, especially if the size of the subgroups is small or imbalanced (Cuijpers et al., 2021). Differences between groups of effects of educational level were assessed by a formal test for subgroup differences in RevMan, instead of by comparing statistical significance between each educational-level subgroup (Cuijpers et al., 2021). Subgroup results were therefore interpreted as initial evidence of the potential for variation/heterogeneity, but not moderation. The findings are presented to conclude that there might be a tendency or pattern in the effect of PjBL for each level of education, especially for the EFL learners' writing achievement.

4. Results

4.1 Study Selection

The detailed literature search and selection protocol is presented in Figure 1 and has been carried out based on the PRISMA 2020 statement. A preliminary database search was conducted through Scopus (n = 200), Crossref (n = 655) and Google Scholar (n = 740), yielding 1.595 records in total. After deduping 527 entries, 1.068 unique entries were title and abstract screened. 943 records not meeting baseline eligibility parameters were removed with this initial screening. The main reasons for exclusion at this stage were: non-Project-Based Learning (PjBL) interventions (n = 310), language learning outcomes that were not related to writing skills (n = 245), not being conducted in an EFL context or not in a formal educational context (n = 185), non-experimental or qualitative research designs (n = 125), and non-English publications or incomplete bibliographic entries (n = 78).

A total of 125 reports were sought for full-text assessment and were assessed for eligibility. Of the evaluated reports, 105 were not included because they explicitly excluded studies for methodological reasons, and 20 primary studies were included in the meta-analysis (Page et al., 2021).

4.2 The Characteristics of Included Studies

This systematic aggregation of primary empirical literature includes 20 studies that examined the effect of Project-Based Learning (PjBL) in English as a Foreign Language (EFL) writing. Trial size varied in each trial between 28 participants and 242 participants, and involved three main educational levels: junior high/middle school learners, senior high/secondary school, and undergraduate/tertiary level learners. Geographically, the studies compiled are based on a wide variety of international instructional settings such as Indonesia, Iran, China, Cameroon, Morocco, Saudi Arabia, Ecuador, and Bangladesh.

In terms of the instructional design that the experimental cohorts used, they respectively had different project-based language learning pedagogical treatments, such as a collaborative 7-step language project, a language project based on comic activities, a wall magazine project, a 6-phase language project, and a language project by creating a blog/vlog using digital media. In contrast, the control cohort received teacher-centered or textbook-based instruction. Target writing outcomes evaluated included a comprehensive list of genre-specific writing tasks, such as descriptive, narrative, argumentative, persuasive, recount, and comparison/contrast essay or paragraph writing, through validated analytical scoring rubrics and standardized placement tests for homogeneity of

the student cohorts at baseline. Instructional periods ranged from one intense instructional period to up to 4-12 weeks or a full school semester. In all 20 studies, post-test results indicated that there were higher mean scores for the experimental group receiving project-based instruction compared to their non-project-based control groups.

4.3 Risk of Bias Assessment

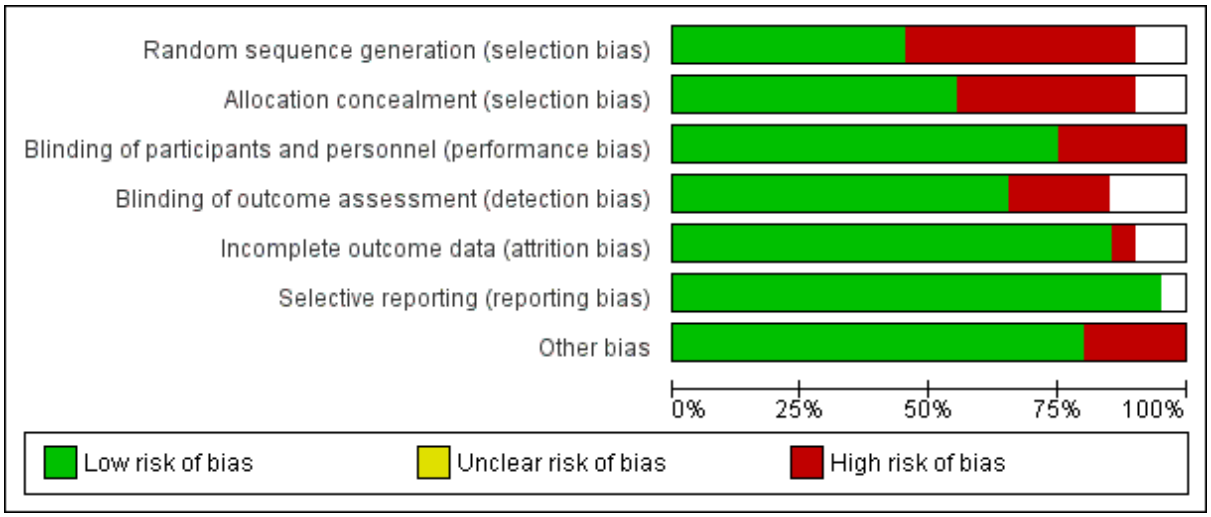


Figure 2. Risk of Bias Graph

In this meta-analysis, the methodological quality and internal validity of the 20 primary studies were systematically assessed for risk of bias through the seven standard criteria of Cochrane. In general, the judgments made are very methodologically rigorous overall, and low-risk judgments are predominant in the majority of domains across the compiled body of literature.

In particular, blinding of participants/ personnel (performance bias) had the highest rate of compliance, with 75% of the studies (15/20) rated as low risk because of similar instructional procedures and a similar number of sessions for the experimental and control groups. Key statistical measures, such as means and standard deviations, and values of inferential tests, were complete and transparent, with no studies being rated as high risk for selective reporting (reporting bias), and 95% (19/20) being evaluated as low risk. In the same way, the incomplete outcome data (attrition bias) was classified with low risk bias in 85% (17/20) of the studies because of high rates of retention of the participants from pre-test to the post-test with minimal attrition.

Low-risk proportion for allocation concealment (selection bias) was 55% (11/20 studies), suggesting good group assignment concealment; low-risk proportion for blinding of outcome assessment (detection bias) was 65% (13/20 studies), indicating that most studies had low evaluator subjectivity because the outcome of the assessment was indicated by some form of validated scoring rubric; and low-risk judgments for other bias accounted for 75% (15/20 studies), while 25% (5/20 studies) were rated as high risk. On the other hand, the domain with the largest number of high-risk studies was random sequence generation (selection bias), with 45% (9/20) of studies being high risk and 10% (2/20) being unclear. This heightened selection risk is due to the structural nature of the research, which relied on intact classroom settings rather than individual random allocation (a known logistical constraint in applied studies in school settings).

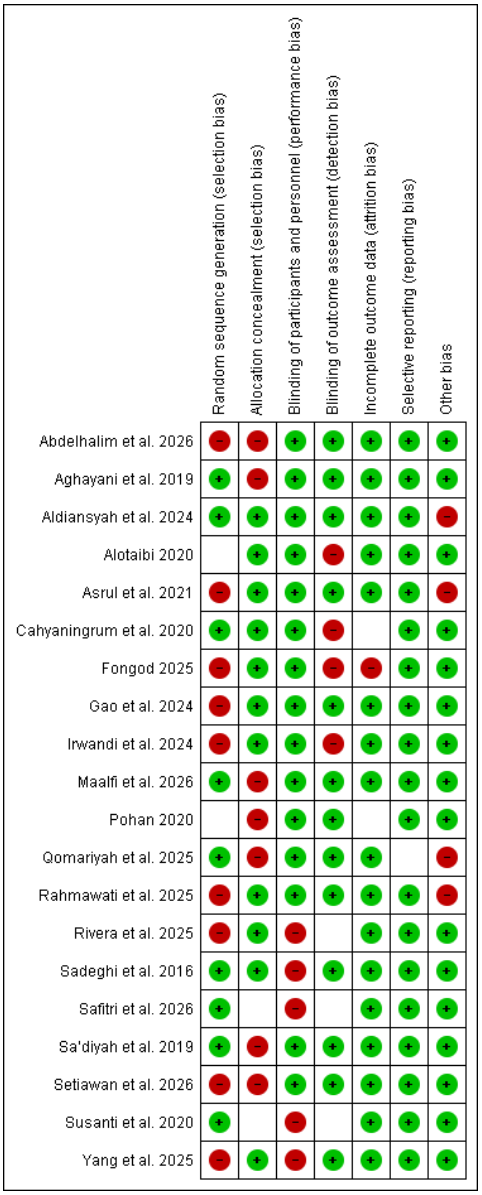


Figure 3. Risk of Bias Summary

Figure 3 presents the complete study-level risk of bias assessment across the seven Cochrane domains. Methodological quality profiles showed the methodological quality in the various types of educational settings to be similar, but with specific weaknesses identified at the level of individual trials. Regarding selection Bias (Random Sequence Generation & Allocation Concealment) there were nine studies (Aghayani et al., 2019; Aldiansyah et al., 2024; Cahyaningrum et al., 2020; Maalfi et al., 2026; Qomariah et al., 2025; Sa'diyah et al., 2019; Sadeghi et al., 2016; Safitri et al., 2026; Susanti et al., 2020) received low risk ratings for sequence generation. On the other hand, nine studies (Abdelhalim et al., 2026; Asrul et al., 2021; Fongod et al., 2025; Gao et al., 2024; Irwandi et al., 2024; Rahmawati et al., 2025; Rivera et al., 2025; Setiawan et al., 2026; Yang et al., 2025) were rated as high risk, while two studies (Alotaibi, 2020; Pohan, 2020) were classified as unclear. In terms of allocation concealment, eleven studies received low risk ratings, whereas seven studies (Abdelhalim et al., 2026; Aghayani et al., 2019; Maalfi et al., 2026; Pohan, 2020; Qomariah et al.,

2025; Sa'diyah et al., 2019; Setiawan et al., 2026) were rated as high risk. The remaining two studies (Safitri et al., 2026; Susanti et al., 2020) were classified as unclear.

For performance bias, fifteen studies demonstrated a low risk, suggesting that this domain was generally well addressed across the included trials. Nevertheless, five studies (Rivera et al., 2025; Sadeghi et al., 2016; Safitri et al., 2026; Susanti et al., 2020; Yang et al., 2025) showed a high risk. A similar pattern was observed in detection bias, where thirteen studies were assessed as low risk. Four trials (Alotaibi, 2020; Cahyaningrum et al., 2020; Fongod et al., 2025; Irwandi et al., 2024) presented a high risk, whereas the assessment remained unclear for Rivera et al., (2025), Safitri et al., (2026), and Susanti et al., (2020).

The attrition bias domain was among those to receive the most favorable appraisals, with seventeen studies being of low risk. A high risk was evident in only one instance, Fongod et al., (2025). Judgments were left unclear for Cahyaningrum et al., (2020) and Pohan, (2020) on account of incomplete outcome data. Selective reporting followed a similar trend: nineteen studies were deemed low risk, and none were found to be at high risk, though Qomariah et al., (2025) could not be clearly assessed. Other bias presented a different picture; five studies Abdelhalim et al., 2026; Aldiansyah et al., 2024; Asrul et al., 2021; Qomariah et al., 2025; Rahmawati et al., 2025) were put down as high risk, while the other fifteen were low.

In short, the included studies have a methodological profile that is generally sound, especially where attrition and reporting are concerned. That said, the issues noted in random sequence generation, allocation concealment, and other bias point to some limitations that must be taken into account in any interpretation of the results. Such differences are of value in judging the reliability of the evidence.

4.4 Meta-Analysis of the Effect of Project-Based Learning on EFL Writing Performance

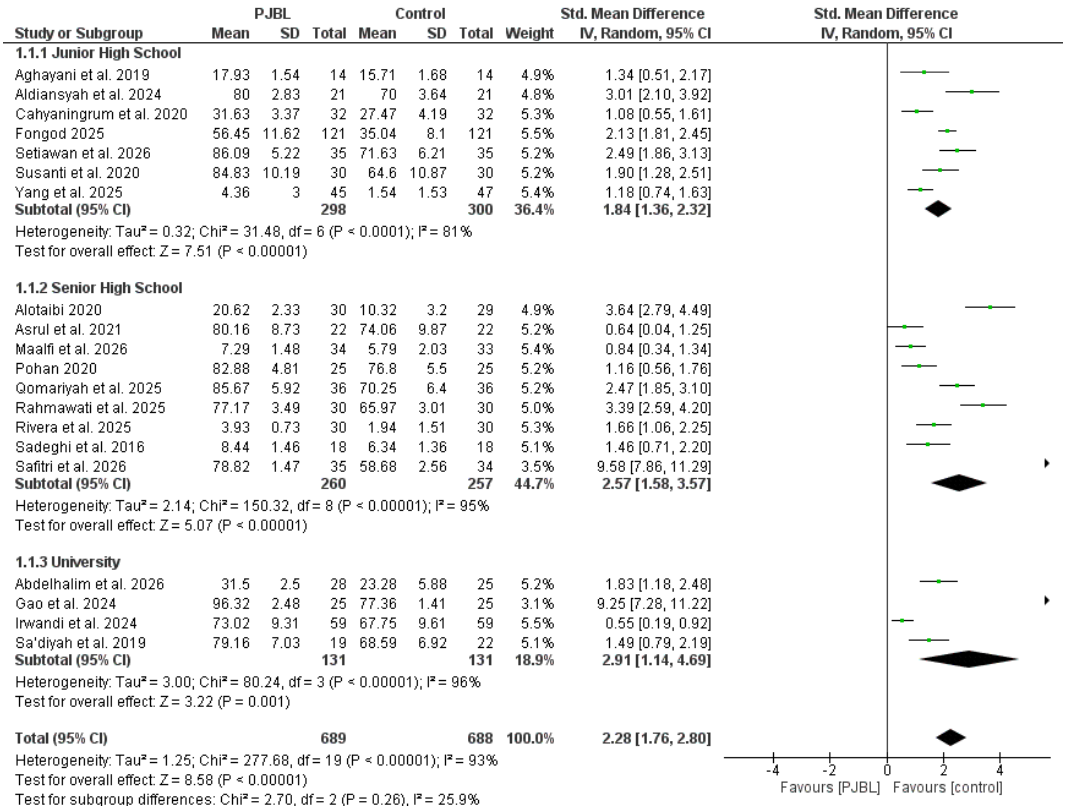


Figure 4. Forest Plot Analysis of PjBL Effect Sizes Across Educational Levels

This meta-analysis was conducted as a random-effects approach to synthesize the overall effect size of Project-Based Learning (PjBL) on English as a Foreign Language (EFL) writing performance and to examine whether there are any moderating effects across the different tiers. There were 20 primary empirical trials, with a total of 689 students in the experimental PjBL groups and 688 students in the control groups. The global pooled effect size was statistically significant and large in favour of project-based teaching as compared to traditional pedagogical approaches (Standardized Mean Difference (SMD) = 2.28; 95% Confidence interval (CI): 1.76, 2.80; Z = 8.58, and $p < 0.00001$). There was significant overall heterogeneity amongst the compiled literature ($\tau^2 = 1.25$; $x^2 = 277.68$, df = 19, $p < 0.00001$; $I^2 = 93\%$), which supported using a moderator subgroup analysis based on educational level.

The primary studies were divided into three academic levels:

The project-based instruction in the junior high school subgroup consisted of 7 empirical trials (N = 298 experimental and N = 300 control), and resulted in a statistically significant pooled effect size of SMD = 1.84 (95% CI: 1.36, 2.32; Z = 7.51, $p < 0.00001$) and accounted for 36.4% of the total meta-analytic weight. Intra-subgroup heterogeneity remained substantial ($\tau^2 = 0.32$; $x^2 = 31.48$, df = 6, p = 0.0001; $I^2 = 81\%$). The largest cluster was comprised of the senior high school subgroup, which included 9 primary studies (N = 260 experimental; N = 257 control), accounting for 44.7% of the weights, and yielded a strong overall pooled effect of SMD = 2.57 (95% CI: 1.58, 3.57; Z = 5.07, p = 0.0001). High within-group variability was also present ($\tau^2 = 2.14$; $x^2 = 150.32$, df = 8, $p < 0.00001$; $I^2 = 95\%$). University level subgroup: encompassing 4 tertiary-level studies (N = 131 experimental; N = 131 control) with a 18.9% relative weighting, the tertiary tier demonstrated the largest point estimate at SMD = 2.91 (95% CI: 1.14, 4.69; Z = 3.22, p = 0.001), accompanied by pronounced heterogeneity ($\tau^2 = 3.00$; $x^2 = 80.24$, df = 3, $p < 0.00001$; $I^2 = 96\%$).

Importantly, the statistical test for the difference between the groups was non-significant ($x^2 = 2.70$, df = 2, p = 0.26, $I^2 = 25.9\%$). This result indicates that the analysis did not detect a statistically significant difference in the estimated effects of PjBL across educational levels. However, this finding should not be interpreted as evidence that the effects are equivalent across the three groups. PjBL, therefore, demonstrates a consistently positive effect on EFL writing performance across junior high school, senior high school, and university settings.

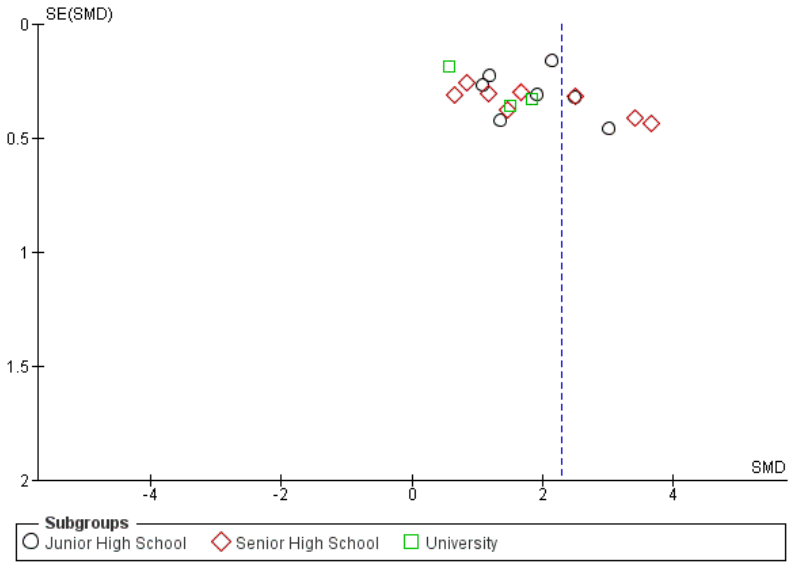


Figure 5. Funnel Plot Analysis for Publication Bias Assessment

A funnel plot was visually inspected with the Standard Error [SE(SMD)] on the vertical axis and the Standardized Mean Difference (SMD) on the horizontal axis to assess the presence of publication bias and small study effects[2]. The vertical line of the central rectangle indicates the overall pooled effect estimate of the SMD = 2.28.

The visual distribution exhibits a reasonably symmetric funnel shape, with the data points spread around either side of the central effect line in the range from SMD 0.6 to SMD 3.7. The majority of studies are done at the top of the plot, with SE in a small range from 0.15 to 0.45, suggesting that several studies have relatively small standard errors. Moreover, the educational subgroups (junior high school is circles, senior high school is red diamonds, and university level are green squares) are distributed evenly and not systematically clustered on the graph space, which would signal reporting suppression by educational subgroup.

Visual inspection of the funnel plot was inconclusive as to the extent of publication bias and was limited by the number of studies and the extent of heterogeneity (Sterne et al., 2011). Funnel plot symmetry should therefore not be considered as definitive evidence of the absence of publication bias.

5. Discussion

The general findings show that Project-Based Learning (PjBL) provides favorable conditions for developing EFL writing performance across the three educational levels examined in this review. The overall pooled effect was large and statistically significant (SMD = 2.28, 95% CI [1.76, 2.80], $p < 0.00001$), indicating a positive effect of PjBL compared with the control conditions. This finding is in line with the positive direction of the study conducted by Cahyono et al., (2024) and is also complementary to the evidence from studies on persuasive writing, digitally supported academic writing, and secondary school writing (Alotaibi, 2020; Irwandi et al., 2024; Maalfi et al., 2026). Studies of junior and senior high school students have put forward similar positive results, for instance Susanti et al., (2020), Asrul et al., (2021), Qomariah et al., (2025) and Rivera et al., (2025). The same is true of work on writing development in other EFL settings by Aldiansyah et al., (2024), Fongod et al., (2025), Gao et al., (2024), Rahmawati et al., (2025), Safitri et al., (2026), Setiawan et al., (2026) and Yang et al., (2025). What these findings have in common is to suggest that the instructional value of PjBL lies in the connection made between writing and a genuine communicative end. In the course of the project, the learner is put to work on developing ideas, selecting the right linguistic tools, and making revisions. That said, the interventions differ in their project design, resources, feedback, and learning demands. Consequently, the results are an indication of what particular instructional packages can do rather than any one element of a project. The evidence is there that PjBL is a sound framework, but its effectiveness is a matter of how well it is put into practice. This study adds to that body of evidence with a synthesis of 20 studies to see if the good effects vary from one educational level to the next instead of just looking at the overall efficacy of PjBL.

All forms of collaborative writing projects have turned up positive numbers which are in line with the socially mediated view of writing development. One can find support for writing gains in such settings in Aghayani et al. (2019) and Sadeghi et al. (2016) and for interaction as part of a broader learning process in Irwandi et al. (2024) and Chao et al. (2025). Taken together, the work shows collaboration has the capacity to mix individual composition with chances to re-examine text decisions and offer explanations. Through peer discussion, a student may be helped to zero in on word choices that obscure meaning or disorganized exposition, and revision will make of those observations some improvement in the final product. Yet participation is not synonymous with learning, particularly when the more able members of the group do most of the writing. Since the

present synthesis has not looked at mediating processes, collaboration, feedback and revision are offered as likely explanations to be probed further.

The heterogeneity of the studies is considerable (I^2 = 93%; τ^2 = 1.25) and points to the fact that PjBL's success is tied to the conditions and methods of instruction. While Cahyono et al., (2024) found intervention length to be an influential moderator, Irwandi et al., (2024) and Maalfi et al., (2026) have shown how differences in the way projects are run, the use of technology and comparison instruction can have an effect on the amount of writing, feedback and revision. Divergent estimates may also be put down to the instrument used; some will judge language accuracy and others the quality of the text as a whole. It would be wrong to see this variation as a failure of pedagogy since the studies are measuring different things under different circumstances. As Inthout et al., (2016) note, the mean effect should be distinguished from the range of possible outcomes. The present synthesis therefore raises questions about the nature of implementation and does not take a positive average to mean equally large effects in every classroom. This is cause enough to look at educational level as a possible moderator while acknowledging that other methodological factors are at play.

That no clear difference was found between the levels means the institutional stage cannot explain all the variance in PjBL achievement. Even though the estimated effects were statistically significant in each case, the test for subgroup differences was not (x^2 = 2.70, df = 2, p = 0.26; I^2 = 25.9%). The SMDs for the junior and senior high subgroups were 1.84 (95% CI [1.36, 2.32]) and 2.57 (95% CI [1.58, 3.57]), respectively, and for the university subgroup 2.91 (95% CI [1.14, 4.69]). While the university figures are the highest, this is not proof of greater effectiveness at that level. The finding is in keeping with Cahyono et al., (2024) but falls short of showing a leveling effect for learners. Subgroup analyses are often without the statistical power to pick out meaningful differences where the evidence is thin, as Cuijpers et al., (2021) would have it. Then again, the interventions in Alotaibi, (2020), Irwandi et al., (2024) and Maalfi et al., (2026) are at the crossroads of the educational setting and the tools and needs for writing. A more proficient user might be set a more complex task than one who is less experienced and in need of more accessible products and scaffolding. This goes beyond a simple developmental account and puts the focus on the fit between the learner's ability and the task. The new contribution here is to put this educational distinction to a quantitative test over the wider evidence base rather than deduce it from isolated positive reports. For the junior-high students in particular, the positive outcome is an indication that even those with little writing experience can make use of the project presentation method. A significant positive effect was put forward by the junior high school subgroup (SMD = 1.84, 95% CI [1.36, 2.32]) even if there is still a good deal of heterogeneity to be found within it (I^2 = 81%). To put structure on written work and develop ideas, one can use concrete products and topics that are well known. This is in line with the instructional matters put forward by Cahyono et al., (2024) and Chao et al., (2025), as well as the collaborative possibilities shown in the work of Aghayani et al., (2019) and Sadeghi et al., (2016). Susanti et al., (2020), Aldiansyah et al., (2024) and Setiawan et al., (2026) have also reported positive outcomes which stand as evidence for PjBL in secondary writing. While these sources may point to the origin of the subgroup's pattern, they do not in themselves demonstrate it to be the work of junior-high students. At this stage, projects are often effective since teachers can model and break down the writing process into steps and give scaffolded feedback. Yet short-term interventions or assessments will more readily show gains in the task than any long-term improvement in writing. The subgroup findings then further validate a carefully scaffolded approach but leave open the question of whether the learners can apply what they have gained to their own endeavours and to writing tasks they are not so familiar with.

At the senior-high level, the results are positive and show that PjBL can be put to more demanding writing ends without being bound to a set format. There is evidence from persuasive and other secondary-school writing development that projects can serve to connect rhetorical aims with sustained activity (Alotaibi, 2020; Maalfi et al., 2026). Cahyono et al., (2024) and Chao et al., (2025) back up this view and would have it that pedagogical flexibility is preferable to uniformity in the way genres are improved. Persuasive tasks in particular require an awareness of the audience and justification, whereas others are more concerned with description or sequencing. These can be brought together in a meaningful product, but the project must be judged on the textual conventions at play. If not, a finished project might be an incentive to take part but fail to remedy any lack of coherence, accuracy or argumentation. It is therefore suggested by the senior-high data that genre instruction and revision be part of the project design and that baseline proficiency and assessment quality be factored in when looking at progress. The result for the subgroup should be read as a positive effect in junior high school studies rather than as proof that this level is better served than the rest.

Universities have yielded positive results pointing to the utility of PjBL for academic writing, though it is not shown that university learners are any more amenable to it than those in secondary schools. The university subgroup had the largest estimated effect (SMD = 2.91, 95% CI [1.14, 4.69]) and a high degree of heterogeneity (I^2 = 96%), but the test for differences did not put them ahead of the high school subgroups in any statistically significant way. Irwandi et al. (2024) offer examples of tertiary work where project and online tools can be combined for longer interaction. In something like an academic writing assignment, this can be of help in coordinating the content and its drafting and feedback. Any reading of the university subgroup has to be done in light of the review's eligibility criteria. Given the small and heterogeneous nature of the subgroup and the methodological points made by Cahyono et al., (2024) and Cuijpers et al., (2021) one cannot be too strong in one's conclusions. The evidence from the tertiary level is heartening, but the contrast between the instruction and the transfer to actual academic writing products would make for a better appraisal. So while the university subgroup adds to the case for PjBL at the tertiary level, the size of the point estimate is no proof of superiority.

Some of the benefits seen with digitally aided interventions could be put down to the technology itself and the fact that it permits the writing process to go on beyond the classroom. Irwandi et al., (2024), Chao et al., (2025) and Cahyono et al., (2024) all make the case for examining how learning resources and sustained participation relate to writing development. Digital spaces make for easier access to resources and later drafts and provide other avenues for revision and feedback. What makes the effort educational is what can be done with it, not the platform. The present synthesis has not singled out digital integration as a moderator or separated its impact from other forms of increased exposure and feedback. Access, digital competence, and the role of the teacher in facilitating are other variables that will determine who reaps the rewards. Technology is a component of implementation with possible consequences of some significance and must be directly compared to judge its incremental worth. That is a necessary distinction since the overall positive effect in this meta-analysis cannot be ascribed to technology-supported PjBL alone. How much digital tools contribute is a matter for future studies.

Evidence shows a beneficial direction, but methodological findings show that there might be uncertainty regarding the credibility and size of the synthesized benefit. Causal interpretation is made complicated by intact-class allocation, baseline differences, and discrepancies between the indicated and documented procedures for conducting bias assessment. In addition to these concerns, the concerns of implementation diversity pointed out by Cahyono et al. (2024) and Chao et al. (2025), the uncertainty indicated by Inthout et al. (2016), and the limitations of subgroup inference presented by Cuijpers et al. (2021) are all present. Random sampling is not equivalent to

random assignment of treatments, and a validated assessment rubric is not necessarily equivalent to a blinded assessment of outcomes. The funnel plot provides a visual assessment of the distribution of study effect sizes in relation to their standard errors; however, visual inspection alone cannot establish the presence or absence of publication bias. Checks for eligibility, verification of extraction, and sensitivity analyses are, therefore, needed to determine that the conclusion is robust in the face of important methodological weaknesses. The high overall heterogeneity ($I^2 = 93\%$) also means that the pooled effect should be interpreted with caution, even though it is statistically significant. So, there is evidence of a qualified claim of instructional promise at this time, but not causal superiority. The present findings should consequently be understood as strong evidence of a positive association between PjBL-based instruction and writing performance in the included comparisons, while acknowledging the methodological and contextual variation among studies.

The evidence supporting PjBL's adaptive use in the EFL writing domain is the positive outcomes in the different educational contexts. The fundamental practical idea that is rooted in all the above work is the same, which is connecting meaningful project products to clear project planning, writing, feedback, and revision. Both task complexity and support must be adapted to the needs of writing for each of the teachers, not just by educational level. Group work should be combined with individual assessment to define whether group work will be evidence of the learners' writing competence or not. Future studies should make clear comparisons and consider baseline differences, and involve delayed measurements and unfamiliar tasks for measuring performance. Such designs could help to identify the benefits of long-term and transferable development in the project area. Thus, the synthesis in the present paper presents PjBL as a possible framework, and brings along a series of conditions which are considered fundamental for determining the Educational value of PjBL: the quality of the implementation, individual learning, and evidential credibility. The principal research novelty of this review is its updated quantitative examination of PjBL effectiveness across junior high school, senior high school, and university contexts, combined with a formal test of educational level as a potential moderator. Unlike an interpretation based only on the positive results of individual studies or the overall pooled effect, the present analysis shows that PjBL has a significant positive overall effect, while the differences among educational-level subgroups are not statistically significant. This finding adds a more differentiated conclusion to the existing evidence: PjBL appears beneficial across the educational levels examined, but educational level alone does not explain the substantial variation in effect sizes. The remaining heterogeneity indicates that future research should investigate other potential moderators, including intervention duration, project design, writing genre, assessment instruments, technology integration, and the intensity of instructional scaffolding.

6. Conclusion

According to this meta-analysis, Project-Based Learning (PjBL) exerts a significantly more positive influence on EFL writing performance in students when compared with non-PjBL methods. The subgroup analysis, though, turned up no statistically significant variation in the estimated effect from junior and senior high school to the university level. In that sense, PjBL can be viewed as a viable teaching model for the three levels under review, even if the results do not put them on an equal footing. The work serves to re-evaluate educational level as a possible moderator and to put the evidence, which has become more of a writing concern, in order.

While the findings are theoretically sound in support of socially based accounts of how writing develops, they do not directly test collaboration or feedback/revision as the reason for it. They do, however, lend themselves to well-integrated writing projects of substance, be it explicit instruction, guided writing, or a personal evaluation of the work. One should not take project suitability for

granted by virtue of the education level attained; the instructional supports and demands ought to be dictated by what the learner's writing requires.

The studies' nonrandomized designs, the small numbers in each subgroup, and the considerable heterogeneity preclude any firm conclusions on generalizability and effect size. Nor should pooled estimates be regarded as robust given some unresolved eligibility questions with the comparators and inconsistencies in the bias assessment and extraction of figures that still need to be verified. What is called for in future research is instructional comparisons that are clearly defined, an accounting for baseline and classroom clustering, and independent measures of writing on unfamiliar tasks later. Such an approach will go some way to determining if gains hold up beyond the immediate setting and in the context of project transfer.

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