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ENHANCING EFL STUDENTS' RECOGNIZING ASSUMPTION SKILL THROUGH PROBLEM-BASED LEARNING IN INDONESIAN HIGH SCHOOLS

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Abstract: Education plays a pivotal role in fostering higher-order thinking skills that enable learners to navigate complex social and epistemic realities. Within the Indonesian educational reform agenda particularly the Merdeka Belajar (Freedom to Learn) curriculum there has been an explicit shift from teacher-centered to student-centered pedagogies that promote inquiry, reasoning, and learner autonomy. This study investigates the impact of Problem-Based Learning (PBL) on students' assumption recognition skills, a critical subcomponent of higher-order thinking essential for argument evaluation and reflective judgment in English language learning. Employing a quasi-experimental design, the research involved senior high school students in Brebes Regency who were divided into experimental and control groups. The experimental group received PBL instruction enriched with scaffolds for identifying and questioning assumptions, while the control group engaged in conventional teacher-led learning. Quantitative data were collected through the Assumption Recognition Subscale of the Watson–Glaser Critical Thinking Appraisal and analyzed using inferential statistics, complemented by qualitative classroom observations to examine facilitation dynamics and discourse patterns. Results revealed that the PBL group demonstrated statistically significant improvements in assumption recognition compared to the control group, indicating that structured inquiry and collaborative reasoning effectively enhance critical subskills. Qualitative findings further suggested that teacher facilitation, peer dialogue, and problem authenticity were key mediators of cognitive engagement. These results highlight the potential of PBL as a pedagogical model that operationalizes the Merdeka Curriculum's vision of student-centered learning by cultivating reflective, autonomous, and epistemically responsible learners. The study concludes with pedagogical implications for teacher education, curriculum design, and assessment practices aimed at strengthening critical thinking in English language classrooms.
Keywords: *Problem-Based Learning; assumption recognition; critical thinking; student-centered learning.*

INTRODUCTION

Education performs a central social function: it reproduces and transforms knowledge, cultivates cognitive capacities, and prepares citizens to participate meaningfully in democratic, economic, and cultural life (Biesta, 2020). As a public institution, schooling is expected not only to transmit disciplinary content but also to develop higher-order cognitive skills such as critical thinking, metacognition, and the capacity to evaluate implicit premises underlying claims and arguments (OECD, 2018). The ability to recognize assumptions defined as detecting unstated or taken-for-granted propositions that support reasoning is a discrete and pedagogically tractable component of critical thinking, with direct relevance for students' academic success and civic competence (Brookfield, 2012; Facione, 2020).

The growing body of international research has consistently highlighted the potential of Problem-Based Learning (PBL) in enhancing various dimensions of English language learning. Recent systematic reviews confirm that PBL

positively impacts English as a Foreign Language (EFL) learning outcomes across multiple contexts and proficiency levels (Guo et al., 2024). In the Indonesian context specifically, Wijaya (2022) demonstrated that PBL activities significantly improve students' productive language skills, including speaking and writing, by providing authentic opportunities for language use and meaningful communication. These findings are particularly relevant given the Indonesian government's emphasis on developing communicative competence alongside critical thinking abilities.

Over recent decades, Indonesian education policy has signaled an explicit shift away from rote, teacher-centered instruction toward more student-centered pedagogies that foreground active learning, higher-order thinking, and student agency (Kementerian Pendidikan dan Kebudayaan, 2020). National reforms, culminating in the *Merdeka Belajar* ("Freedom to Learn") agenda, emphasize foundational competencies, teacher professionalization, and curricular flexibility all of which create an enabling environment for pedagogical models that place learners, rather than instructors, at the center of the knowledge-building process (OECD, 2021; Mulyasa, 2022). This national transformation is driven by concerns that conventional, lecture-driven classrooms insufficiently develop students' capacities to reason critically amid complex, uncertain information environments (Yuliana & Arifin, 2023).

Problem-Based Learning (PBL) exemplifies a robust student-centered approach that aligns intrinsically with these policy aims. Originating as a pedagogical innovation in professional education, PBL situates learners around authentic, ill-structured problems that require collaborative inquiry, iterative hypothesis testing, and integrative reasoning (Hmelo-Silver, 2013; Savery, 2015). Empirical syntheses indicate that PBL can produce reliable improvements in higher-order cognitive outcomes, including measures of critical thinking, when implementation fidelity is maintained and assessment instruments are well matched to instructional goals (Walker et al., 2020; Loyens et al., 2022). Meta-analytic evidence suggests moderate to substantial effect sizes for PBL on general critical-thinking outcomes, although these vary depending on the domain, student level, and fidelity of PBL enactment (Capon & Kuhn, 2021; Strobel & van Barneveld, 2022). These findings make PBL a promising candidate for operationalizing student-centered reform efforts in Indonesian senior high schools.

Despite PBL's documented benefits for broad critical-thinking constructs, less attention has been paid to its isolated effects on component skills such as recognition of assumptions. Standard critical-thinking instruments (e.g., Watson–Glaser subscales) treat assumption recognition as a distinct cognitive operation one that involves not only logical analysis but also epistemic sensitivity to contextual warrants and evidentiary gaps (Watson & Glaser, 2012). Because assumption recognition can be practiced through explicit instructional scaffolds (for example, think-aloud modelling, assumption checklists, and guided peer critique), investigating whether PBL enhances this specific skill is both theoretically interesting and practically important for curriculum designers who aim to translate student-centered aspirations into measurable cognitive gains (Paul & Elder, 2019).

The effectiveness of PBL in fostering critical thinking has been extensively documented in recent scholarship. Montafej, et. Al., (2022) found that both hybrid and pure PBL approaches significantly enhanced Iranian EFL learners' productive skills and critical thinking abilities when implemented through mobile-assisted language learning applications. Similarly, Kök and Duman (2023) reported that PBL positively influenced Turkish EFL students' problem-solving skills, a cognitive capacity closely related to assumption recognition. These international findings suggest that PBL's benefits for higher-order thinking transcend specific cultural and educational contexts, making it a promising pedagogical model for adaptation in Indonesian senior high schools.

The Indonesian classroom context poses both opportunities and constraints for PBL implementation. Local studies and programmatic reports have documented successful PBL adaptations that increase classroom activity, student engagement, and domain-specific problem solving, but they also highlight challenges such as limited teacher training, assessment systems that privilege memorization, and resource disparities across regions (Sari & Wibowo, 2021; Pratiwi et al., 2023). Translating the national student-centered policy rhetoric into routine classroom practice therefore requires empirical evidence that attends to both outcome effects and process variables including teacher facilitation strategies, the design of problems that foreground

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assumption detection, and classroom discourse practices that normalize epistemic questioning.

Within the Indonesian educational landscape, the implementation of PBL under the Merdeka Curriculum has gained increasing attention from researchers and practitioners. Mardiant and Damayanti (2024) explored the role of EFL teachers in facilitating PBL within the emancipated curriculum context, highlighting that teachers serve as facilitators, motivators, and learning resources who guide students through problem-solving processes rather than simply transmitting knowledge. Their study underscores the importance of teacher readiness and professional development in ensuring successful PBL implementation. Furthermore, the shift toward student-centered learning requires teachers to reconceptualize their classroom roles and develop new facilitation strategies that promote active student engagement and critical inquiry.

This study responds to the foregoing gaps by examining the impact of a PBL intervention explicitly designed to foster recognition of assumptions among senior high school students in Brebes Regency, Indonesia. Brebes is representative of many Indonesian districts seeking to reconcile national reform goals with local resource realities; hence, a focused investigation within this setting can generate insights that are locally actionable and potentially generalizable to similar contexts. The intervention integrates standard PBL phases with targeted scaffolds for assumption recognition: structured problem prompts that require students to articulate underlying premises, small-group reflection protocols that foreground challenged assumptions, and teacher facilitation moves that model epistemic skepticisms and evidentiary testing.

The flexibility of PBL delivery formats has also been investigated in recent research. Orhan (2024) compared online and in-class PBL implementations in higher education EFL classrooms, finding that both formats significantly enhanced learning outcomes and critical thinking, though each presented unique advantages and challenges. This finding is particularly relevant as Indonesian schools increasingly integrate technology into their instructional practices. Additionally, Arani, Zarei, and Sarani (2023) examined the barriers to PBL implementation from teachers' perspectives, identifying factors such as limited training, large class sizes, and assessment constraints that hinder widespread adoption. These insights are valuable for understanding the implementation context in Indonesian schools, where similar challenges may exist.

The specific skill of assumption recognition has been addressed in several recent studies examining PBL's impact on critical thinking. Bendraou and Sakale (2023) investigated the effects of PBL combined with reading stories on Moroccan middle school students' critical thinking development, finding that students who engaged in problem-based activities demonstrated improved ability to analyze texts, identify implicit meanings, and question underlying assumptions. Similarly, Paudel (2025) proposed innovative strategies for fostering critical thinking in EFL learners, emphasizing that assumption recognition must be explicitly taught through structured activities that require students to examine evidence, consider alternative perspectives, and evaluate the logical consistency of arguments. These pedagogical insights informed the design of the assumption recognition scaffolds incorporated into the PBL intervention in the present study.

The application of PBL extends beyond general English instruction to specialized language learning contexts. Mariotti (2024) examined the integration of PBL in English for Specific Purposes (ESP) settings, identifying strengths such as increased learner motivation, enhanced problem-solving skills, and improved ability to apply language in professional contexts. While the present study focuses on general EFL instruction in senior high schools, the principles of authentic task design and collaborative inquiry that underpin ESP-oriented PBL are equally relevant. Furthermore, Ibnian (2023) demonstrated that online PBL activities significantly improved university EFL students' expository essay writing, suggesting that PBL's benefits extend to both receptive and productive language skills. Quinaluisa (2025), in a doctoral dissertation, confirmed that PBL effectively enhances English speaking skills by providing structured opportunities for meaningful communication and collaborative problem-solving.

Beyond language skills, PBL has been shown to cultivate broader cognitive competencies essential for academic and professional success. Bazarbayeva and Aitbayeva (2023) investigated the impact of PBL on master students' critical thinking development, finding that engagement with authentic problems and collaborative inquiry significantly improved participants' ability to analyze complex issues, evaluate evidence, and construct well-reasoned arguments. These

findings at the graduate level suggest that PBL's cognitive benefits are scalable across educational levels, reinforcing its suitability for secondary school implementation. Additionally, Han (2024) explored the development of teacher professional identity through PBL programs, highlighting that when teachers themselves experience PBL as learners, they develop a deeper understanding of its pedagogical principles and greater confidence in facilitating student-centered inquiry.

Comparative studies have also examined PBL alongside other student-centered approaches. Arochman et al. (2024) investigated the effect of Project-Based Learning on EFL students' writing skills, demonstrating that inquiry-oriented pedagogies consistently outperform traditional instruction in developing both language proficiency and higher-order thinking. While Project-Based Learning and Problem-Based Learning share common principles, PBL's specific emphasis on ill-structured problems and hypothesis testing makes it particularly well-suited for developing assumption recognition skills. Most recently, Huang et al. (2025) explored the enhancement of student reading performance through a personalized two-tier PBL approach integrated with generative artificial intelligence, demonstrating that PBL can be effectively combined with emerging technologies to create adaptive learning environments that respond to individual student needs. This finding opens exciting possibilities for future PBL implementations in Indonesian classrooms as digital infrastructure continues to improve.

This study responds to the foregoing gaps by examining the impact of a PBL intervention explicitly designed to foster recognition of assumptions among senior high school students in Brebes Regency, Indonesia. Brebes is representative of many Indonesian districts seeking to reconcile national reform goals with local resource realities; hence, a focused investigation within this setting can generate insights that are locally actionable and potentially generalizable to similar contexts. The intervention integrates standard PBL phases with targeted scaffolds for assumption recognition: structured problem prompts that require students to articulate underlying premises, small-group reflection protocols that foreground challenged assumptions, and teacher facilitation moves that model epistemic skepticism and evidentiary testing. Drawing on insights from recent PBL research (Guo et al., 2024; Kök & Duman, 2023; Orhan, 2024), the intervention was designed to maximize cognitive engagement and promote transferable critical thinking skills.

In sum, this study situates the role and function of education to cultivate reflective, epistemically responsible citizens within ongoing Indonesian efforts to transform pedagogy from teacher-centered transmission to student-centered inquiry. By focusing on the micro-skill of recognizing assumptions, the research offers a granular account of how PBL can operationalize national reform goals in classroom practice and thereby strengthen the cognitive foundations necessary for students' lifelong learning and civic engagement.

METHOD

This research employed a quasi-experimental design with a non-equivalent control group pretest-posttest structure to examine the effectiveness of Problem-Based Learning (PBL) in improving students' assumption recognition skills. This design was appropriate because random assignment was not feasible in intact classroom settings, a common constraint in educational research (Creswell & Creswell, 2018; Field, 2018).

The study was conducted at three public senior high schools in Brebes Regency, Indonesia, all implementing the Merdeka Curriculum, which supports student-centered learning (Mardiant & Damayanti, 2024). Participants comprised 197 eleventh-grade students from six intact classes, divided into an experimental group (n = 102) receiving PBL instruction and a control group (n = 95) receiving conventional teaching. Three English teachers facilitated the experimental instruction. Written informed consent was obtained from all participants, parents, and school authorities.

Teachers collaboratively developed lesson plans, worksheets, and assessment tools during focus group discussions. Materials incorporated authentic problem scenarios requiring assumption identification, designed following PBL principles from recent literature (Kök & Duman, 2023; Montafej et al., 2022; Mariotti, 2024). Expert review ensured alignment with learning objectives (Mardiant & Damayanti, 2024).

The experimental group received PBL following Arends' (2012) five steps: problem introduction, learner organization, guided investigation, solution presentation, and reflection. Teachers were trained in facilitation strategies drawing on Arani et al. (2023) and Han (2024). The intervention ran for eight weeks with two 90-minute sessions weekly, totaling sixteen

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sessions. This systematic approach follows recommendations from recent PBL research (Orhan, 2024; Guo et al., 2024).

The control group received conventional teacher-centered instruction focusing on lectures, textbook exercises, and grammar explanations, with equivalent instructional time.

Students' assumption recognition was measured using an adapted version of the Watson-Glaser Critical Thinking Appraisal recognition of assumptions subtest (Watson & Glaser, 2012). This subskill focus aligns with research emphasizing explicit critical thinking instruction (Paudel, 2025; Bendraou & Sakale, 2023). The instrument comprised 20 multiple-choice items (maximum score 100), adapted through translation and back-translation for Indonesian students. Expert validation involved reviewers in English education and linguistics (Kök & Duman, 2023; Montafej et al., 2022; Ibnian, 2023; Arochman et al., 2024). A pilot study with 30 students was conducted following Huang et al. (2025). Cronbach's alpha was 0.84, indicating good reliability.

Pre-tests were administered one week before intervention, post-tests one week after completion, under standardized conditions. Classroom observations verified implementation fidelity.

Scores were scored by two independent blind raters (inter-rater reliability = 0.92). Data were analyzed using SPSS version 26. Normality was assessed using the Shapiro-Wilk test (Field, 2018). Independent Samples t-tests compared post-test and gain scores between groups. Paired Samples t-tests compared pre-test and post-test scores within groups. Effect sizes (Cohen's d) were calculated. These procedures align with recent PBL studies (Orhan, 2024; Guo et al., 2024; Wijaya, 2022).

Internal validity was ensured through a control group, pre-testing, standardized implementation, and fidelity checks. External validity was addressed through a detailed contextual description. Construct validity was supported by expert review and the use of established instruments. Reliability was confirmed through internal consistency ($\alpha = 0.84$), inter-rater agreement (0.92), and pilot testing (Huang et al., 2025).

Informed consent was obtained, confidentiality was protected through coding, and institutional approvals were secured from the review board and Brebes Regency Education Office. Control group teachers received PBL workshops post-study.

RESULTS AND DISCUSSION

The *Results and Discussion* section outlines the outcomes of the research regarding the influence of applying the Problem-Based Learning (PBL) model on students' ability to recognize assumptions, which represents a fundamental aspect of critical thinking competence. The analysis evaluates the comparative performance of learners exposed to the PBL treatment and those in the conventional instruction group, using both pre-test and post-test assessments. In this investigation, students' assumption recognition ability serves as the dependent variable, while the instructional approach, Problem-Based Learning versus traditional (non-PBL) methods, functions as the independent variable.

To determine the effectiveness of the intervention, a series of statistical procedures was implemented. Initially, a normality test was conducted to confirm that the dataset fulfilled the criteria required for parametric testing. Following this, *Paired Samples t-tests* were utilized to identify significant changes in students' assumption recognition within each instructional group by comparing their pre-test and post-test outcomes. Furthermore, *Independent Samples t-tests* were employed to analyze differences in the mean scores between the PBL and control groups at both stages of measurement.

Normality assumption skills pre test

Before conducting the inferential analyses, a normality test was performed to determine whether the data from both groups met the assumptions for parametric testing. The Shapiro Wilk test was applied to the pre-test scores of students' assumption recognition skills in both the control and Problem-Based Learning (PBL) groups. The results are summarized in Table 1.

Table 1. *Normality assumption skills pre test*

Treatment	Shapiro – wilk		
	Statistic	df	Sig.
Control	0,979	95	0,141
Problem-Based Learning	0,988	102	0,461

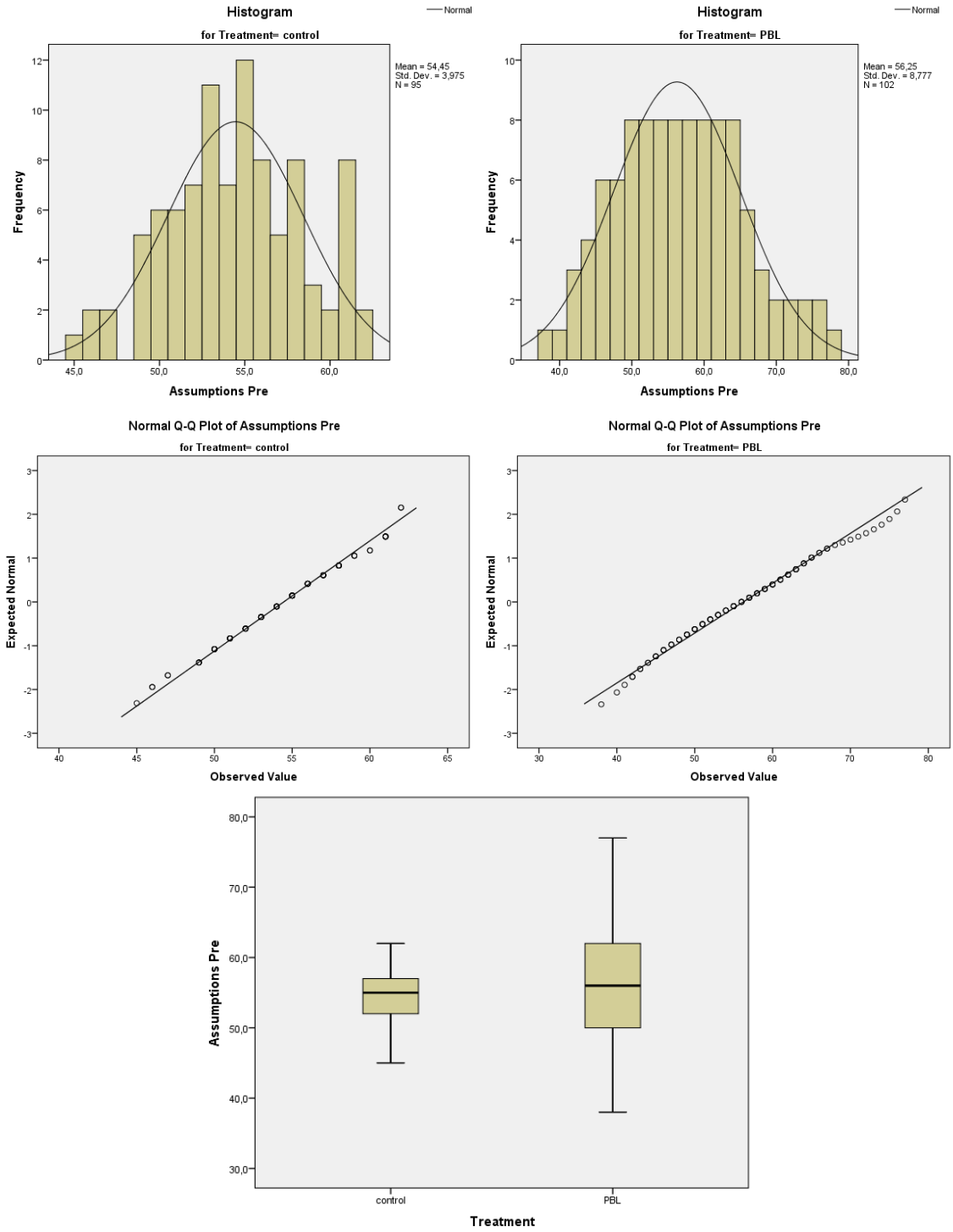


Figure 1. *Normality plot of assumption skills pre-test*

As shown in Table 1, the significance values for both the control group (Sig. = 0.141) and the PBL group (Sig. = 0.461) were greater than the threshold of 0.05. Therefore, it was concluded that the pre-test data for both groups were normally distributed. This finding indicated that the assumption of normality was met, allowing for the use of parametric tests in subsequent analyses. The visual representations provided further support for the statistical results. The histograms for both the control and PBL groups displayed bell-shaped curves that closely followed the normal distribution line, as shown in Figure 1. Additionally, the Q–Q plots demonstrated that the observed data points aligned closely with the expected normal line, confirming the normal distribution of the pre-test scores. The boxplot comparison also revealed relatively symmetrical distributions in both groups, though the PBL group showed a slightly wider spread, indicating

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greater variability in students' initial assumption recognition skills.

In the control group, the mean pre-test score for assumption recognition was 54.45 (SD = 3.975), while in the PBL group, it was 56.35 (SD = 8.777). Although the PBL group had a slightly higher mean score, the greater standard deviation suggested that students in this group exhibited more diverse levels of initial ability in identifying and evaluating assumptions. This variation could be attributed to individual differences in critical thinking experience and prior exposure to inquiry-based tasks, which are often limited in traditional, teacher-centered classroom environments.

These findings align with previous studies (Arends, 2012; Hmelo-Silver, 2014; Savery, 2015) that emphasized how learners enter PBL contexts with varying degrees of readiness for self-directed learning. In Indonesian classrooms, where conventional methods remain dominant, such disparities are common as students gradually transition toward active learning modes (Kusumah et al., 2023; Rahmawati & Lubis, 2022). The baseline normality observed in both groups confirmed that any post-intervention differences could be attributed primarily to the instructional approach rather than to pre-existing disparities in distribution. From a pedagogical perspective, the establishment of normality in both groups provided a sound basis for valid comparison between the experimental (PBL) and control (non-PBL) conditions. The pre-test results reflected that students in Brebes Regency senior high schools possessed moderate levels of assumption recognition skills prior to the intervention. This aligns with national findings reported by the Indonesian Ministry of Education and Culture (Kemendikbud, 2022), which identified critical thinking and reasoning as developing competencies among high school learners within the Merdeka Curriculum framework.

The use of the Problem-Based Learning model in this research aimed to enhance these specific reasoning skills by engaging students in real-world problems that demand assumption identification, justification, and verification. As stated by Facione (2020), recognizing assumptions is a key subskill of critical thinking, allowing learners to distinguish between evidence-based reasoning and subjective belief. The ability to identify underlying assumptions is particularly essential in English language learning, where learners must analyze implied meanings, evaluate argument structures, and interpret authorial perspectives (Ennis, 2018; Ghanizadeh & Moafian, 2021). The initial normality test results, therefore, served not only as a statistical prerequisite but also as a pedagogical indicator of students' readiness to engage in inquiry-oriented learning environments. The balanced baseline conditions between the two groups ensured that subsequent improvements in the post-test phase could be validly interpreted as the effect of the PBL intervention.

Moreover, the visual evidence from the Q–Q plots and histograms illustrated that both distributions adhered closely to normality, with minimal skewness or kurtosis detected. Such patterns are consistent with studies by Khoiriyah and Husamah (2018) and Yew and Goh (2016), who observed that prior to the implementation of PBL, students' critical thinking skills typically followed a normal distribution within a moderate performance range. This trend reflects the general cognitive characteristics of secondary school learners transitioning from passive to active learning paradigms. In summary, the results of the normality analysis confirmed that the pre-test scores of both the control and PBL groups were normally distributed, with the PBL group exhibiting slightly higher variability. This finding validated the suitability of using parametric tests such as the *Independent Samples t-test* and *Paired Samples t-test* in subsequent analyses. More importantly, it provided a statistically sound foundation for examining the potential impact of the Problem-Based Learning approach on enhancing students' recognition of assumptions in English learning contexts.

Independent t-test assumptions skill pre test

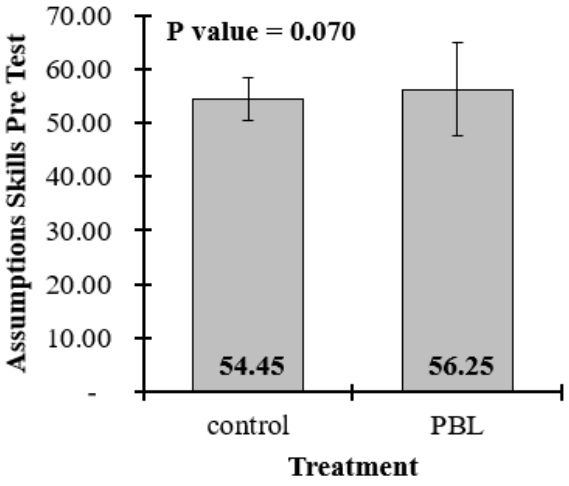


Figure 2. *Assumptions skills pre-test*

An Independent Samples t-test was conducted to compare the students' recognition of

assumptions between the control and Problem-Based Learning (PBL) groups before the intervention. The analysis aimed to determine whether there was a statistically significant difference in students' assumption recognition skills prior to the implementation of the PBL approach. The descriptive statistics showed that the mean score for the control group was 54.45, while the mean score for the PBL group was 56.25 (Figure 2). The inferential results revealed a p-value of 0.070, which is greater than the 0.05 significance level. This indicates that there was no statistically significant difference between the two groups in terms of their assumption recognition skills at the pre-test stage. In other words, both the control and PBL groups demonstrated comparable levels of assumption recognition ability prior to the instructional treatment. These results confirm that both groups started from an equivalent baseline condition, thus satisfying an essential prerequisite for quasi-experimental research designs (Creswell & Creswell, 2018). Such equivalence ensures that any subsequent differences observed in the post-test phase can be attributed to the instructional intervention in this case, the implementation of the PBL approach rather than to pre-existing disparities in students' critical thinking abilities.

From a pedagogical standpoint, the similarity in pre-test performance reflects that students in both groups possessed a moderate level of critical awareness and reasoning capacity, consistent with findings from previous studies in Indonesian senior high schools (Kusumah et al., 2023; Rahmawati & Lubis, 2022). It also aligns with the notion that critical thinking subskills, including the recognition of assumptions, often develop gradually through guided inquiry and dialogic learning rather than through traditional didactic instruction (Facione, 2020; Ennis, 2018). The absence of a significant pre-test difference is pedagogically valuable, as it indicates that the students' initial recognition of assumptions had not yet been strongly influenced by exposure to problem-based or inquiry-driven classroom practices. In typical teacher-centered environments—still prevalent in many Indonesian schools students are accustomed to receiving explicit information from teachers rather than critically analyzing the underlying premises of statements or arguments (Rahmawati & Lubis, 2022). This baseline similarity thus highlights the potential for PBL to serve as a meaningful pedagogical intervention to improve assumption recognition and other higher-order reasoning abilities.

The slight numerical difference between the mean scores (56.25 for the PBL group versus 54.45 for the control group) suggests that students in the PBL classes may have had marginally greater prior exposure to analytical or inquiry-based activities. However, the difference was not large enough to reach statistical significance. This small variation is consistent with earlier findings reported by Hmelo-Silver (2014) and Yew and Goh (2016), who observed that students entering PBL-based instruction typically show diverse but statistically comparable initial reasoning levels. Figure 2 further visualizes these findings. The mean scores and error bars representing the standard error show considerable overlap between the two groups, visually confirming the absence of a significant difference. This graphical evidence supports the statistical conclusion that both cohorts were at a comparable level before the experimental treatment began. Overall, the results of the Independent Samples t-test validate the internal consistency of the research design and provide a robust foundation for evaluating the subsequent impact of Problem-Based Learning on students' recognition of assumptions. With the baseline equivalence established, any observed post-test improvement can be confidently interpreted as a consequence of the pedagogical intervention rather than sampling bias or group disparity.

Normality assumption skills post test

Prior to further statistical analysis, a normality test was conducted to ensure that the data distribution of students' recognition of assumptions met the requirements for parametric testing. The Shapiro–Wilk test results are displayed in Table 2.

Table 2. *Normality assumption skills post test*

Treatment	Shapiro – wilk		
	Statistic	df	Sig.
Control	0,986	95	0,401
Problem-Based Learning	0,982	102	0,179

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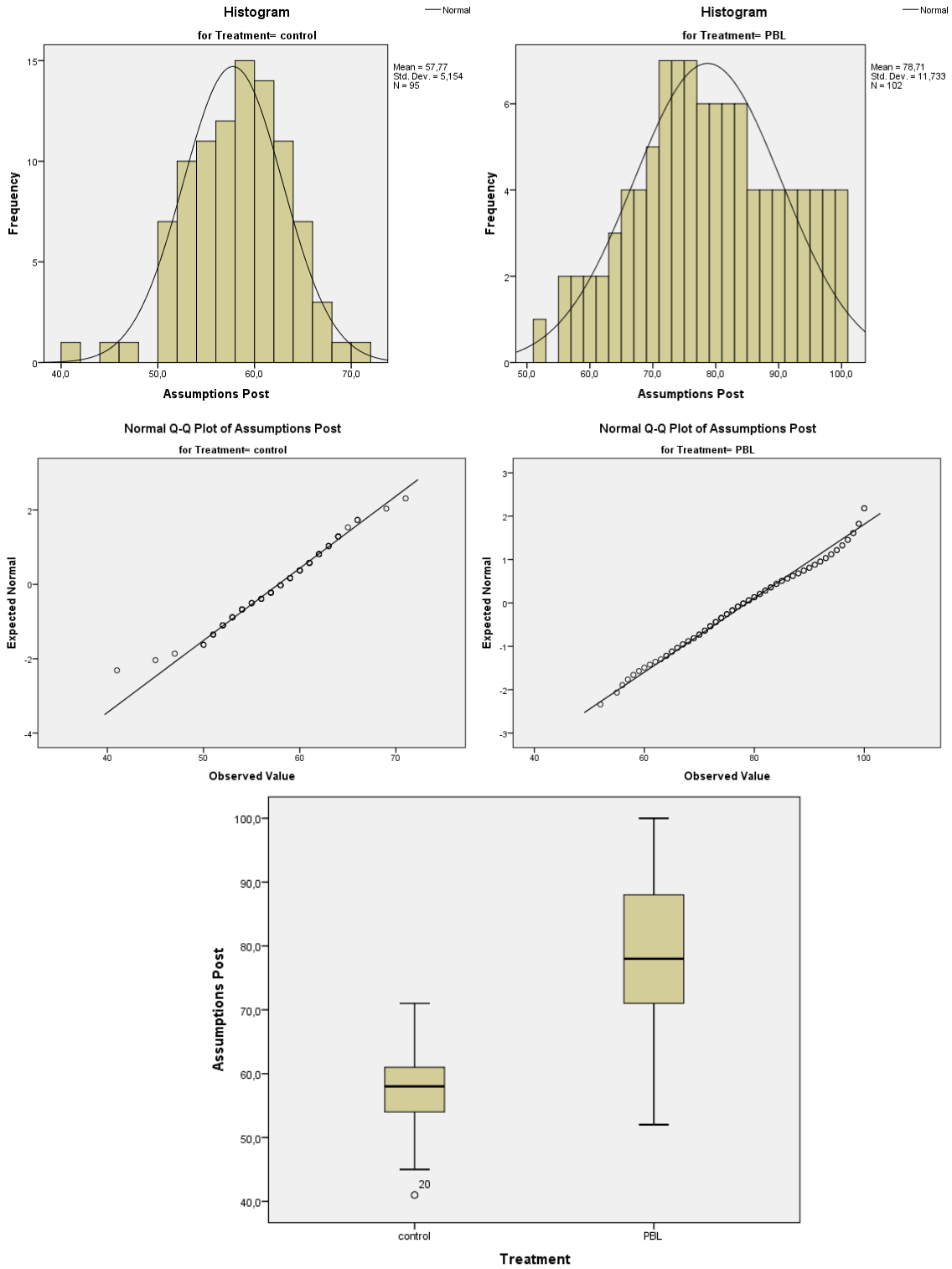


Figure 3. *Normality plot of assumption skills post-test*

As shown in Table 2, the significance values for both the control group (p = 0.401) and the PBL group (p = 0.179) are greater than 0.05. This indicates that the post-test data of both groups were normally distributed. The results are further supported by the histogram and Q–Q plot distributions (Figures 1 and 2), which demonstrate that the data points closely follow the normal curve line. The visual patterns reveal symmetrical distributions without notable skewness or kurtosis deviations, thereby confirming that the assumption of normality was fulfilled (Field, 2018). Figure 1 presents the histogram of post-test scores for both the control and PBL groups. The control group achieved a mean score of 57.77 (SD = 5.154), while the PBL group reached a

substantially higher mean score of 78.71 (SD = 11.733). The histogram shows that the distribution of scores for the control group was concentrated between 50 and 65, whereas the PBL group exhibited a wider distribution range between 60 and 100, with a visible rightward shift in the central tendency.

The Q–Q plots in Figure 2 further confirm that the data points for both groups aligned well with the diagonal line, indicating that the data did not violate the normality assumption. The PBL group, however, displayed a slightly larger variation due to differences in students' levels of engagement and adaptability toward the inquiry-based learning process.

Figure 3 displays the boxplot comparison between the two groups. The median score of the PBL group is markedly higher than that of the control group, visually emphasizing the positive effect of PBL on students' ability to recognize assumptions. Furthermore, the interquartile range of the PBL group was wider, suggesting greater differentiation among learners' outcomes an expected result in student-centered pedagogies where learners actively construct their understanding through collaborative problem-solving (Hmelo-Silver, 2004; Savery, 2015).

The findings indicate a clear improvement in students' recognition of assumptions following the implementation of Problem-Based Learning. Students in the PBL class demonstrated stronger performance in identifying implicit premises and evaluating reasoning processes compared to those in the control group. This enhancement can be attributed to the active learning nature of PBL, which positions students as self-directed inquirers rather than passive recipients of information (Barrows, 1986; Hung, 2011). In the PBL classroom, students were challenged with real-world contextual problems requiring critical evaluation of information sources, hypothesis formulation, and reflective discussion with peers. Such tasks naturally promote deeper metacognitive engagement, allowing learners to identify hidden assumptions in argumentation a critical subskill within higher-order thinking frameworks (Ennis, 2018; Facione, 2020).

Moreover, the higher variability observed in the PBL group aligns with the constructivist perspective that learning outcomes differ across individuals depending on prior knowledge, motivation, and collaborative dynamics (Hmelo-Silver, Duncan, & Chinn, 2007). Students who were more proactive in discussion and problem analysis showed remarkable improvement, whereas those less confident in reasoning required additional scaffolding. Nevertheless, the overall trend supports the conclusion that PBL enhances students' assumption recognition skills through active inquiry and reflective practice. From the pedagogical standpoint of English language education, this improvement has broader implications. The ability to recognize assumptions plays a fundamental role in critical reading, argument analysis, and writing coherence skills that are essential for academic literacy in English classrooms (Halvorsen, 2014; Yeh & She, 2010). By engaging students in PBL activities, teachers foster both linguistic and cognitive growth, integrating language learning with critical reasoning development.

In line with previous studies, these results support the growing consensus that Problem-Based Learning fosters critical thinking and reasoning dispositions across various educational contexts (Savery, 2015; Walker & Leary, 2009). The data from Brebes Regency thus corroborate findings from other international settings, suggesting that PBL can serve as an effective pedagogical model in Indonesian senior high schools to cultivate analytical and reflective learners who can navigate complex information environments.

Independent t-test assumption skill post test

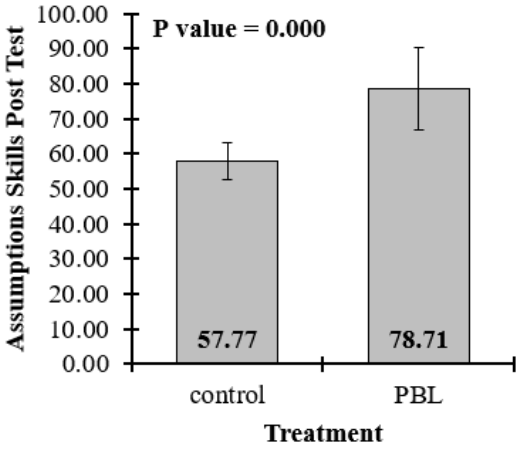


Figure 4. *Assumption skills post-test*

Figure 4 illustrates the comparison of students' post-test scores on the recognition of assumptions between the control group and the Problem-Based Learning (PBL) group. The results show a statistically significant difference in students' performance after the implementation of PBL, with a p-value of 0.000 (< 0.05). This finding indicates that the learning intervention had a substantial positive impact on students' ability to recognize assumptions a key component of

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critical thinking and higher-order reasoning skills in English language learning contexts. As shown in the figure, the mean score of the control group was 57.77, while that of the PBL group reached 78.71. The marked increase of approximately 20.94 points demonstrates that students exposed to PBL were more capable of identifying underlying assumptions embedded in arguments, texts, and communicative tasks. This improvement can be attributed to the distinctive features of the PBL approach, which emphasizes inquiry, collaboration, and reflection rather than passive information reception (Hmelo-Silver, 2004; Savery, 2015).

From a pedagogical standpoint, this result underscores the effectiveness of student-centered learning in English education. Through PBL, students actively engage in real-world problem scenarios that demand critical interpretation, argument evaluation, and inferential reasoning all of which are essential for the development of critical reading and writing skills (Ennis, 2018; Facione, 2020). The interactive nature of PBL discussions encourages students to question assumptions, analyze multiple perspectives, and justify their conclusions based on evidence processes that mirror authentic language use in academic and professional contexts.

Moreover, the higher mean score achieved by the PBL group suggests that learning autonomy and peer collaboration significantly contributed to their improvement. During the PBL sessions, students were encouraged to formulate hypotheses, test ideas through discourse, and reflect on the logical consistency of arguments presented by their peers. These reflective and dialogic activities inherently promote the recognition of assumptions as students learn to discern implicit meanings and unstated premises in texts or conversations (Halvorsen, 2014; Yeh & She, 2010).

In contrast, students in the control group, who experienced traditional teacher-centered instruction, showed limited progress. The lecture-based model tends to focus on factual recall and grammatical accuracy rather than on the analytical interpretation of meaning or reasoning. Consequently, learners had fewer opportunities to engage in interpretive dialogue or to apply reasoning strategies within communicative tasks. This limitation aligns with prior research suggesting that conventional instruction often fails to stimulate the metacognitive awareness necessary for detecting assumptions and evaluating arguments (Walker & Leary, 2009; Hung, 2011). The statistical evidence in Figure 4 thus provides empirical support for integrating Problem-Based Learning into the teaching of English as a Foreign Language (EFL), particularly in fostering critical thinking dispositions. The substantial improvement in post-test performance indicates that when students are provided with opportunities to collaboratively explore problems and justify solutions in English, they develop not only linguistic proficiency but also critical literacy the ability to think beyond surface meanings and question the reasoning behind textual claims (Halvorsen, 2014; Cottrell, 2017).

Furthermore, the low standard error bars shown in the figure suggest consistent performance improvements across the PBL group, highlighting the reliability of the intervention effect. This finding reinforces the notion that structured inquiry and guided facilitation rather than direct instruction enable more sustainable cognitive engagement. When English teachers act as facilitators rather than transmitters of knowledge, they encourage students to become reflective thinkers and independent learners, which is essential for success in higher education and professional communication. Overall, the results presented in Figure 4 affirm that the implementation of Problem-Based Learning significantly enhanced students' recognition of assumptions at senior high schools in Brebes Regency. This outcome aligns with the current national educational transformation in Indonesia, which promotes a paradigm shift from teacher-centered to student-centered learning models, as outlined in the *Merdeka Belajar* curriculum. Within this framework, PBL emerges as a powerful pedagogical approach to equip learners with both critical thinking competence and communicative proficiency in English.

Paired t-test treatment control

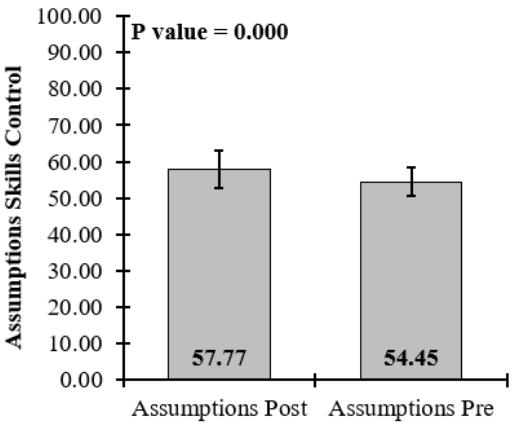


Figure 5. *Assumption skills control*

Figure 5 presents the comparison of students' pre-test and post-test mean scores on the recognition of assumptions for the control group. As shown in the figure, the mean score increased modestly from 54.45 in the pre-test to 57.77 in the post-test. Although the p-value ($0.000 < 0.05$) indicates a statistically significant difference between the two tests, the overall improvement was relatively limited compared to the gain observed in the Problem-Based Learning (PBL) group. This suggests that while some progress occurred in the control group, the enhancement was minimal and likely attributable to repeated exposure to similar assessment tasks rather than the result of a substantial pedagogical intervention. In this context, the control group was taught using a traditional teacher-centered approach, in which instruction was primarily lecture-based and focused on the transmission of linguistic content, vocabulary, and comprehension exercises. Such a pedagogical model tends to emphasize rote learning and factual recall, providing students with limited opportunities to engage in higher-order reasoning or to apply critical thinking skills in authentic communicative contexts. Consequently, although students in the control group demonstrated some familiarity with the task format and test items, their ability to identify implicit assumptions in texts or arguments remained largely underdeveloped.

The marginal improvement observed in the control group reflects a broader issue in English language education when learning environments remain passive and teacher-dominated. According to Ennis (2018) and Facione (2020), the recognition of assumptions constitutes a complex cognitive process that requires learners to evaluate unstated premises, detect bias, and interpret underlying meanings. Such skills cannot be effectively cultivated through mechanical exercises or isolated grammar instruction. Instead, they demand a classroom environment that encourages inquiry, dialogue, and reflective engagement, elements that are often absent in conventional instruction (Halvorsen, 2014; Cottrell, 2017).

Moreover, the modest gain in post-test performance may also indicate that the control group's exposure to routine classroom practices, such as question-and-answer sessions and teacher explanations, helped students slightly increase their awareness of reasoning patterns. However, these activities likely did not foster metacognitive awareness the ability to reflect on one's own thinking which is a prerequisite for recognizing assumptions critically (Kuhn, 2019; Lai, 2011). This finding aligns with earlier research suggesting that traditional instructional strategies are generally insufficient to enhance students' critical thinking subskills, particularly those related to inference and assumption recognition (Yeh & She, 2010; Walker & Leary, 2009). From a pedagogical perspective, the results highlight the limitations of conventional English teaching practices in developing critical literacy—the ability to analyze and evaluate language use within broader social, cultural, and logical contexts. When instruction is focused primarily on surface-level comprehension or linguistic accuracy, students tend to process texts at a literal level, failing to engage with the deeper structure of reasoning embedded in discourse. This approach contrasts sharply with constructivist models such as Problem-Based Learning, which actively involve students in problem analysis, argument construction, and evidence evaluation (Hmelo-Silver, 2004; Savery, 2015).

The error bars presented in Figure 5 indicate a relatively narrow range of variation, suggesting that students' scores within the control group were fairly consistent. This consistency, however, reflects uniformly low development in the recognition of assumptions, implying that the instructional method did not significantly stimulate individual growth in analytical reasoning. While statistically significant improvement was detected, the practical significance remained weak a phenomenon often observed when learning experiences do not require students to synthesize or evaluate information critically.

In conclusion, the findings from Figure 5 demonstrate that although students in the control group showed a small increase in their ability to recognize assumptions between the pre-test and post-test, the improvement was minimal compared to that achieved through the Problem-Based Learning approach. The results reinforce the argument that teacher-centered learning provides limited opportunities for learners to practice cognitive and metacognitive processes essential for higher-order thinking. For English teachers, this suggests the need to adopt more interactive, inquiry-based, and student-centered strategies that foster reasoning and reflective learning, aligning with Indonesia's ongoing educational reform toward the *Merdeka Curriculum*, which emphasizes student agency, critical inquiry, and collaborative learning.

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Paired t-test treatment Problem-Based Learning (PBL)

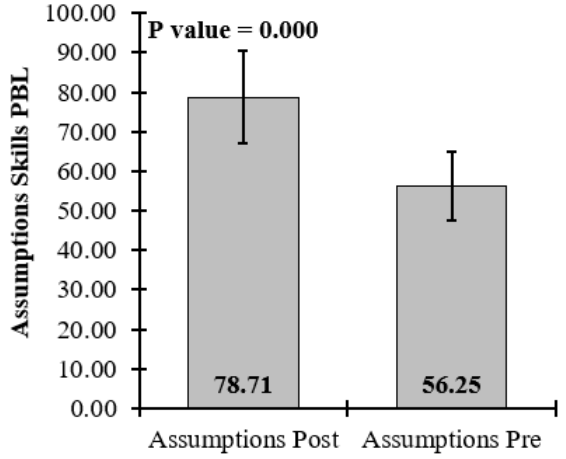


Figure 6. *Assumption skills Problem-Based Learning (PBL)*

Figure 6 illustrates the comparison of students' mean scores in the recognition of assumptions before and after the implementation of Problem-Based Learning (PBL). The data indicate a substantial improvement from a pre-test mean score of 56.25 to a post-test mean score of 78.71, with a p-value of 0.000 (< 0.05). This statistically significant increase confirms that the PBL intervention had a strong positive effect on students' ability to recognize assumptions a core component of critical thinking. The marked improvement suggests that PBL effectively engaged students in higher-order cognitive processes, including analysis, evaluation, and inference. Through exposure to authentic, ill-structured problems and guided inquiry, students were encouraged to question information, identify implicit assumptions, and justify their reasoning in contextually meaningful ways. Such learning conditions align with the principles of constructivist pedagogy, where knowledge is co-constructed through active exploration rather than passively received from the teacher. This shift from teacher-centered to learner-centered instruction appears to have fostered deeper cognitive engagement and reflective thought (Hmelo-Silver, 2004; Savery, 2015).

The improvement in post-test performance also reflects the development of metacognitive awareness students became more conscious of their own reasoning processes and were better able to monitor the validity of their assumptions while analyzing information. According to Facione (2020) and Ennis (2018), the recognition of assumptions represents an advanced level of reasoning, requiring learners to evaluate unstated premises, detect bias, and differentiate between evidence-based and opinion-based claims. By situating learning within problem scenarios that demanded interpretation and justification, PBL created the cognitive challenge necessary to cultivate these subskills of critical thinking.

Furthermore, the significant gain demonstrates that PBL supported students' critical literacy within English language learning. Rather than focusing solely on linguistic accuracy or comprehension, students were guided to interpret texts through multiple perspectives, question authorial intent, and discuss the socio-cultural implications embedded in discourse. These practices mirror what Paul and Elder (2014) describe as the movement from "surface comprehension" toward "deep reasoning," where language becomes a medium for thought and inquiry. In this sense, English instruction under the PBL framework not only improved linguistic competence but also nurtured intellectual autonomy a crucial outcome in modern ELT that emphasizes communication, problem-solving, and reflective learning.

The large mean difference (22.46 points) between pre-test and post-test results highlights the pedagogical strength of PBL in promoting sustained engagement and student ownership of learning. Working collaboratively in groups allowed learners to share diverse perspectives, challenge each other's assumptions, and co-construct meaning through dialogue. Such peer interactions likely reinforced reasoning and language use simultaneously, as students practiced articulating arguments, supporting claims, and negotiating interpretations skills central to communicative competence and academic discourse in English (Richards & Rodgers, 2014; Halvorsen, 2014). The error bars in Figure 6, though overlapping slightly, show a clear upward trend in mean performance, indicating that the improvement was consistent across participants. This consistency suggests that the PBL intervention was effective for learners of varying proficiency levels, promoting inclusive cognitive growth rather than benefiting only high-achieving students.

In summary, the findings presented in Figure 6 demonstrate that the PBL model significantly enhanced students' ability to recognize assumptions, as reflected in the notable increase in post-test scores. This result provides empirical evidence that problem-based and inquiry-oriented pedagogies can meaningfully improve learners' critical thinking dispositions and subskills within English language education. Consequently,

integrating PBL into the English classroom can be considered a viable approach for advancing critical thinking instruction, fostering learner autonomy, and aligning with the goals of Indonesia's *Merdeka Curriculum*, which emphasizes creativity, reasoning, and active learning.

From a theoretical perspective, the effectiveness of PBL in enhancing assumptions skill can be understood through the lens of constructivist learning theory, which posits that knowledge is actively constructed by learners through experience and social interaction rather than passively received (Vygotsky, 1978; Piaget, 1972). In a PBL environment, students are required to engage with complex, ill-structured problems that mirror real-life situations, compelling them to analyze contexts, identify underlying assumptions, and justify their reasoning collaboratively. This process nurtures what Paul and Elder (2014) describe as intellectual humility and intellectual integrity the willingness to question one's own presuppositions and evaluate the validity of evidence before reaching conclusions.

According to Hmelo-Silver (2004), PBL stimulates self-directed learning and reflective inquiry, encouraging learners to articulate their thought processes explicitly. When students are guided to identify assumptions, they learn to discern the difference between *facts*, *inferences*, and *beliefs*, thereby improving the accuracy of their reasoning. In language learning, this cognitive engagement is particularly valuable because it enables learners to move beyond surface comprehension toward critical literacy, where language is viewed not only as a communication tool but also as a means for constructing and deconstructing meaning (Wallace, 2003; Halvorsen, 2014).

Moreover, the process of questioning assumptions aligns closely with Bloom's revised taxonomy (Anderson & Krathwohl, 2001), which places *analyzing* and *evaluating* above mere *understanding*. Through PBL, learners are consistently challenged to interpret linguistic and contextual cues, identify biases in texts, and reconstruct meaning based on evidence. Such higher-order thinking fosters epistemic curiosity a key motivational component of deep learning (Berlyne, 1965; Murdoch & Wilson, 2008). Therefore, the increase in assumptions skill observed in this study reflects not only cognitive growth but also a shift in students' epistemological beliefs about knowledge and learning.

Within the domain of English Language Teaching (ELT), developing the skill of recognizing assumptions is integral to nurturing critical communicative competence. When engaging with texts, discussions, or debates, learners must be able to detect implicit messages, identify cultural or ideological assumptions, and respond with logical reasoning. PBL provides a dynamic context for this process, as students must collaboratively negotiate meaning, question each other's perspectives, and substantiate claims using linguistic evidence. This dialogic interaction promotes critical discourse awareness (Fairclough, 1992) and reflective communication, key outcomes for 21st-century English education (Richards & Rodgers, 2014).

Furthermore, the PBL framework encourages authentic task design, where students explore issues relevant to their personal, social, or professional contexts. As they analyze real-life problems in English, they simultaneously strengthen both language proficiency and cognitive engagement. This synergy aligns with the goals of *content-based language instruction* (CBLI), which integrates language development with cognitive skill enhancement (Brinton et al., 2003). Thus, the improvement in assumptions skill signifies a dual impact students not only think more critically but also communicate their reasoning more effectively in English.

The positive impact of Problem-Based Learning (PBL) on assumptions skill offers significant pedagogical implications for English teachers, curriculum developers, and teacher educators. First, from an instructional design perspective, English teachers are encouraged to integrate problem-based tasks that invite learners to interpret texts critically, identify implicit biases, and challenge underlying assumptions. Meaningful scenarios involving controversial issues, ethical dilemmas, or socio-cultural themes can serve as authentic learning stimuli that promote critical dialogue and foster reasoned argumentation in English. Such learning experiences enable students to engage in deeper language processing and develop analytical awareness while enhancing communicative competence.

In terms of assessment, evaluation practices should transcend mere linguistic accuracy to encompass the measurement of critical thinking subskills such as identifying assumptions, recognizing logical fallacies, and justifying

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opinions through evidence-based reasoning. Assessment rubrics can be designed to capture both content comprehension and the quality of learners' reasoning, allowing educators to provide more holistic feedback that reflects students' cognitive as well as linguistic development.

Furthermore, the findings highlight the importance of teacher training programs in equipping both pre-service and in-service teachers with effective facilitation strategies for inquiry-based learning. Teachers must be able to guide reflective discussions, scaffold reasoning processes, and encourage independent thought without dominating classroom discourse. In this sense, teachers assume the role of facilitators and mediators of thought rather than mere transmitters of knowledge, consistent with Brookfield's (2012) notion of critical pedagogy that positions the teacher as a catalyst for intellectual growth.

Lastly, the implementation of PBL contributes significantly to the cultivation of learner autonomy. By engaging in self-directed exploration and collaborative problem-solving, learners develop greater self-regulation, metacognitive awareness, and independence in learning. This growth aligns with the vision of the Merdeka Curriculum, which promotes curiosity, reasoning, and social responsibility as central values in 21st-century education. Through these pedagogical implications, it becomes evident that PBL not only enhances students' assumptions skill but also transforms English classrooms into spaces that nurture reflective, autonomous, and critically engaged learners prepared to navigate complex linguistic and social realities.

Overall, the integration of PBL into English language classrooms significantly enhances learners' assumptions skill by promoting reflective inquiry, critical reasoning, and collaborative problem-solving. The development of these abilities is not only crucial for academic success but also for preparing students to engage thoughtfully and ethically in complex, information-rich societies. By embedding critical thinking tasks within meaningful language use, teachers can transform English learning into a process of intellectual empowerment and cognitive awakening.

CONCLUSION

The findings revealed that students who were taught using the PBL approach showed a significant improvement in their ability to recognize assumption skills compared to those who were taught through conventional methods. This result indicates that PBL successfully enhanced students' capacity to identify hidden premises, detect bias, and analyze underlying viewpoints within texts and discussions. The improvement in assumption recognition demonstrates that student-centered approaches such as PBL are effective in cultivating higher-order thinking in English learning. Through problem-oriented tasks and collaborative discussions, learners were encouraged to question ideas, explore multiple perspectives, and justify their reasoning. These experiences not only strengthened their analytical skills but also developed reflective thinking habits that are essential for critical literacy and independent learning. Furthermore, the study highlights the need for a pedagogical shift in English language instruction from a teacher-centered model toward a more interactive and inquiry-based approach. PBL allows students to take ownership of their learning, engage in real-world issues, and apply reasoning in authentic contexts. Such an approach supports the broader goals of national education reforms that emphasize creativity, curiosity, and critical awareness as part of character development and lifelong learning.

From an educational standpoint, the results suggest several practical directions. Teachers should design lessons that integrate problem-solving activities, encourage open dialogue, and promote analytical questioning. Curriculum planners should provide flexible frameworks that allow for contextual learning and critical engagement with language. Teacher education programs also need to prepare future educators with the skills to facilitate inquiry-based learning and to assess both language proficiency and reasoning skills effectively.

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