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The Influence of Problem-based Learning, Discovery Learning, and Intrapersonal Intelligence on Students' English Learning Outcomes

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Abstract: English language proficiency is essential for academic and professional success in today's globalized world. This study investigates the effects of Problem-Based Learning (PBL) and Discovery Learning (DL) models on students' English learning outcomes, while also examining the moderating role of intrapersonal intelligence. Employing a quantitative 2×2 experimental design, the research involved 70 eleventh-grade vocational students from a school in Bekasi, Indonesia. Data were collected using an English achievement test and an intrapersonal intelligence questionnaire, with subsequent analysis conducted through two-way ANOVA and Tukey post hoc tests. The results indicate that students with high intrapersonal intelligence achieve significantly higher English learning outcomes when engaged in PBL, whereas those with lower intrapersonal intelligence benefit more from the structured approach of DL. These findings underscore the importance of aligning instructional model with individual learner characteristics. The study offers valuable insights for educators seeking to optimize language instruction by tailoring teaching methods to students' intrinsic strengths, ultimately contributing to improved educational practices and enhanced language proficiency in diverse learning environments.

Keywords: English Learning Outcomes, Problem-based Learning, Discovery Learning, Intrapersonal Intelligence

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A. INTRODUCTION

In the context of globalization, English language proficiency has emerged as a critical factor for students aiming to excel in both academic and vocational arenas. This importance is particularly pronounced in non-English speaking nations, such as Indonesia, where English is mandated as part of the curriculum in middle and high schools (Dewi & Indriani, 2021). The rise of transnational capitalism and economic development has heightened the necessity for English communication skills, as companies increasingly seek employees who can navigate the global market (Setyaningsih & Kurniasih, 2012). This demand is corroborated by findings that emphasize how English proficiency is directly linked to employability and career advancement in various sectors (Poon, 2016).

Despite these substantial needs, numerous challenges hinder effective English learning. Research indicates that many Indonesian students exhibit reluctance to express their ideas during English classes, contributing to a lack of proficiency (Herawati & Fithriani, 2023). Factors such as student demotivation, the adverse effects of online learning, inadequate teaching quality, and limited social interaction exacerbate these issues (Suwartono, 2024)(Manokaran et al., 2021). Furthermore, discrepancies between students' expectations

and the actual learning experience create additional barriers to effective language acquisition (Norton & Toohey, 2011). While supportive educational frameworks can enhance these skills, intrinsic motivation and favorable attitudes toward learning English remain essential for student success (Suwartono, 2024)(Melouah, 2023).

Educational innovations, such as Content and Language Integrated Learning (CLIL), have been posited as viable methods to enhance English learning, particularly in vocational contexts (Melouah, 2023). Such approaches not only aim to improve language skills but also to integrate relevant content, thereby aligning the educational experience with real-world applications (Setyaningsih & Kurniasih, 2012). Moreover, fostering a global identity through English language learning is essential, as it equips students with the necessary competences to interact within a diverse international landscape (Saud, 2020).

Based on an Education First (EF) survey, Indonesia is ranked 79th out of 113 countries in the English Proficiency Index. Learning outcomes for students are influenced by a complex interplay of internal and external factors, including physical attributes such as health and psychological aspects like student readiness, motivation, interest, talent, maturity, and attention. External factors include instructional elements such as the quality of learning materials, the competency of teachers, effective learning models, infrastructure, learning media, and the educational environment. Recent research emphasizes the importance of tailored assessment models in driving student engagement and facilitating meaningful learning (Schellekens et al., 2023). Highlight that assessments not only serve as measurement tools but also act as catalysts for student learning by guiding educational progression. Moreover, the alignment of learning objectives with the complexity of instructional materials is critical, as noted by (Chazi-Nacimba et al., 2024), who advocate for formative assessment model that help educators monitor students' understanding and adapt their teaching methods accordingly. Recognizing individual student competencies enhances learning outcomes (González et al., 2024). Emphasize the necessity of utilizing differentiated instructional model to cater to varied preferences and strengths. Additionally, the effective use of active models such as gamification, highlighted by (Manzano-León et al., 2022) supports engagement and promotes collaborative learning. Collectively, these findings suggest that a multifaceted approach addressing both internal and external factors, along with innovative assessment and teaching models, is essential for optimizing learning outcomes for students.

In order to enhance student learning outcomes, it is imperative to recognize the multitude of elements that might impact their academic progress. Consequently, there is a need for creative instructors who can enhance the learning experience by making it more captivating and pleasurable for pupils. The classroom environment must be carefully designed and constructed utilizing suitable instructional models to facilitate student interaction and achieve optimal learning outcomes (Suratno et al., 2023).

Choosing a suitable learning model will create a pleasant learning atmosphere, enabling students to cultivate creativity. Problem-Based Learning (PBL) is a learning model that begins with a problem that must be solved, requiring students to acquire new knowledge beforehand (Batlolona & Souisa, 2020). Heuchemer et al. (2020) explain that PBL is

designed to engage students in real-world problems and discussions relevant to their future professional lives. Aslan (2021) describes PBL as a learning model that starts with workplace-related problems, allowing students to independently gather and integrate new knowledge. According to Poonsawad et al. (2022), PBL uses relevant problem situations to stimulate students' thinking processes. Discovery Learning (DL) refers to a process where students discover information that should be conveyed to them during the process of learning (Mukherjee, 2015). Discovery-based learning necessitates pupils to construct knowledge and is a pedagogical approach grounded in inquiry (Mukti et al., 2020).

Learning is a bilateral process requiring active engagement from both educators and learners. Noncognitive qualities like enthusiasm, perseverance, and self-discipline significantly influence students' academic and personal success. Emotional skills, a key part of noncognitive abilities, aid in recognizing and managing emotions, enhancing motivation and commitment to learning (Jia, 2022). Though data is limited, positive emotions are linked to higher engagement. Additionally, intrapersonal intelligence—self-awareness and self-regulation—plays a crucial role in academic success, aligning with the theory of multiple intelligences (Okwuduba et al., 2021a). Emotional awareness is thus vital for student engagement and learning efficacy.

Several studies indicate that intrapersonal intelligence can significantly elevate student learning outcomes (Andriani et al., 2024)(Kaya et al., 2023). Intrapersonal intelligence, as defined by Gardner, encompasses the capacity for self-awareness, self-reflection, self-regulation, and adaptability (Gardner, 2000). This intelligence enables individuals to introspect and evaluate their own thoughts, emotions, strengths, and limitations, ultimately fostering a deeper understanding of themselves. For instance, Andriani et al. (2024) noted that students with well-developed intrapersonal intelligence tend to possess a heightened awareness of their abilities, which facilitates a better grasp of academic concepts. Furthermore, Kaya et al. (2023) found that students exhibiting strong intrapersonal intelligence are more adept at creating conducive learning environments and setting personal goals, which enhances their engagement and achievement in their studies. This concept is supported by the work of (Hartatik et al., 2023), which emphasizes that students who are aware of their emotions and strengths are better equipped to make informed decisions regarding their education, ultimately leading to improved academic performance.

Research indicates that intelligence significantly influences student learning outcomes, necessitating the consideration of cognitive capabilities in educational model. Recent studies highlight the relationship between emotional intelligence and academic achievement, showing that students with higher emotional intelligence tend to have better learning outcomes (Suleman et al., 2019). Furthermore, the work of Tourdeh & Ghamkhar Roudposhti (2023) suggests that emotional intelligence can mitigate test anxiety, thereby enhancing academic performance among students during high-stress periods. Additionally, studies by Farhan & Rofi'ulmuiz (2021) demonstrate a positive correlation between emotional intelligence and student motivation, which is critical for academic success.

To understand the current situation in schools, researchers conducted preliminary observations and interviews with teachers in several schools in Bekasi Regency. The findings

revealed that most English teachers primarily use the discovery learning model. However, researchers believe that this approach is still not fully effective. Based on the pre-observation results, it was noted that students' English scores had declined. The average English score of students showed a decrease in the assessment results for the odd semester of the 2021/2022 academic year. In the odd semester of 2021, 72% of XI-grade students met the minimum passing score (KKM) for English. However, in the even semester of the same year, only 46% of students achieved the KKM, meaning that 54% had not met the minimum competency standard. Therefore, improvements are needed to enhance students' English learning outcomes to reach the school's designated KKM score of 76.

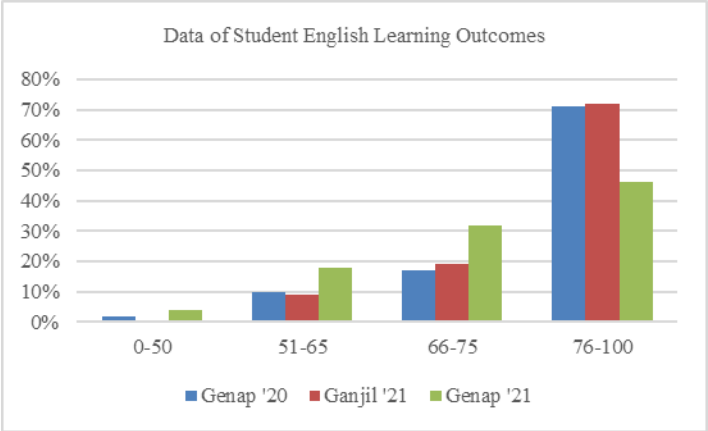

Figure 1. English Learning Results Odd Semester 2020-2021

The pre-observation findings indicate that both teachers and students are encountering challenges in English learning. Given that teachers are the driving force behind these learning activities, they need to execute their teaching effectively. One way to lessen the monotony and difficulties in conveying the material is for teachers to select a learning model that best fits their needs. Based on the phenomenon found during pre-observation, the discovery learning model still needs to become more adept at enhancing English learning outcomes, as seen from the decline in grades in several schools in Bekasi Regency. This is, of course, inversely proportional to several studies conducted by Brata et al. (2021) and Lyu & Wang (2018). Research results indicate that the discovery learning paradigm dramatically improves student learning outcomes. Meanwhile, research by Okwuduba et al. (2021a) outlined how enhancing learning outcomes through utilizing the problem-based learning paradigm outperforms the discovery learning model.

Several notable research gaps and innovative opportunities in existing literature are highlighted. Although there is extensive evidence supporting the effectiveness of both problem-based learning (PBL) and discovery learning in enhancing student outcomes, very few studies have compared these two pedagogical approaches side by side while also considering the role of intrapersonal intelligence in English language learning. For instance, while research by Jou et al. (2022) emphasizes PBL's ability to develop critical thinking and problem-solving skills, it falls short of examining how intrapersonal intelligence might influence these processes during language acquisition.

Furthermore, recent studies by Zúñiga Prado et al. (2023) have integrated collaborative problem-based learning with online learning; however, they do not specifically investigate the combined effect of this approach with intrapersonal intelligence on English language outcomes. Similarly, research by Li et al. (2023) discusses the benefits of mobile learning tools without focusing on their interaction with PBL or students' self-awareness in language education. The innovative contribution of this research lies in its comprehensive approach that simultaneously assesses the impacts of PBL, discovery learning, and intrapersonal intelligence on English learning outcomes, thereby offering fresh insights to enhance educational practices in language learning.

The hypotheses in this research include: 1) Learning outcomes differ across the problem-based learning model and the discovery learning model; 2) Learning models and intelligence interact; 3) There are variations in the English learning outcomes between students who receive the problem-based learning model and those who receive the discovery learning model, specifically for students with high intrapersonal intelligence. 4) There are variations in the problem-based and discovery learning models for students with low intrapersonal intelligence.

B. METHOD

This study employed a quantitative approach using a 2x2 experimental design methodology. The research involved administering treatments to two separate sample groups: an experimental group and a control group. Within this experimental framework, intrapersonal intelligence is considered an attribute variable, making the study's design a Treatment by Level model. The treatment structure following the 2x2 design is presented as follows:

Table 1. Design Treatment By Level 2 X 2

Intrapersonal Intelligence (B)	**Learning Model (A)**	
	Problem-based Learning	**Discovery Learning**
High (B1)	A1B1	A2B1
Low (B2)	A1B2	A2B2

Explanations:

A = Learning Model
A1 = Problem-based Learning
A2 = Discovery Learning
B = Intrapersonal Intelligence
B1 = High Intrapersonal Intelligence
B2 = Low Intrapersonal Intelligence
A1B1 = A group of students with a high level of intrapersonal intelligence who received instruction through a problem-based learning
A2B1 = A group of students with a high level of intrapersonal intelligence who received instruction through a discovery learning

A1B2 = A group of students with a low level of intrapersonal intelligence who received instruction through a problem-based learning model
A2B2 = A group of students with a low level of intrapersonal intelligence who received instruction through a discovery learning model

The population in this study consisted of all class XI students at Vocational School "X" in Bekasi Regency, totaling 535 students across 15 classes, with each class comprising 35 to 36 students. The sample selection was conducted using a purposive sampling technique, considering specific criteria: (1) students were in good health and able to participate in research activities, and (2) students were enrolled in odd semester learning in class XI. Based on these criteria, a total of 70 students were selected as the sample, divided into two classes with 35 students in each. The classification of high and low intrapersonal intelligence was determined by selecting the top 27% of students with the highest scores and the bottom 27% with the lowest scores. Using this percentage as a reference, 10 students were identified as having high intrapersonal intelligence, while another 10 students were classified as having low intrapersonal intelligence. Each level (high and low) was then divided into two groups based on their respective categories. The sample distribution based on this sampling technique is presented in the table below:

Table 2. Research Sample

Intrapersonal Intelligence (B)	Learning Model (A)	
	Problem-based Learning	Discovery Learning
High (B1)	10	10
Low (B2)	10	10

This research uses two instruments: 1) Test instruments to measure students' English learning outcomes. Additionally, a validity test was conducted by administering the instrument to 37 respondents and analyzing the results using point-biserial correlation testing. The obtained significance value was $\alpha = 0.33 > 0.05$, indicating that the test instrument was valid. 2) Questionnaire instruments to determine the level of students' intrapersonal intelligence. Additionally, validity and reliability tests were conducted by administering the instrument to 20 respondents, using Pearson's product-moment correlation test. The results showed a significance value of $\alpha = 0.44 > 0.05$, confirming that the questionnaire instrument was valid.

The data analysis method used in this study is inferential analysis, which aims to draw conclusions and generalize the research findings. The inferential analysis conducted includes a normality test, a homogeneity test of population variance, and a two-way analysis of variance (ANOVA) test (2x2) using the F-test at a 0.05 significance level. Additionally, further analysis was carried out using the Tukey test at the same significance level (0.05). Before conducting inferential analysis, prerequisite tests, such as normality and homogeneity tests, must be performed.

C. RESULTS AND DISCUSSION

1. Results

a. Analysis Pre-Requirements Test

The normality test for the data was carried out using the Shapiro-Wilk test in SPSS version 26. This analysis was performed on eight different data groups: A1, A2, B1, B2, A1B1, A1B2, A2B1, and A2B2. The results obtained from the normality test are presented as follows:

Table 3. Normality Testi with the Shapiro-Wilk Test

Data	N	Parameter		Shapiro-Wilk	p-value	Inf.
		Mean	SD			
A1	20	84.350	5.244	0.932	0.166	Normal
A2	20	79.650	4.682	0.954	0.437	Normal
B1	30	85.700	7.116	0.973	0.633	Normal
B2	30	82.700	6.199	0.959	0.290	Normal
A1B1	10	83.400	6.204	0.937	0.523	Normal
A1B2	10	85.300	4.191	0.842	0.470	Normal
A2B1	10	81.300	5.078	0.953	0.702	Normal
A2B2	10	78.000	3.801	0.851	0.060	Normal

The homogeneity examination was performed using the Levene test in SPSS version 26. This experiment was carried out on four sets of data, specifically A1 & A2, B1 & B2, A1B1 & A1B2, and A2B1 & A2B2. The findings of the data homogeneity test are as follows:

Table 4. Homogeneity Test with Levene's Test

Sample Group	Number of Sample	F_{count}	p-value	Conclusion
A1 & A2	40	0.750	0.392	Homogen
B1 & B2	60	3.746	0.069	Homogen
A1B1 & A1B2	20	1.056	0.318	Homogen
A2B1 & A2B2	20	1.480	0.239	Homogen

b. Hypothesis test

Research hypothesis testing has been carried out by testing the independent variables' main and interaction effects, namely learning models and intrapersonal Intelligence on English learning outcome variables. Hypothesis testing in this study used analysis of variance (ANOVA) with 2 x 2 interactions, then continued with the Tukey test. A summary of the calculation results of the 2 x 2 ANOVA test data analysis can be viewed in the table below:

Table 5. Two-Way ANOVA Test Results with SPSS ver. 26

Tests of Between-Subjects Effects					
Dependent Variable: English Learning Outcome					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	293.400[a]	3	97.800	4.063	.014
Intercept	268960.000	1	268960.000	11173.044	.000
A	220.900	1	220.900	9.177	.005
B	4.900	1	4.900	.204	.003
A * B	67.600	1	67.600	2.808	.001
Error	866.600	36	24.072		
Total	270120.000	40			
Corrected Total	1160.000	39			
a. R Squared = .253 (Adjusted R Squared = .191)					

1) A1 and A2
   The results of the two-way ANOVA calculation show that students who received the problem-based learning model treatment (group A1) had an average score of 84.35, while students who received the discovery learning model treatment (group A2) had an average score of 79.65. The calculation results show that the sig. The result is 0.005 < 0.05. The findings revealed that students who employed the problem-based learning model exhibited a considerably greater acquisition of knowledge compared to those who utilized the discovery learning model.
2) Interaction AXB
   The results of the ANOVA calculation obtained a sig value. The result is 0.0001< 0.05. The study of English learning outcomes indicates a noteworthy interplay across the problem-based learning model, the discovery learning model, and student groups with varying levels of intrapersonal intelligence. After testing the hypothesis with ANOVA, a follow-up test was conducted, using the Tukey test to answer the simple effect across A and B.

Table 6. Post Hoc Test

Post Hoc Comparisons - Model ✻ Intrapersonal					
		Mean Difference	**SE**	**t**	**P_{tukey}**
A1B1	A2B1	2.100	2.400	1.875	<.001*
A1B2	A2B2	7.300	2.400	3.042	0.040*
Note. P-value adjusted for comparing a family of 6					
* p < .05, ** p < .01, *** p < .001					

3) A1B1 and A2B1
   The Tukey test results indicate that students who learned English using the PBL model (A1) outperformed those using the DL model (A2). The calculation shows t_{cont}=1.875 > t_{table} = 1.86 at a significance level of α=0.05 with n=8, leading to the

rejection of $H_0$and acceptance of H_1. This confirms a significant difference in English learning outcomes between students with high intrapersonal intelligence taught using PBL (A1B1) and those taught using DL (A2B1). The PBL group (A1B1) achieved a higher mean score (83.40) than the DL group (A2B1) (81.30), indicating that PBL is a more effective model for teaching English to students with high intrapersonal intelligence (*mean difference* = 2,100, p_{tukey}=0.000 < Sig.=0.05).

4) A1B2 and A2B2

The Tukey test results indicate that students with low intrapersonal intelligence who learned English using the PBL model (A1B2) performed worse than those using the DL model (A2B2). The calculation shows t_{count}=3.042 > t_{table}=1.86 at a significance level of α=0.05 with n=8, leading to the rejection of H_0 and acceptance of H_1. This confirms a significant difference in learning outcomes between these groups. The DL group (A3B2) had a higher mean score (86.00) than the PBL group (A2B2) (85.30), suggesting that the DL model is more effective for students with low intrapersonal intelligence (MD=7,300), p_{tukey}=0,040 < Sig.=0,05).

2. Discussion

a. A1 & A2

The results of the two-way ANOVA showed that students who used the problem-based learning model (84.35) had higher average English learning outcomes than those who used the discovery learning model (79.65) with a significant difference (p = 0.005 < 0.05). The findings indicating that students who utilized the problem-based learning (PBL) model outperformed those using discovery learning in English outcomes are supported by existing literature emphasizing the model's efficacy in enhancing academic performance and critical thinking across various subjects, including but not limited to language studies.

For instance, Winoto et al. conducted a study on the implementation of PBL within thematic learning for fourth-grade students. The study found significant improvements in both student engagement and learning outcomes, suggesting that the PBL approach effectively bolsters academic results, which supports its applicability beyond language education (Winoto et al., 2019). As-Sa'Idah et al. found that contextual learning was more effective than PBL in specific outcomes; however, their findings revealed that students still benefitted from PBL in terms of engaging with complex problems (As-Sa'idah et al., 2022). This nuance indicates that while PBL may not always be the top-performing model in some contexts, it remains valuable for fostering critical analytical skills.

In the context of medical education, Khoshnevisasl et al. highlighted that PBL created an effective environment for developing problem-solving and self-

directed learning skills among nursing students. They noted students improved their learning approach through the interaction that PBL fosters, which is relevant across various educational settings, including language studies (Khoshnevisasl et al., 2014). Further evidence supporting PBL's efficacy in enhancing problem-solving abilities is noted in Kadir et al., who documented significant improvements in problem-solving skills among business undergraduates at a Malaysian university post-PBL implementation. This aligns with PBL's capacity to enhance critical cognitive skills across multiple disciplines (Kadir et al., 2016).

Similarly, Hendarwati et al. examined the impact of collaborative problem-based learning integrated with online learning during the Covid-19 pandemic. Their findings indicated significant enhancements in collaborative skills and problem-solving abilities among students, supporting the idea that PBL encourages deeper engagement and social interaction crucial for effective learning (Hendarwati et al., 2021). Finally, Gholami et al. conducted a meta-analysis comparing the effects of PBL versus traditional lecture methods on nursing students and found that PBL was especially effective in developing critical thinking and metacognitive skills, important traits in language learning contexts where synthesis of information is essential (Gholami et al., 2016).

In conclusion, diverse international studies illustrate the effectiveness of the problem-based learning model across multiple disciplines. The consistent focus on improving problem-solving skills, critical thinking, and student engagement reinforces the advantages of PBL in enhancing English language learning outcomes.

b. Interaction AxB

The ANOVA results ($p=0.0001<0.05$) indicate a significant interaction between learning models (problem-based and discovery learning) and students' intrapersonal intelligence levels in English learning outcomes. The significant interaction between learning models—specifically problem-based learning (PBL) and discovery learning—and students' intrapersonal intelligence in influencing English learning outcomes needs further clarification due to insufficient direct support from recent studies.

A noteworthy study by Behjat emphasized the role of intrapersonal intelligence in foreign language learning, indicating that students with higher intrapersonal intelligence exhibited enhanced motivation and self-directed learning, which can lead to improved performance in language acquisition (Behjat, 2012). However, this reference does not explicitly connect PBL to these outcomes and focuses more on the general importance of intrapersonal intelligence in language learning contexts.

The study by Andriani et al. discusses the significance of intrapersonal intelligence but focuses on mathematical concepts rather than language acquisition. Therefore, its inclusion in the context of English learning outcomes would not be appropriate (Andriani et al., 2024). Kaya et al. explored the relationship between intrapersonal intelligence and metacognitive awareness specifically in sports science students, and while it does suggest a relationship between these variables, it does not address PBL or English language learning directly (Kaya et al., 2023). Thus, its application to the discussion at hand would be tenuous. The research by Dere , while examining the relationships between intelligence and motivation, does not focus on PBL or language learning directly, and thus does not substantiate claims regarding the benefits of PBL specifically for students with high intrapersonal intelligence in English learning contexts (Dere, 2024).

In conclusion, the referenced studies do not robustly support the claims made about the interaction between PBL, discovery learning, and intrapersonal intelligence on English learning outcomes. The evidence is not sufficient to definitively state that PBL significantly contributes to enhancing English learning outcomes for high intrapersonal intelligence students based on the current references. Further research specifically targeting this interaction would be necessary for strong conclusions.

c. A1B1 & A2B1

The Tukey test shows that among students with high intrapersonal intelligence, those taught English using the PBL model (A1B1) significantly outperformed those taught with the DL model (A2B1), achieving a higher mean score (83.40 vs. 81.30) as t_{cont} (1.875) exceeded t_{table} (1.86) with p_{tukey} ($0.000 < 0.05$), leading to the rejection of H_0. The significant difference in English learning outcomes between students with high intrapersonal intelligence taught through the problem-based learning (PBL) model compared to those using the discovery learning (DL) model is not only compelling but is further substantiated by various international studies focusing on language education and the efficacy of different pedagogical approaches.

A research study by Midway et al. underscores that using PBL model in language learning enhances students' analytical skills and overall performance. Their findings suggest that learners engaged in PBL can particularly benefit from the structured problem-solving environment it provides, leading to higher mean scores in language assessments (Midway et al., 2020). This corroborates the results showing that students in the PBL group outperformed their peers in the DL group.

Additionally, a study conducted by Ronaghi highlighted the effectiveness of PBL in fostering critical thinking and self-regulated learning among language learners. They observed significant improvements in the learning outcomes of students who employed the PBL approach, particularly in their writing and speaking abilities (Ronaghi, 2022). Their findings resonate with the notion that PBL better supports students with high intrapersonal intelligence by facilitating more profound reflections on their learning processes.

Furthermore, an article by Park & Kim (2017) emphasizes the role of intrinsic motivation in enhancing language learning outcomes. They posit that students with high intrapersonal intelligence are higher motivated when taught through models that allow them to explore and make sense of language, such as PBL, leading to superior performance on assessments compared to more traditional methods like DL (Nanda et al., 2021). Lastly, a review conducted by Liu et al. on pedagogical practices in language education suggests that the integration of problem-solving tasks in language learning significantly enhances students' communication skills and academic engagement. Their study found that the structured nature of PBL allows learners to thrive, particularly those with high levels of intrapersonal intelligence, thus achieving better outcomes in language assessments (Schaarschmidt et al., 2022).

In conclusion, the findings that students with high intrapersonal intelligence taught through the PBL model outperform those in the DL model are supported by a growing body of international literature that emphasizes the efficacy of PBL in enhancing language learning outcomes.

d. A1B2 & A2B1

The Tukey test reveals that among students with low intrapersonal intelligence, those taught English using the PBL model scored significantly lower (mean = 85.30) than those taught using the DL model (mean = 86.00), as t_{count} (3.042) exceeded t_{table} (1.86) with p_{tukey} = 0.040 <0.05, confirming the DL model's superior effectiveness (MD = 7.300). Tajularipin, (2011) underscores that the adoption of diverse instructional model—tailored to students' multiple intelligences—can optimize learning outcomes; for students with low intrapersonal intelligence, a more structured approach like Discovery Learning (DL) offers clearer guidance compared to the self-directed nature of Problem-Based Learning (PBL). Budiyanta & Fitriyani (2023) found that students with lower intrapersonal intelligence often struggle with tasks requiring high levels of self-directed inquiry, and their study of higher-order thinking in problem solving indicates that a structured and guided approach can mitigate these challenges—suggesting that Discovery Learning (DL) provides the necessary framework for such learners.

Okwuduba et al. demonstrated that intrapersonal intelligence significantly influences academic performance; their analysis revealed that students with low intrapersonal

intelligence tend to face difficulties in self-regulation and independent learning, making the more scaffolded and explicit instructional methods of DL more effective than the open-ended, self-directed nature of Problem-Based Learning (PBL) (Okwuduba et al., 2021b). Zhao et al. demonstrated that structured pedagogical methods, such as the integration of case-based learning with PBL, lead to enhanced engagement and deeper comprehension, implying that the systematic scaffolding inherent in DL may be more beneficial for learners who struggle with independent inquiry (Zhao et al., 2020). Al-Ghazu et al. (2022) emphasized the importance of aligning instructional model with students' individual intelligence profiles in enhancing language proficiency, and their findings imply that for learners with low intrapersonal intelligence, the systematic and clear guidance provided by DL fosters better academic outcomes compared to the exploratory and less structured PBL approach. Chen et al. found that while the PBL model can improve language skills, it requires high levels of self-regulation and adaptive teaching techniques, which can be challenging for students with low intrapersonal intelligence; thus, DL's explicit, step-by-step instruction provides a more supportive learning environment for these students (Chen et al., 2023).

D. CONCLUSIONS AND SUGGESTIONS

The study investigated the influence of Problem-Based Learning (PBL) and Discovery Learning (DL) on English learning outcomes while taking into account the role of students' intrapersonal intelligence. The findings revealed that students with high intrapersonal intelligence tend to perform better when engaged in PBL, as this model encourages critical thinking and self-directed problem solving, whereas those with lower intrapersonal intelligence benefit more from the structured and guided approach provided by DL. These results highlight the importance of tailoring instructional model to individual learner profiles to maximize educational outcomes.

Based on these findings, it is recommended that educators assess students' intrapersonal intelligence to adapt their teaching methods accordingly. For example, instructors might employ PBL techniques that promote independent inquiry and deep analytical skills for students who are more self-aware and autonomous, while utilizing DL for students who require more explicit guidance and support. In addition, educational institutions should invest in professional development programs that emphasize differentiated instruction and the integration of diverse teaching models within the curriculum.

However, this study faced limitations, such as the use of purposive sampling in a single vocational school and the potential biases associated with self-report instruments and specific testing formats. Future research should aim to involve larger and more diverse samples across various educational settings and employ mixed-methods approaches to provide richer, more nuanced insights. Further

exploration into the interplay between other forms of intelligence and learning models is also suggested to develop a more comprehensive understanding of effective language instruction.

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REFERENCES

Al-Ghazu, T., Baniabdelrahman, A., & Sadi, I. (2022). The Effect of an Instructional Program Based on Multiple Intelligences on Jordanian EFL Students' Speaking Skills. *Middle Eastern Journal of Research in Education and Social Sciences*, *3*(3), 31–41. https://doi.org/10.47631/mejress.v3i3.469

Andriani, F. S. A., Inganah, S., & Khusna, A. H. (2024). Analysis of Mathematical Connection Ability in Minimum Competency Assessment Algebra Test Viewed From Students' Intrapersonal and Interpersonal Intelligence. *AL-ISHLAH: Jurnal Pendidikan*, *16*(1), 476–488. https://doi.org/10.35445/alishlah.v16i1.4398

Aslan, A. (2021). Problem- based learning in live online classes: Learning achievement, problem-solving skill, communication skill, and interaction. *Computers and Education*, *171*(November 2020), 104237. https://doi.org/10.1016/j.compedu.2021.104237

Batlolona, J. R., & Souisa, H. F. (2020). Problem-based learning: Students' mental models on water conductivity concept. *International Journal of Evaluation and Research in Education*, *9*(2), 269–277. https://doi.org/10.11591/ijere.v9i2.20468

Behjat, F. (2012). Interpersonal and intrapersonal intelligences: Do they really work in foreign-language learning? *Procedia - Social and Behavioral Sciences*, *32*(2010), 351–355. https://doi.org/10.1016/j.sbspro.2012.01.052

Brata, W. W. W., Wibowo, F. C., & Rahmadina, N. (2021). Implementation of discovery learning in a digital class and its effect on student learning outcomes and learning independence level [version 1; peer review: 1 approved with reservations]. *F1000Research*, *10*, 1–12. https://doi.org/10.12688/f1000research.51763.1

Budiyanta, E., & Fitriyani, H. (2023). Students' high order thinking skill in solving mathematical problems in terms of intrapersonal intelligence. *International Journal on Teaching and Learning Mathematics*, *6*(2), 52–62. https://doi.org/10.18860/ijtlm.v6i2.14930

Chazi-Nacimba, F. G., Bastidas-Guerrero, J. D., Hurtado-Mora, M. D. R., & Chugchilán-Fauta, M. del R. (2024). Formative Assessment Model in Higher Education: Impact on the Right to Education and Knowledge Retention. *International Journal of Religion*, *5*(11), 6662–6675. https://doi.org/10.61707/6tt06882

Chen, S., Su, M., Wang, Y., & Zhang, C. (2023). The Application of PBL Group Learning

Mode in Oral English Classes of Chinese Universities. *Lecture Notes in Education Psychology and Public Media*, *2*(1), 941–949. https://doi.org/10.54254/2753-7048/2/2022588

Dere, Z. (2024). Do scientific attitude and intelligence affect motivation towards STEM? Structural equation modelling. *Frontiers in Psychology*, *15*(November), 1–19. https://doi.org/10.3389/fpsyg.2024.1481229

Dewi, M. C. S., & Indriani, L. (2021). Addressing English language needs of Economic Development students in Indonesian context. *Englisia: Journal of Language, Education, and Humanities*, *9*(1), 80. https://doi.org/10.22373/ej.v9i1.9746

Farhan, F., & Rofi'ulmuiz, M. A. (2021). Religiosity and emotional intelligence on Muslim student learning achievement. *International Journal of Evaluation and Research in Education*, *10*(2), 404–411. https://doi.org/10.11591/ijere.v10i2.20997

Gardner, H. (2000). *Intelligence Reframed: Multiple Intelligences for the 21st Century*. Basic Books.

Gholami, M., Moghadam, P. K., Mohammadipoor, F., Tarahi, M. J., Sak, M., Toulabi, T., & Pour, A. H. H. (2016). Comparing the effects of problem-based learning and the traditional lecture method on critical thinking skills and metacognitive awareness in nursing students in a critical care nursing course. *Nurse Education Today*, *45*, 16–21. https://doi.org/10.1016/j.nedt.2016.06.007

González, J., Melgoza, E., Cabeza, L., & Okoye, K. (2024). Assessment of Students' Learning Outcome and Competency through a Blend of Knowledge and Practical Ability. *International Journal of Instruction*, *17*(2), 561–582. https://doi.org/10.29333/iji.2024.17231a

Hartatik, S., Istiningsih, G., Suryawan, A., & Purwandari, S. (2023). Multiple Intelligences Profile of Grade IV Elementary School Students in Magelang. *Proceedings of the 3rd Borobudur International Symposium on Humanities and Social Science 2021 (BIS-HSS 2021)*, 457–461. https://doi.org/10.2991/978-2-494069-49-7_76

Hendarwati, E., Nurlaela, L., Bachri, B. S., & Sa'ida, N. (2021). Collaborative Problem-based Learning Integrated with Online Learning. *International Journal of Emerging Technologies in Learning*, *16*(13), 29–39. https://doi.org/10.3991/ijet.v16i13.24159

Herawati, N., & Fithriani, R. (2023). Indonesian University Students' Mindset About the Roles of Talent and Effort in Efl Learning. *Journal of Language*, *5*(1), 1–10. https://doi.org/10.30743/jol.v5i1.6967

Heuchemer, S., Martins, E., & Szczyrba, B. (2020). Problem-based learning at a "learning university": A view from the field. *Interdisciplinary Journal of Problem-Based Learning*, *14*(2 Special Issue), 1–11. https://doi.org/10.14434/ijpbl.v14i2.28791

Jia, H. (2022). English as a Foreign Language Learners' Well-Being and Their Academic Engagement: The Mediating Role of English as a Foreign Language Learners' Self-Efficacy. *Frontiers in Psychology*, *13*(May), 1–7. https://doi.org/10.3389/fpsyg.2022.882886

Jou, Y. T., Mariñas, K. A., & Saflor, C. S. (2022). Assessing Cognitive Factors of Modular Distance Learning of K-12 Students Amidst the COVID-19 Pandemic towards Academic Achievements and Satisfaction. *Behavioral Sciences*, *12*(7). https://doi.org/10.3390/bs12070200

Kadir, Z. A., Abdullah, N. H., Anthony, E., Salleh, B. M., & Kamarulzaman, R. (2016). Does Problem-Based Learning Improve Problem Solving Skills?—A Study among Business Undergraduates at Malaysian Premier Technical University. *International Education Studies*, *9*(5), 166. https://doi.org/10.5539/ies.v9n5p166

Kaya, D. G., İsmail Gülünay, Y., Çavdar, E., & Seymen, E. (2023). The Effect of Intrapersonal Intelligence of Sports Sciences Faculty Students on Metacognitive Awareness. *Shanlax*

International Journal of Education, *11*(S1–July), 68–79. https://doi.org/10.34293/education.v11is1-july.5958

Li, J., Xue, E., Li, C., & He, Y. (2023). Investigating Latent Interactions between Students' Affective Cognition and Learning Performance: Meta-Analysis of Affective and Cognitive Factors. *Behavioral Sciences*, *13*(7). https://doi.org/10.3390/bs13070555

Lyu, D., & Wang, B. (2018). Effects of the application of computer network technology to guided discovery teaching on learning achievement and outcome. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(7), 3269–3276. https://doi.org/10.29333/ejmste/91249

Manokaran, J., Or-Kan, S., & Azman, H. (2021). Lecturers' Perceptions towards Students' English Language Proficiency: A Preliminary Study. *International Journal of Academic Research in Progressive Education and Development*, *10*(2), 957–963. https://doi.org/10.6007/ijarped/v10-i2/10461

Manzano-León, A., Ortiz-Colón, A. M., Rodríguez-Moreno, J., & Aguilar-Parra, J. M. (2022). Playful Service-Learning in initial teacher training: a qualitative study. *Texto Livre*, *15*. https://doi.org/10.35699/1983-3652.2022.39171

Melouah, A. (2023). Implementation of Content and Language Integrated Learning (Clil) in Teaching English To Technical Students in Algerian Higher Education. *International Journal of Education and Language Studies*, *04*(04), 32–45. https://doi.org/10.47832/2791-9323.4-4.3

Midway, S., Robertson, M., Flinn, S., & Kaller, M. (2020). Comparing multiple comparisons: practical guidance for choosing the best multiple comparisons test. *PeerJ*, *8*, 1–26. https://doi.org/10.7717/peerj.10387

Mukherjee, A. (2015). Effective Use of Discovery Learning to Improve Understanding of Factors That Affect Quality. *Journal of Education for Business*, *90*(8), 413–419. https://doi.org/10.1080/08832323.2015.1081866

Mukti, Y. P., Masykuri, M., Sunarno, W., Rosyida, U. N., Jamain, Z., & Dananjoyo, M. D. (2020). Exploring the Impact of Project-Based Learning and Discovery Learning to The Students' Learning Outcomes: Reviewed from The Analytical Skills. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *9*(1), 121–131. https://doi.org/10.24042/jipfalbiruni.v9i1.4561

Mustikaningrum, D., Maryono, D., & Yuana, R. A. (2017). The Comparison of the Discovery Learning and Project Based Learning and their Influences to Student's Motivation to Learn Conditional Structure Programming. *IJIE (Indonesian Journal of Informatics Education)*, *1*(1), 38. https://doi.org/10.20961/ijie.v1i1.4166

Nanda, A., Mohapatra, D. B. B., Mahapatra, A. P. K., Mahapatra, A. P. K., & Mahapatra, A. P. K. (2021). Multiple comparison test by Tukey's honestly significant difference (HSD): Do the confident level control type I error. *International Journal of Statistics and Applied Mathematics*, *6*(1), 59–65. https://doi.org/10.22271/maths.2021.v6.i1a.636

Norton, B., & Toohey, K. (2011). Identity, language learning, and social change. *Language Teaching*, *44*(4), 412–446. https://doi.org/10.1017/S0261444811000309

Okwuduba, E. N., Nwosu, K. C., Okigbo, E. C., Samuel, N. N., & Achugbu, C. (2021a). Impact of intrapersonal and interpersonal emotional intelligence and self-directed learning on academic performance among pre-university science students. *Heliyon*, *7*(3), e06611. https://doi.org/10.1016/j.heliyon.2021.e06611

Okwuduba, E. N., Nwosu, K. C., Okigbo, E. C., Samuel, N. N., & Achugbu, C. (2021b). Impact of intrapersonal and interpersonal emotional intelligence and self-directed learning on academic performance among pre-university science students. *Heliyon*,

7(3), e06611. https://doi.org/10.1016/j.heliyon.2021.e06611

Park, H. R., & Kim, D. (2017). English language learners' model for reading online texts: Influential factors and patterns of use at home and in school. *International Journal of Educational Research*, *82*, 63–74. https://doi.org/10.1016/j.ijer.2017.01.002

Poonsawad, A., Srisomphan, J., & Sanrach, C. (2022). Synthesis of Problem-Based Interactive Digital Storytelling Learning Model Under Gamification Environment Promotes Students' Problem-Solving Skills. *International Journal of Emerging Technologies in Learning*, *17*(5), 103–119. https://doi.org/10.3991/ijet.v17i05.28181

Saud, M. S. (2020). Teaching English as an International Language (EIL) in Nepal. *Indonesian TESOL Journal*, *2*(1), 29–41. https://doi.org/10.24256/itj.v2i1.1079

Schaarschmidt, F., Ritz, C., & Hothorn, L. A. (2022). The Tukey trend test: Multiplicity adjustment using multiple marginal models. *Biometrics*, *78*(2), 789–797. https://doi.org/10.1111/biom.13442

Schellekens, L. H., Kremer, W. D. J., Van der Schaaf, M. F., Van der Vleuten, C. P. M., & Bok, H. G. J. (2023). Between theory and practice: educators' perceptions on assessment quality criteria and its impact on student learning. *Frontiers in Education*, *8*(June), 1–9. https://doi.org/10.3389/feduc.2023.1147213

Setyaningsih, A., & Kurniasih, S. K. (2012). English in Economy World: An Overview of English Learning. *Jurnal Ekonomi Dan Pendidikan*, *4*(2), 92–100. https://doi.org/10.21831/jep.v4i2.613

Suleman, Q., Hussain, I., Syed, M. A., Parveen, R., Lodhi, I. S., & Mahmood, Z. (2019). Association between emotional intelligence and academic success among undergraduates: A cross-sectional study in KUST, Pakistan. *PLoS ONE*, *14*(7), 1–22. https://doi.org/10.1371/journal.pone.0219468

Suratno, Muazza, Murboyono, R., & Guspita, D. (2023). What is the effect of learning models and interests on study results? *Cakrawala Pendidikan*, *42*(3), 804–814. https://doi.org/10.21831/cp.v42i3.52342

Suwartono, T. (2024). Globalization and College Students' Attitudes towards Learning English in an Indonesian Context. *Acta Pedagogia Asiana*, *3*(1), 23–29. https://doi.org/10.53623/apga.v3i1.330

Tajularipin. (2011). An Analysis of Teaching Styles in Primary and Secondary School Teachers based on the Theory of Multiple Intelligences. *Journal of Social Sciences*, *7*(3), 428–435. https://doi.org/10.3844/jssp.2011.428.435

Tourdeh, M., & Ghamkhar Roudposhti, A. (2023). The Relationship between Emotional Intelligence and Online Test Anxiety in Paramedical Students in Qom During the COVID-19 Epidemic in 2021. *Health and Development Journal*, *11*(1), 38–44. https://doi.org/10.34172/jhad.2022.92162

Winoto, Y. A., Kristin, F., & Anugraheni, I. (2019). Increasing Activities And Results Of Learning Of 4th Class School Students Through Application Of Learning Model Based On Problem-Based Learning Problems For Thematic Learning. *Handayani*, *10*(1). https://doi.org/https://doi.org/10.24114/jh.v10i1.14140

Zhao, W., He, L., Deng, W., Zhu, J., Su, A., & Zhang, Y. (2020). The effectiveness of the combined problem-based learning (PBL) and case-based learning (CBL) teaching method in the clinical practical teaching of thyroid disease. *BMC Medical Education*, *20*(1), 1–10. https://doi.org/10.1186/s12909-020-02306-y

Zúñiga Prado, J. R., Rodríguez Paz, M. L., Herrera Rubio, A. M., & Toro, S. O. (2023). Influence of Sociodemographic Factors on Academic Performance in the Subject of Human Gross Anatomy | Influencia de los Factores Sociodemográficos en el Rendimiento Académico en la Asignatura de Anatomía Macroscópica Humana. *International Journal of Morphology*, *41*(1), 96–103.