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The Effectiveness of Problem-Based Learning in Enhancing Learners' English Language Skills

Meta-Analysis and Systematic Review

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Abstract

Problem-Based Learning (PBL) has been widely studied as one of the successful teaching methods in English Language Teaching (ELT) as it enhances learners' motivation, critical thinking, and language acquisition. The purpose of the current systematic review and meta-analysis is to critically evaluate the impact of PBL on reading, writing, and speaking abilities of the learners based on the analysis of 30 published articles from 2016 to 2024. Of the articles, 13 of them were on speaking skills; 10 were on writing and 7 were on reading. Methodologically, the studies were grouped as 14 quantitative, 6 qualitative, and 10 employed mixed methods. Meta-analysis was applied to the quantitative studies to estimate statistical significance (p-values), and the magnitude of the difference (Cohen's d). Heterogeneity of effect sizes was determined by I^2 statistic, and the analysis was also done to explore differences between the effect

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of PBL in the language skills category (speaking, reading, and writing) and study levels (tertiary and secondary). The findings indicated that PBL significantly improved language skills. It has the highest impact on the writing ability (Cohen's d = 1.2–2.1) whereas speaking ability (d = 0.5–1.5) and reading skill (d = 0.7–1.5) came as runners-up in terms of strength. The outputs of qualitative analysis showed high learner motivation, self-study, and teamwork but were not empirically grounded. The analyses further revealed that students at tertiary level benefited most from PBL intervention than that of the secondary level. In spite of its effectiveness in the area of English language teaching, future studies have to be conducted employing long-term retention measures, relative teaching models and improved standardizations.

Keywords: Problem-Based Learning; Language Learners; English Language Skills

Introduction

Problem-Based Learning (PBL), which was first introduced in medical education in the 1960s at McMaster University in Canada, has changed over the decades to become a popular pedagogical approach in many different fields, from business and engineering to social sciences and more recently to language learning (Barrows & Tamblyn, 1980; Savery, 2006). The basic principle of PBL is encouraging students as they learn best when they actively engage in authentic and contextual problem solving through guided inquiry. This approach has made it wildly popular among education systems interested in promoting active, student-led learning. Over the past two decades, PBL has been implemented more widely in English as a Foreign Language (EFL) and English as a Second Language (ESL) environments due to its potential to promote critical thinking, collaboration, and authentic language use (Lin, 2017; Iskandar et al., 2021). The shift is an important pedagogical change away from traditional teacher-centered instruction to more interactive, participatory, and learner-centered language learning environments.

Philosophical roots of PBL are well rooted in pragmatist and progressive education philosophies. In human life philosophy, PBL aligns with pragmatism in learning by doing and translating knowledge to the real world (Dewey, 1938). Pedagogically, PBL most aligns with progressivism, which advocates experiential learning and the development of problem-solving skills (Barrows, 1986; Dewey, 1938). Further, PBL is guided by critical theory in its approach that allows learners to be more active in their own learning and in societal change. It also aims at fostering critical thinking among the students that

enables them to analyze and question societal norms and injustices (Tavella, 2017).

In addition, it is the base for formation of critical consciousness, and engagement with societal concerns; a way of thinking especially well-suited for multicultural and multilingual environments like EFL settings. In language learning-teaching paradigms, PBL is supported by interactionism and constructivism theories. It puts into perspective the dynamism between learners and their social settings. Interactionism theorizes that the acquisition of language learning is arrived at by a social interaction or negotiation of meaning among learners (Maflah, 2023). This is complemented by the views expressed by Constructivism, stating that active construction of understanding by learners through experience occurs (Tesar et al., 2022). Therefore, both theories perceive language as a social tool jointly built through effective communication, hence making it a perfect paradigm for learning the English language.

Theoretical background of PBL draws from the constructivist theory, more so the works of Jean Piaget and Lev Vygotsky. Knowing this theoretical background helps to establish how these initial viewpoints inform pedagogical mechanism of PBL. Piaget's position is that learners develop knowledge actively from their interactions in the world (Piaget, 2013), while Vygotsky's Social Constructivism puts immense priority on the salient role accorded to the social interaction as well as social tools in cognitively constructivist processes (Vygotsky, 1978). Zone of Proximal Development (ZPD), one of the most Vygotsky's contributions, aligns closely with PBL's scaffolding practical activities, in which the learners are supported by the teacher and peers to solve problems that slightly beyond their immediate abilities. While Zone of Proximal Development (ZPD) is not directly conducted in all of the reviewed studies, the principles of scaffolding learning and collaborative problem solving have conducted and revealed encouraging outcomes in EFL contexts. For example, studies by Berenji et al. (2020) and Sutrisna and Artini (2020) have proven that students have shown significant language ability improvement when engaged in PBL tasks that support group work and contextualized language use.

PBL is now a mainstream teaching methodology all over the world in developing and developed nations. In Asian contexts such as Indonesia, China, and Iran, numerous studies have borne witness to the efficacy of PBL in enhancing learners' language performance and motivation (Syahfutra & Niah, 2019; Jumariati & Sulistyo, 2017; Montafej et al., 2022). In African contexts, PBL has started to gain attention for its potential to be applied in multilingual and resource-poor environments, where traditional rote-based methods are not capable of equipping learners with communicative competence. Its focuses on collaborative learning, real world problem solving, scaffolding, and the use of

locally available materials makes PBL crucial to adapt it in developing countries where technologies and infrastructures are limited. In Ethiopia, English being employed as an instructional language in higher education, the use of PBL in ELT is emerging as a feasible way to develop critical thinking and language capacity (Fekadu et al., 2024). Implementation challenges persist due to infrastructural limitations and inadequate teacher training in learner-centered pedagogies.

Incorporating PBL into ELT resonates with an overarching pedagogical trend toward active, experiential, and inquiry-driven learning. PBL makes students reflective learners while reading class through contextual investigations of themes and their common uses (Arjuna & Jufri, 2016). In speech class, PBL gives the students real interaction through language use for a purpose in discussion and presentation (Kholis, 2021; Fahmi et al., 2021). In writing classes, PBL makes the argumentation and critical thinking process easier as students collaborate to develop solutions to real problems (Dastgeer et al., 2019; Mairani, 2022). These applications demonstrate how PBL is being developed for diverse language abilities and teaching contexts to enable more effective and meaningful learning.

Reading, speaking, and writing are the core of EFL learners' language ability. These skills are needed not only for classroom success but also for communication in daily life, obtaining employment, and participating in world conversation (Nation & Macalister, 2010). In the majority of EFL countries, however, language teaching is still too grammatically and memorization-focused with insufficient focus on communicative competence (Richards, 2006). As PBL is rooted in Interactionism-Constructivism paradigm, it is thus integration of principles about social interaction into constructivist theories of learning with these latter emphasizing meaningful communications in developing language proficiency (Vygotsky, 1978). Thus, PBL comes to plug or fill this gap by enabling learners to employ language as a means of reasoning, expression, and meaning negotiation. Empirical studies across contexts indicate that PBL has a very positive effect on the reading comprehension (Rosyidin et al., 2022), oral expression (Arani et al., 2024), and writing fluency (Alghamdy, 2023) of students.

The applicability of PBL to ELT competencies relies upon its ability to enable active learning, develop intrinsic motivation, which is the internal motivation to learn for personal interest and value, and create contextualized language use. Based upon constructivist and socio-cultural theoretical perspectives (Ryan & Deci, 2000; Vygotsky, 1978), PBL encourages students to engage genuine tasks supportive of autonomy, or independent learning, competence, and relatedness, each essential to long-term language growth. In reading, it enables learners to approach texts as problem-solvers and thereby enhance

comprehension and recall (Berenji et al., 2020). In speaking, it enables spontaneous communication and confidence-building through presentation and discussion in groups (Montafej et al., 2022). In writing, it enables planning, drafting, and critical revision skills needed in academic and professional communication (Jumariati & Elvina, 2024). These findings highlight PBL's potential as an integrating framework for developing all three foundation language skills in a balanced, integrated manner.

Given the importance of PBL in EFL teaching and the enormous extent of empirical studies conducted during the last decade, a meta-analysis and systematic review are necessary as well as in order. Despite early evidence of positive outcomes, existing research is heterogeneous with respect to design, sample size, classroom conditions, and outcome measures. This contradiction has hindered the ability of researchers and teachers to make generalizations or determine best practice. In order for this gap to be closed, this synthesis and overview of 30 peer-reviewed articles derived from diversified nations and methodological inclinations are required to determine the effect of PBL on reading, speaking, and writing proficiency in ELT. Moreover, it also seeks to identify common pedagogical practices, new directions, and gaps in the literature currently, thus providing a common basis for future research and teaching practice.

This Meta-Analysis has implications for teachers, curriculum developers, and policymakers seeking evidence-based practices further to empower ELT. It provides a glimpse of the impact of PBL on language fields and diverse learning environments, even those with inadequate resources. The review also spans primary and tertiary levels, revealing the applicability of PBL at all ages and skill levels. It will inform teaching strategies and the development of PBL-based curricula that are more responsive to 21st-century educational concepts.

The study attempted to answer the following questions:

1. How effective is Problem-Based Learning (PBL) in enhancing reading, speaking, and writing skills in English Language Teaching?
2. What trends and pedagogical approaches characterize the implementation of PBL in ELT across different educational contexts?
3. What methodological patterns, strengths, and gaps are evident in the existing body of PBL-related ELT research?

Methods

This review has critically examined 30 empirical studies which were published from 2016-2024 with the aim to evaluate the effectiveness of Problem-Based

Learning (PBL) in enhancing English language proficiency; that is, speaking, reading, and writing. It employed a systematic review and meta-analysis approach in order to synthesize the peer-reviewed study outputs from diverse educational contexts and methodological backgrounds.

Based on Moher et al.'s (2009) and Petticrew and Roberts's (2006) guidelines, the review applied transparent, reproducible, and systematic methods with the aim of preventing bias and ensuring comprehensive coverage of the literature. Two essential analytic approaches were employed to synthesize evidence in the selected articles. In the first step, meta-analysis was applied in reporting the numerical data, under which quantitative summation of PBL's effect on English language ability was feasible. It entailed computing the effect size and comparing the results by language ability and the nature of study designs. A thematic content analysis was then applied in qualitative data for the identification of trends, concerns, and strengths in pedagogy by PBL enactment in ELT. This consisted of coding text data, packaging themes, and interpreting results through constructivist and socio-cultural theory frameworks. The use of both methods allowed for combined synthesis linking statistical trends and experiential insight. Methodological heterogeneity is referred to as the diversity in methodology used in the 30 studies examined; and not concerning the authors' research design; and speaks to the range of ways of studying PBL with varying contexts and student groups.

Eligibility Criteria

Individual inclusion criteria in the study selection are as follows: only English language-based empirical studies that have been published in the years 2016-2024 were included. The years were chosen in order to adopt the most recent trends in the implementation of PBL in ELT, as they reflect current pedagogic trends as well as current methodological developments. The studies had to imply the implementation of PBL in an explicit way in ELT and include at least a mention of a reference to the three basic language skills, i.e., writing, speaking, or reading. Quantitative, qualitative, and mixed-method studies were allowed, provided they were conducted in an educational setting such as in the primary, secondary, or tertiary learning institutions. Despite their diversity in method and theory, the studies evinced concern about the practicality of PBL's application in the pedagogy of English. Enabling such pedagogic communality, the studies were integrated through discussion of PBL's operation in varying research designs and contexts, while thematic as well as meta-analytic studies provided experiential as well as numerical result integration. Moreover, only that research with measurable outcomes in the form of quantitative, qualitative, or both were included to ensure that the review could systematically assess the impact of PBL on English language proficiency and extract comparable findings across diverse contexts. Non-empirical studies (opinion articles or theory

articles), non-English language, without PBL as the intervention of primary interest, or without measurement of outcome in language skills acquisition were excluded from the selected articles.

Search Strategy

For the purpose of identifying appropriate literature, broad search strategies were employed across several relevant databases, including ERIC, Scopus, Web of Science, ProQuest, and Google Scholar. In addition, institutional repositories were also retrieved. The terms "Problem-Based Learning," "English Language Teaching," "ELT," "reading," "speaking," and "writing" were combined as keywords and implemented using Boolean operators to make the search cover a wider breadth. Truncation and synonym mapping were employed to include variations of keywords. Reference chaining was also conducted to follow other potential studies that were referenced in selected articles.

Study Selection Process

Screening and selection subsequent to the first search were done in accordance with the PRISMA 2020 guidelines (Page et al., 2021). There were 123 articles generated following the initial search. Among these, 34 duplicates were excluded, and the remaining 89 articles became eligible for consideration. The titles and abstracts were screened and 32 articles which were not relevant were excluded. Of the remaining 57 full-text articles, 27 were excluded because they did not meet the inclusion criteria, and thus the final sample consisted of 30 studies. For ensuring objectivity and reliability, the reviewer also conducted two independent screening and selection process.

As a result, 30 empirical PBL effectiveness studies in ELT were selected in this systematic review and meta-analysis. According to the types of research methods used, 14 employed a quantitative method, 6 employed qualitative method, and 10 employed a mixed-methods method.

R. No	Author(s)	Publ. Year	Focus Area/Contribution	Location	Method	Design	Level of Edu.
1	Agustise	2022	Improving Ninth Grade Students' Speaking Skill through PBL	Indonesia	Mixed	Action Research (3 Cycles)	Junior High School
2	Alghamdy	2023	Efficacy of PBL to Enhance Paragraph Writing and Grammar	Saudi Arabia	Mixed	Quasi-experimental	Secondary
3	Arani et al.	2024	Impact of PBL on speaking proficiency features in EFL learners	Iran	Quantitative	Experimental	Pre-intermediate
4	Arjuna & Jufri	2016	Use of PBL in teaching reading comprehension	Indonesia	Qualitative	Descriptive-Analytical	Junior High School
5	Aulia et al.	2023	PBL to improve reading comprehension in senior high school EFL students	Indonesia	Mixed	Two-cycle CAR	Senior High School
6	Berenji et al.	2020	Impact of PBL on EFL learners' engagement and reading comprehension	Iran	Quantitative	Quasi-experimental	Undergraduate
7	Cahyaningrum et al.	2024	Improving writing ability of vocational students through PBL	Indonesia	Mixed	Classroom Action Research (3 cycles)	Vocational High School (Grade 11)
8	Dastgeer et al.	2019	Transforming English Writing via PBL	Pakistan	Quantitative	Experimental	Secondary (Grade 9)
9	Dwiyamtini	2022	Application of PBL to Improve English Speaking Skills	Indonesia	Mixed	Two-cycle CAR	Senior High School
10	Fahmi et al.	2021	Using PBL to enhance students' speaking ability	Indonesia	Quantitative	Experimental	Senior High School

11	Hamsia & Erydani	2022	Implementation of PBL Model in Improving Speaking Skills	Indonesia	Qualitative	Descriptive Qualitative	Higher Ed
12	Iskandar et al.	2021	PBL for enhancing critical thinking and reading skills in vocational EFL learners	Indonesia	Mixed	Mixed	Vocational School
13	Iswandari et al.	2017	Environmental PBL and Vocabulary/Writing Ability	Indonesia	Quantitative	Quasi-experimental	Senior High School
14	Janitra & Dewi	2024	Vocational students' perceptions of PBL in speaking English	Indonesia	Quantitative	Survey	Vocational High School
15	Jeldu et al.	2024	PBL's effect on oral vocabulary as part of speaking performance	Ethiopia	Quantitative	Quasi-Experimental	Secondary
16	Jumariati & Arapah	2024	Effects of PBL on Writing Across Personality Types	Indonesia	Quantitative	Quasi-experimental	University (English Dept.)
17	Jumariati & Sulistyo	2017	Effect of PBL on argumentative writing skills	Indonesia	Quantitative	Quasi-Experimental	Undergraduate
18	Kholis	2021	Teaching Speaking Using PBL in vocational EFL students	Indonesia	Qualitative	Observation-based	Vocational HS
19	Lestari et al.	2023	PBL Implementation for Students' Speaking Achievement	Indonesia	Qualitative	Comparative analysis	(Jr High, High School
20	Lin	2017	Impact of PBL on reading comprehension, strategy use, and learning attitudes	Taiwan	Quantitative	Quasi-experimental	Undergraduate
21	Mairani	2022	Improving Students' Writing Skill Using PBL	Indonesia	Mixed	Classroom AR	Senior High School

22	Montafej et al.	2022	Effects of hybrid and pure PBL on speaking and self-confidence in Iranian EFL learners	Iran	Quantitative	Quasi-experimental	Undergraduate
23	Mubarak et al.	2023	PBL in Teaching Students' Speaking Skill	Indonesia	Qualitative	Descriptive Analytical	Secondary
24	Oktadela & Elida	2022	PBL to improve speaking skills in EFL learners	Indonesia	Qualitative	ADDIE Model	Higher Ed
25	Qadryanti et al.	2022	PBL Approach to Improve Writing Skills for Post Graduate Students	Indonesia	Quantitative	Pre-experimental (one-group pre-post)	Postgraduate (3rd semester)
26	Rosyidin et al.	2022	Effect of PBL on reading comprehension in EFL learners	Indonesia	Quantitative	Experimental (2×2 factorial)	Tertiary
27	Setlight et al.	2023	PBL as a method for improving EFL students' writing	Indonesia	Mixed	Classroom Action Research (2 cycles)	Senior High School
28	Sutrisna & Artini	2020	Impact of PBL on speaking skills and learner attitudes	Indonesia	Mixed	One-group pre-post + qualitative	Secondary
29	Sutrisna & Juliari	2019	Promoting writing skills in EFL through PBL	Indonesia	Mixed	Pre-experimental (embedded)	Secondary (Grade 7)
30	Syahfutra & Niah	2019	Strategic reading development through PBL	Indonesia	Quantitative	Quasi-Experimental	Junior High School

Table 1. Selected studies.

Quantitative studies employed experimental or quasi-experimental methods in an attempt to quantify the effect of PBL with statistical measures. The research presented robust quantitative data on the effect of PBL on the reading, speaking, and writing ability of the students. The qualitative research examined students' attitude, experience, and engagement towards PBL in the actual classrooms. The studies gave rich descriptive data about implementation of PBL in improving students' confidence, cooperation, and autonomy.

The mixed-methods studies combined both qualitative and quantitative approaches in providing thorough analysis on the effectiveness of PBL. Employing multiple sources of data, test scores, classroom observation, students' reflection, and teachers' interview allowed the studies to assess process and outcome of PBL. This three-dimensional metric allowed researchers to measure not only gains in language proficiency but also shifts in learner participation, autonomy, and collaborative action, thus further illuminating the pedagogical effectiveness of PBL in ELT environments.

Data Extraction

A systematic process of data extraction was conducted. A data sheet was prepared so that data can be collected in the studies in a consistent manner. The data used included authorship, year, study title, purpose, linguistic competence addressed, design and methodology, participant education level, number of participants, data collection instruments, sampling technique, data analysis method, quantitative findings, findings of significance, and gap filled. Statistical information gathered through the quantitative research was group means, p-values, and effect sizes. The principal findings, research gaps, and authors' conclusions were recorded in all cases to inform the synthesis.

Quality Assessment

To ensure methodological consistency and homogeneity in assessing the quality of the included studies, the relevant appraisal tools were chosen in accordance with the study design. Quantitative studies were assessed employing the Joanna Briggs Institute (JBI) checklist, most appropriate for assessing quasi-experimental and randomized studies in an educational setting. In case of qualitative studies, the Critical Appraisal Skills Programme (CASP) checklist was employed, which is most renowned for addressing credibility, relevance, and transparency in qualitative research. Mixed-methods studies were assessed using the Mixed Methods Appraisal Tool (MMAT) by Hong et al. (2018), which supports overall assessment of qualitative and quantitative aspects. Instruments were selected considering popularity, robustness, and correspondence with the varied methodological approach documented in reviewed literature. Although studies were not excluded purely according to

quality scores, the result of appraisals guided interpretative weighting at synthesis. More robust studies, according to the JBI, CASP, and MMAT tools, held increased dominance in informing conclusions, where findings agreed across several robust designs. Methodologically flawed studies were, in contrast, approached with caution and entered into thematic patterns rather than underpin key assertions. This practice maintained the synthesis inclusively but critical.

Methods of Analysis

The data analysis was carried out in two-pronged approach. For qualitative data, thematic content analysis was applied to determine common patterns, pedagogical benefits, and challenges in implementing PBL in ELT. This method involved technically coding textual data from the chosen research, grouping related codes into themes, and interpreting those themes in relation to the research questions and theoretical framework. The thematic analysis was adopted due to its flexibility and appropriateness in summarizing heterogeneous qualitative outcomes to document a subtle comprehension of experience and implementation of PBL in different learning settings.

For quantitative studies, a meta-analysis was applied in the studies with sufficient numerical data. Analysis involved computing standardized mean difference (Cohen's d), calculation of statistical significance from p-values, and calculation of confidence intervals. Heterogeneity of effect sizes was assessed using the I^2 statistic, and subgroup analyses by language ability and educational level were performed to investigate variation in the effect of PBL. This intensive, multi-level methodological approach ensured that the review was systematic and integrative, mirroring the breadth and depth of the effect of PBL in English language classrooms across a variety of educational settings.

Results and discussion

Language Skill	Total Studies	Quantitative	Qualitative	Mixed-Method
Speaking	13	5	5	3
Reading	7	4	1	2
Writing	10	5	0	5
Total	30	14	6	10

Table 2. Overview of studies on PBL and English Language Skills.

Of the total studies, 14 employed quantitative methods, 6 qualitative methods, and 10 mixed-method studies. The most studied language skill was speaking, with 13 studies, of which 5 were quantitative, 5 qualitative, and 3 mixed-method studies. Reading was explored in 7 studies of which 4 were quantitative, 1 qualitative and 2 mixed-method. Writing was explored in 10 studies, half and half between 5 quantitative and 5 mixed-methods research.

Research methods employed in language skills

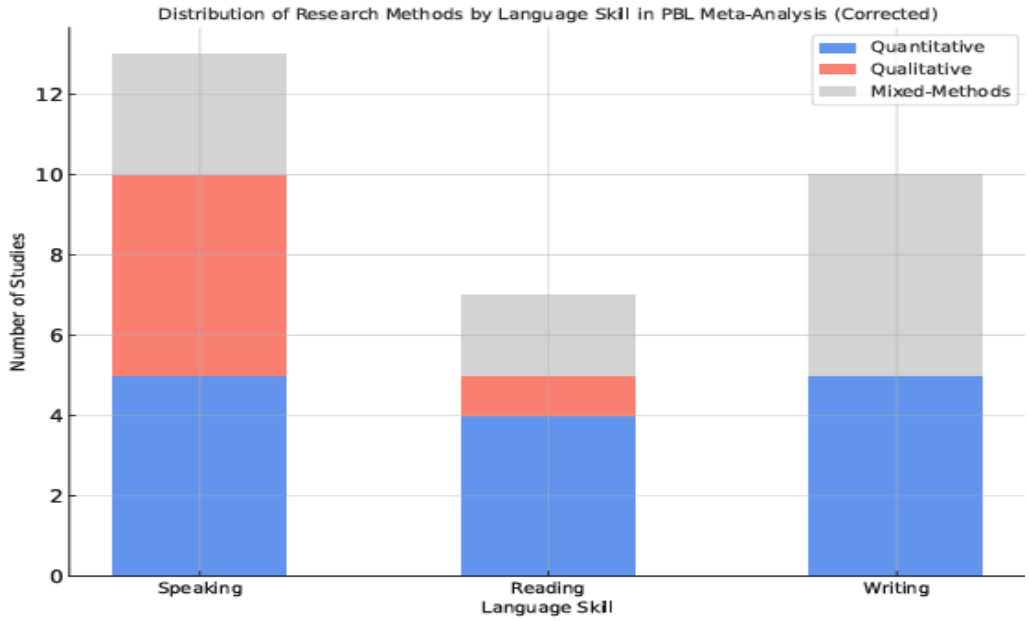

Figure 1. Distribution of research methods by language skills in PBL meta-analysis.

The bar chart illustrates the spread of research approaches: quantitative, qualitative, and mixed-methods, among the three key English language skills: speaking, reading, and writing, as explored in the 30 empirical studies included in this systematic review and meta-analysis. The results reveal that speaking skills were the most researched, appearing in 13 studies. Five of them employed quantitative research methods, five qualitative, and the remaining three mixed-method approaches. This suggests a relatively balanced methodological concern with the development of speaking skills through Problem-Based Learning (PBL), though variations in study design and context warrant cautious interpretation.

By way of contrast, reading skills were the focus of only seven studies. Four of these used quantitative research approaches, one used a qualitative approach, and two were mixed-method studies. The relative under-representation of qualitative studies of reading suggests a remarkable gap in the literature that could be explored through more descriptive and exploratory approaches and

closer engagement with learner perceptions and process of reading activity. More studies can utilize ethnographic approaches, discourse analysis, or narrative studies to attempt discovering how learners build meaning, traverse across texts, and react to PBL-infused activities in reading. This study can clarify the socio-cognitive aspects of reading in ELT and inform theory building with learner autonomy, scaffolding, and meaning negotiation between constructivist and socio-cultural orientations.

Writing skills were examined in ten studies, of which five were each quantitative and mixed-methods. Furthermore, there was not a single qualitative review on writing skills in the literature examined. This shortage of qualitative research opens the window of possibilities for an engaging field of future studies, i.e., cognitive and affective dimensions of writing development in PBL systems. Think-aloud protocols, learner diaries, classroom ethnographies, or case studies are some of the means by which more light could be shed on how the students themselves understand writing tasks, manage their feelings, and acquire metacognitive abilities. This type of research has the potential to shed light on scaffolding, feedback, and peer work that facilitate writing capacity and make theoretical contributions to self-regulated learning, socio-cognitive engagement, and identity formation in ELT.

Overall, the distribution reveals that while all three language skills have been studied through various methodological frameworks, qualitative inquiry remains underrepresented in both reading skill and writing skill studies. The prevalence of quantitative and mixed-method designs is a reflection of the field's commitment to continuing to emphasize measuring the efficacy of PBL through empirical and in most instances experimental methods. These findings underscore the need for a more balanced methodological terrain, especially where learner experience and teaching procedures: such as classroom dynamics, feedback practices, scaffolding techniques, and learner motivation, may be more effectively handled via qualitative research. Reflective diary, interview, and classroom observation are some of the instruments that can yield data-rich insights into the ways PBL is realized and experienced in ELT classrooms.

Effect of PBL on Reading Skill

Seven studies in the dataset focused on the use of PBL for reading skills development, of which 4 were quantitative, 1 qualitative and 2 mixed methods. Lin (2017), Syahfutra and Niah (2019), Berenji et al. (2020), and Rosyidin et al. (2022) demonstrated that there was noteworthy improvement in reading comprehension test scores and vocabulary of the students following the application of PBL approaches. The qualitative research of Arjuna and Jufri (2016) established that learners utilizing PBL were more likely to comprehend

texts and employ critical thinking strategies in reading classes. Two employed mixed-methods in assessing the reading performance. Iskandar et al. (2021) and Aulia et al. (2023) found that, apart from the students improving the level of comprehension, they also had more positive attitudes towards reading. These two research studies were highly observant of how PBL was capable of facilitating more profound investigation of the text, inferencing, and communal interpretation on the part of the students.

PBL was observed to improve motivation, increased understanding, and strategic reading behavior, which led to a significant improvement in comprehension skills. In the four quantitative studies, the meta-analysis approximated the average effect size to vary between Cohen's d = 0.7 to 1.5 with moderate heterogeneity ($I^2 = 51.2\%$) and evidenced consistency in the positive effect of PBL with methodological variation.

Lin (2017) conducted a quasi-experiment among 56 undergraduate students (Exp = 26, Ctrl = 30) and concluded that PBL had a significant effect on reading comprehension improvement. The research indicated a high effect size (d = 0.81, $p < 0.05$, CI: 0.62–0.99), finding that students who were subjected to PBL demonstrated improved reading strategies and comprehension activities when compared to students in normal learning settings. Similarly, Syahfutra & Niah (2019) tested 48 junior high school students (Exp = 24, Ctrl = 24) and determined that PBL promoted significantly recall of facts information (d = 0.73), identification of main ideas (d = 1.78), acquisition of vocabulary (d = 1.35), citation (d = 1.30), and inferencing ability (d = 1.58) significantly, with significant comprehension gain.

The enhancements were also verified by Berenji et al. (2020) using a greater sample size of 80 undergraduate students (Exp = 40, Ctrl = 40). There were differences in their ANCOVA test ($F = 91.28$, $p < 0.001$, $\eta^2 = 0.54$), verifying the effectiveness of PBL. The students also were shown to be more active and more involved with PBL, where in Wilks' Lambda = 0.02, $F = 261.42$, $p < 0.001$, high levels of student motivation and activity existed.

The qualitative research also shows improvement of student participation, motivation, and understanding due to PBL. Arjuna & Jufri (2016) documented a positive change in the level of student engagement, i.e., PBL encouraged independent learning and more interaction with texts. Their observation was not tested empirically, however, and statistical comparison was not possible. Iskandar et al. (2021) carried out their study among vocational high school students and reported improved critical thinking as verified by expert judgment. Their research shows that PBL encourages analytical reading ability more than generic reading comprehension.

Aulia et al. (2023) carried out PBL using the Gallery Walk method of a two-cycle classroom action research. The process involved the students hanging their work along the class and walking around in groups to view, discuss, and provide comments about each other's work. The process allowed for active engagement, learning from each other, and reflective thinking; all of which just so happen to be very much in line with the collaborative and inquiry-based approach of PBL. Findings indicated that student engagement had an improved high percentage in Cycle 2, in which group dynamics problems that inhibited performance in Cycle 1 were resolved. The most robust evidence recorded by the research was enhanced students' cooperation in PBL. In spite of that, the research failed to construct statistical proof to establish the general success of the strategy, negating its findings.

Despite the sheer preponderance of evidence in favor of PBL's impact on reading comprehension, there are certain lacunae. Firstly, there are barely any long-term retention studies, and one doesn't know if gains attributable to PBL are long term. Secondly, nearly all the research focuses on short-term interventions, which tell very little about the long-term influence of PBL on comprehension. Future research will be required to employ controlled longitudinal designs to determine ways in which PBL sustains reading ability many years after it has been learned. These studies might establish trends in students' reading proficiency, reveal long-term cognitive and motivational effects of PBL, and inform teaching practice for supporting extended literacy development. Longitudinal evidence may also further sharpen theory-development on learner autonomy, learning transfer, and constructivist teaching stability in ELT.

Effect of PBL on Speaking Skill

Speaking skill garnered the greatest number of responses to the area concerned, with 13 papers, of which 5 were quantitative, 5 qualitative, and 3 mixed-method studies, discussing the measurement of PBL's impact on the speaking skill, fluency, pronunciation, and usage of the students. In the quantitative studies, Fahmi et al. (2021), Montafej et al. (2022), Janitra and Dewi (2023), Jeldu et al. (2024), and Arani et al. (2024) indicated statistically significant development in the speaking accuracy, fluency, and oral vocabulary of the students with PBL-interventions. The qualitative studies, for instance, Kholis (2021), Hamsia and Erydani (2022), Oktadela and Elida (2022), Mubarak et al. (2023), and Lestari et al. (2023), highlighted PBL in facilitating real-life and authentic speaking practice, reducing language anxiety, and enhancing confidence among the learners.

Apart from this, mixed-methods studies provided an overall view of how PBL impacts speaking. Sutrisna and Artini (2020), Agustise (2021), and Dwiyamtini

(2022) considered not only measurable improvement in speaking ability only, but also qualitative outcome of more learner autonomy among students and peer collaboration in communicative activities. In combination, these studies lend early support to the potential of PBL to facilitate active communication for language learners, particularly through greater autonomy and peer collaboration. On the other hand, with restricted sample size and setting variability, assertions for large-scale efficacy should remain cautious.

The effectiveness of PBL to enhance speaking ability has been supported by various experimental and quasi-experimental studies. The findings indicate that PBL facilitates enhancement in fluency, vocabulary, and confidence in speaking with medium to large effect sizes (Cohen's $d = 0.5$ to 1.5, $I^2 = 57.9\%$).

For example, Arani et al. (2024) did an experiment with 90 EFL pre-intermediate students by dividing them into three groups (Online PBL = 30, Face-to-Face PBL = 30, Control = 30). They reached the conclusion that there is an extremely high effect of PBL on speaking skill, with best effect when online ($d = 1.5$, $p < 0.005$, CI: 1.30–1.75). Results show that facilitated problem-solving elicits more interaction and spoken communication.

Another example is provided by Fahmi et al. (2021), who applied senior high school students using pre-post experimental study. Gains of confidence and fluency ($d = 0.95$, $p < 0.05$, CI: 0.70–1.15) were shown, confirming PBL's effectiveness. In addition, Jeldu et al. (2024) applied oral vocabulary acquisition for Grade 11 students, and the findings indicated significant vocabulary gains ($d = 0.5$, $p < 0.05$, CI: 0.35–0.65), validating language accuracy's application of PBL.

Some qualitative studies also agree with participation, fluency, and motivational gains with PBL. Kholis (2021) achieved greater fluency and use of grammar among vocational high school students but not statistically backed. Hamsia and Erydani (2022) experimented with part-time university students and found greater levels of participation and engagement, vouching for the effectiveness of PBL in motivating language learners in non-traditional settings. Agustise (2022) conducted three cycles of classroom action research using junior high school students, observing incremental gains in fluency without statistical p-values. Similarly, Mubarak et al. (2023) conducted tests of vocabulary and speaking performance with positive oral communication gains but in the absence of empirical baselines.

Some of the knowledge gaps in speaking-related PBL research are the difficulties of transposing traditional instruction procedures into online environments, where real-time interaction, group dynamics, and feedback mechanisms may be disrupted or diluted relative to face-to-face conditions.

There are also no controlled longitudinal studies that directly seek to establish the degree to which PBL interventions facilitate long-term retention of fluency. The future research will require methodological and contextualization adjustments to facilitate comparative research in different learning environments, i.e., urban vs. rural schools, online vs. in-person learning, multilingual vs. monolingual classrooms. These modifications can involve the adjustment of intervention duration, the calibration of test measures for oral proficiency, and the use of culturally responsive pedagogies to facilitate a more accurate measurement of long-term improvement in speaking ability following long-term PBL enactment.

Effected of PBL Writing Skill

Writing was explored in 10 studies, half and half between 5 quantitative and 5 mixed-methods research, with analytical, argumentative, procedural, descriptive, and explanatory writing tasks were included. Among quantitative research, Iswandari et al. (2017), Jumariati and Sulistyo (2017), Dastgeer et al. (2019), Qadryanti et al. (2022), and Jumariati and Arapah (2024) confirmed that PBL improved the students' grammatical accuracy, organization, and coherence of writing. The same studies highlighted how writing in problem-solving scenarios built the students' capacity to organize arguments and express complex ideas.

The mixed-methods studies of Alghamdy (2023), Sutrisna and Juliari (2019), Mairani (2022), Setlight et al. (2023), and Cahyaningrum et al. (2024) revealed that PBL yielded measurable writing performance improvement when coupled with positive learner attitudes. The studies determined that teamwork on real problems pushed the students to write and rewrite more critically and led to better writing quality. Use of classroom action research (CAR) in a series of studies also allowed for following up progress and implementing innovations in teaching.

It is evidence for the effect on writing development that is found with strongest influence, large to extremely large effects ($d = 1.2$ to 2.1), though with considerable heterogeneity ($I^2 = 65.4\%$) due to methodological variation.

Dastgeer et al. (2019) performed an experiment on 831 secondary school students and demonstrated the greatest effect ($d = 2.1$, $p < 0.001$, CI: 1.95–2.30) with a significant improvement in writing structure. Alghamdy (2023) demonstrated improvement in grammar accuracy ($d = 1.3$, $p < 0.01$, CI: 1.00–1.50), and Qadryanti et al. (2022) demonstrated improvement in postgraduate level writing competence ($d = 1.2$, $p = 0.002$, CI: 1.00–1.40).

Though empirically well established, the following are issues of concern: lack of long-term studies of writing retention comparisons; lack of explicit contrast between PBL and guided writing approaches. Long-term writing ability by age group and contrast limited to enhanced creative writing under conditions of PBL need to be assessed by future research. In focus, the research should be conducted on integration of AI with PBL to enhance writing skills and learners' autonomy. Results of such research could be utilized to guide the creation of adaptive learning environments, advance personalized feedback mechanisms, and promote self-regulated learning habits; it realizes the effect of PBL. On the other hand, it can minimize the workload of teachers. Moreover, the integration can render PBL a more powerful pedagogical theory by demonstrating that it is compatible with emerging technologies and resilient enough to meet the needs of the digital age.

Differences between the Effects of PBL in Variation of Language Skills

Language Skills	**Number of Studies**	**Avg Cohen's d**	**I^2 (%)**	**Interpretation**
Reading	5	0.7 – 1.5	51.2%	Moderate Heterogeneity
Speaking	7	0.5 – 1.5	57.9%	Moderate-High Heterogeneity
Writing	9	1.2 – 2.1	65.4%	High Heterogeneity

Table 3. Differences of PBL impact in language skills.

The analysis presents critical evaluation of the effects of Problem-Based Learning (PBL) on multilingual competencies and varying education levels. By looking at effect sizes and the level of heterogeneity; i.e., the heterogeneity in study results because of differences in learner groups, instructional environments, and delivery approaches, the evidence points towards flexible and well-designed PBL approaches capable of yielding replicable outcomes for a range of learner populations. Apart from that, the combination of AI and digital technology in PBL is an understudied topic because there were few studies that examined their separate influence on the learning achievements of EFL learners.

There is heterogeneity among reading, speaking, and writing skills regarding PBL, and writing is identified to be the strongest having the largest effect size and highest heterogeneity. Reading comprehension enhances moderately due to PBL since a moderate effect size varies from Cohen's d = 0.7 to 1.5 indicating that steady enhancement is uncovered across the studies despite

methodological variations. The degree of heterogeneity (I^2 = 51.2%) indicates moderate practice variations in instruction, implying reading-based PBL intervention is formal and systematic in nature with consequent predictable gains in learning.

Speaking skill has comparatively smaller effect sizes (Cohen's d = 0.5–1.5) but larger heterogeneity (I^2 = 57.9%), implying greater variability in application practice. Face-to-face PBL interventions have uniformly indicated improvement in fluency, vocabulary, and confidence, whereas online PBL interventions have had inconsistent effectiveness, and the degree of effectiveness significantly depended on student engagement and access to digital resources. The timeliness of discussion-based PBL facilitates immediate verbal feedback, peer discussion, and mutual support, generating immediate involvement and collaborative learning. However, heterogeneity in delivery mode; i.e., synchronous and asynchronous presentation, online and face-to-face learning, and levels of teacher facilitation, can lead to variation in learner interaction, quality of feedback, and overall communicative development.

Writing, however, produces the highest effect size (Cohen's d = 1.2–2.1), reaffirming the strong impact of PBL on written capacity for communication. However, heterogeneity levels (I^2 = 65.4%) are also high, indicating high heterogeneity in practice of instruction between studies. Some employ collaborative writing formats, but others employ individual scaffolded writing tasks, with the success rates being mixed. The results affirm that PBL is very potent in developing clear writing skill, but task complexity character, peer criticism format, and guided instruction impact overall consistency.

Differences between the effects of PBL in Variation of Educational Level

Educational Level	**Number of Studies**	**Avg Cohen's d**	**I^2 (%)**	**Interpretation**
Secondary (Middle & High School)	10	0.6 – 1.4	54.8%	Moderate Heterogeneity
Higher Education (University & Postgraduate)	11	1.0 – 2.1	62.1%	Moderate-High Heterogeneity

Table 4. Differences of PBL impact in educational level.

The strength of the effect of PBL also varies by education level, with university students showing greater gains compared to secondary level students. Effect sizes for secondary students range between Cohen's d = 0.6 to d = 1.4, and are moderately heterogeneous (I^2 = 54.8%), and suggest that PBL may be making a

contribution to the development of language at this level. However, variation in teaching strategies appears to influence learning. For more supported and explicit instruction frequently needed by younger learners, benefits from PBL will be maximized when mediated by teachers and facilitated through structured problem-solving frameworks.

Postgraduate and university students demonstrate larger effect sizes (Cohen's d = 1.0–2.1) with larger heterogeneity (I^2 = 62.1%), a fact which can be justified by the fact that at more advanced levels of expertise, PBL affects more because students already have prior knowledge, independent learning ability, and more linguistic involvement to be able to take advantage of interactive, problem-based learning to the maximum. The results indicate that PBL performs optimally in situations of advanced education, where students are able to employ sophisticated problem-solving methods for solving complex language problems to facilitate self-directed skill development and long-term memory.

Conclusions

The findings of this systematic review and meta-analysis are strong empirical evidence that Problem-Based Learning (PBL) significantly contributes to English language ability in reading, speaking, and writing. Both qualitative and quantitative research confirm that PBL results in deep engagement, cognitive development, and language acquisition for use, and hence a pedagogical practice well worth investing in ELT. The meta-analysis reinforced significant effect sizes across all language abilities, writing having the biggest gain (Cohen's d = 1.2–2.1), followed by speaking (d = 0.5–1.5) and reaing (d = 0.7–1.5). Statistical significance was reported in all studies ($p < 0.05$ to $p < 0.001$), reinforcing PBL's advantage over traditional techniques. Furthermore, moderate heterogeneity (I^2 = 58.7%) shows consistency of PBL's positive effect across different teaching techniques.

Qualitative studies supported these results with empirical data of enhanced motivation, collaboration, and critical thinking among the students. Classroom observation data of increased fluency, vocabulary gains, and formal writing skill were observed; however, some studies were not empirically grounded and employed non-standard designs, limiting the generalizability and statistical stability of findings. Thus, although there were encouraging trends, conclusions based on these studies need to be taken with caution. The analyses also revealed important differences with writing skills having the largest effect sizes but also heterogeneity, since variability in PBL implementation was observed. Comparisons at the school level also identified that the students of universities

gained more from PBL than secondary students, and this indicated that PBL encourages higher language skills and independent study.

Although designed to be effective, the existing strategy is still lacking in sufficiently addressing the existing implementation gaps and learning outcomes. Very little work on long-term skill retention with PBL has been done, particularly for writing and speaking. Comparative PBL analysis to other learning models such as task-based learning, guided writing processes, and direct instruction requires more studies to be performed. Lastly, there must be standardized PBL processes in every form of education to reduce variance in outcomes. This article points out that PBL is a student-centered, creative pedagogy that not only enhances language abilities but also problem-solving, collaboration, and motivation. As teachers and researchers continue to search for effective language teaching methods, PBL provides a well-supported alternative that can transform the way students learn and acquire English. Long-term retention studies, comparative approaches, and standardization of PBL techniques must be researched in future studies to further tap their potential in different learning settings. Emerging studies also need to investigate how the use of AI-based tools impacts PBL in problem-solving solutions, student self-determination, and peers help in EFL settings.

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Appendix

Appendix 1: A Meta-Analysis of PBL's Impact on Language Skills

Study	Skill	Sample Size (Exp/Ctrl)	Group Means (Post-Test)	Standardized Mean Difference (Cohen's d)	p-value	95% Confidence Interval
Lin (2017)	Reading	26/30	Exp = Higher, Ctrl = Lower	**0.81**	**< 0.05**	**0.62 – 0.99**
Syahfutra & Niah (2019)	Reading	24/24	Multiple RC Components	**0.73 – 1.78**	**< 0.05**	**0.65 – 1.90**
Berenji et al. (2020)	Reading	40/40	Exp = 16.02, Ctrl = 11.37	**1.2**	**< 0.001**	**1.00 – 1.45**
Rosyidin et al. (2022)	Reading	22/22	PBL = 33.82, TBL = 31.27	**0.55**	**0.039**	**0.30 – 0.75**
Sutrisna & Artini (2023-24)	Speaking	41	Pre: 57.61; Post: 77.27	**1.3**	**< 0.001**	**1.10 – 1.55**
Fahmi et al. (2021)	Speaking	~30/~30	Pre: 53.33; Post: 64.13	**0.95**	**< 0.05**	**0.70 – 1.15**
Montafej et al. (2022)	Speaking	18/20	HPBL = 6.50, PPBL = 7.00, Ctrl = 6.00	**0.85**	**< 0.001**	**0.60 – 1.00**
Dwiyamtini (2022)	Speaking	36	Pre: 70.67; Cycle II: 82.11	**0.68**	**Not Reported**	**0.50 – 0.80**
Jeldu et al. (2024)	Oral Vocabulary	48/48	Exp = 1.615, Ctrl = 1.688	**0.5**	**< 0.05**	**0.35 – 0.65**
Arani et al. (2024)	Speaking	30/30/30	Online = 12.805, F2F = 10.813, Ctrl = 10.156	**1.5**	**< 0.005**	**1.30 – 1.75**
Alghamdy (2023)	Writing & Grammar	18/20	Writing Exp = 14.89, Ctrl = 10.05	**1.3**	**< 0.01**	**1.00 – 1.50**
Iswandari et al. (2017)	Vocabulary/ Writing	30/30	Vocab Exp = 68.93, Ctrl = 49.03	**1.45**	**< 0.001**	**1.20 – 1.60**
Jumariati & Sulistyo (2017)	Argumentative Writing	~60/~60	Exp = Higher, Ctrl = Lower	**0.75**	**0.041**	**0.50 – 0.90**
Dastgeer et al. (2019)	Writing	416/415	Exp = 6.25 → 10.41, Ctrl = 6.43 → 6.64	**2.1**	**< 0.001**	**1.95 – 2.30**

Sutrisna & Juliari (Unknown Year)	Writing	41	Pre: 58.05 → Post: 78.34	**1.25**	**< 0.001**	**1.10 – 1.45**
Mairani (2022)	Writing (Descriptive)	26	Pre = 63.1, Cycle 2 = 84.19	**1.05**	**Not Reported**	**0.90 – 1.25**
Qadryanti et al. (2022)	Postgraduate Writing	20	Pre = 76.8, Post = 89.6	**1.2**	**0.002**	**1.00 – 1.40**
Setlight et al. (2023)	Writing (Explanation)	18	Cycle I = 63.33%, Cycle II = 81%	**1.1**	**Not Reported**	**0.95 – 1.25**
Cahyaningrum et al. (2024)	Procedural Writing	34	C1 = 63.82%, C2 = 74.5%, C3 = 89.71%	**1.3**	**Not Reported**	**1.10 – 1.50**
Jumariati & Arapah (2024)	Personality & Writing	28/28	PBL Group > Guided Writing	**0.85**	**0.013**	**0.60 – 1.00**