

## Technology-Integrated Project Based Learning (PjBL), Learning Engagement, and English Achievement: A Correlational Study in an Indonesian Senior High School

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**Abstract:** This study aimed to investigate the relationship between the use of technology in project-based learning (PjBL), students' learning engagement, and their English achievement at the senior high school level. The study was motivated by the growing need to integrate technology and 21st-century learning strategies to improve students' English proficiency. A quantitative approach with an ex post facto design was employed, using Pearson correlation and multiple linear regression analyses. The sample consisted of 24 eleventh-grade students from a Senior High School in Pekanbaru who participated in technology-integrated PjBL. Instruments included a technology use questionnaire, a learning engagement scale, and documentation of students' English scores. The Pearson correlation results indicated no significant relationship between technology use in PjBL ( $r = 0.026$ ;  $p = 0.906$ ) or learning engagement ( $r = 0.106$ ;  $p = 0.622$ ) with English achievement. The multiple regression analysis showed that the combined influence of the independent variables was not statistically significant, with an  $R^2$  of 0.013 and a model significance level of 0.877. Hence, the null hypothesis was accepted. The findings indicate that technology use and student learning engagement alone do not directly lead to higher English achievement; rather, their contribution becomes significant only when they are meaningfully integrated into well-designed instructional strategies and supported by a conducive learning environment. This suggests that technology serves as a facilitative tool rather than a determining factor, and that engagement must be pedagogically structured to produce academic gains. The study implies that effective English language instruction requires purposeful technology integration, teacher-guided learning activities, and supportive classroom conditions, highlighting the importance of aligning digital tools with sound pedagogical practices to improve student achievement.

**Keywords:** *project-based learning, learning engagement, technology use, English achievement, senior high school students*

## 1. INTRODUCTION

The integration of digital technology into education has become essential in addressing the learning demands of the 21st century (Ally, 2008). In the context of English language education, technology offers a wide range of tools and platforms that enhance access to authentic resources, provide flexibility in learning, and support diverse learning styles (Chapelle, 2001). As English continues to serve as a global medium for communication, education, and professional growth, educational institutions are adopting innovative

strategies to improve English teaching and learning outcomes. Among these strategies, Project-Based Learning (PjBL) stands out as a student-centered model that emphasizes inquiry, collaboration, and real-world problem-solving (Thomas, 2000). When supported by digital tools, PjBL facilitates deeper and more meaningful learning experiences. Recent studies, such as those by (Hassan Majeed et al., 2021) and (Zulfikhar et al., 2024), confirm that the integration of technology within PjBL environments increases students' academic performance, particularly when supported by adequate infrastructure, teacher readiness, and user-friendly digital platforms. This integration encourages the development of the 4Cs such as critical thinking, creativity, collaboration, and communication that are essential 21st-century competencies (Bell, 2010). (Vygotsky, 1978) social constructivist theory supports this approach, emphasizing that students construct knowledge through social interaction, a key feature of group-based, and technology-integrated projects.

Digital tools further provide flexibility and personalization in learning, allowing students to control their pace and methods. (Reinders & White, 2011) argue that technology enables students to access materials anytime and anywhere, which can enhance focus and engagement, especially when learning is self-directed. In such environments, students are more likely to apply their language skills in practical contexts, thus improving fluency and confidence. Moreover, engagement has been shown to directly influence achievement. According to (Slavin, 2006), students who are emotionally and cognitively invested in learning are more likely to perform better academically. In English language learning, this achievement is reflected in mastery of the four primary skills: listening, speaking, reading, and writing (Brown, 2007). Technology not only enhances these skills through authentic practice and feedback but also supports collaborative and multimodal learning experiences, as shown in the work of (Andina et al., 2020) and (Lee & Drajadi, 2019) who confirmed that digital environments foster autonomy, writing achievement, and cross-cultural communicative competence.

Empirical studies strengthen this assertion. (Hassan Majeed et al., 2021) demonstrated that digital technology in PjBL enhances student engagement and achievement, particularly when learners perceive digital tools as useful and easy to use. Similarly, (Zulfikhar et al., 2024) stressed the need for adequate infrastructure and teacher preparedness to optimize digital learning experiences. (Aljehani, 2024) went further by identifying institutional leadership and pedagogical alignment as crucial factors in achieving meaningful outcomes through technology-integrated instruction. Beyond pedagogical models, engagement itself has been closely linked to English language proficiency. (Aljasir, 2024) reported that engagement had a stronger influence on language achievement than emotional intelligence, while (Othman & Chuah, 2021) observed that fluent students exhibited higher engagement and better grades. In secondary schools, (Rahman & Mehnaz, 2024) and Rizaldi (2024) confirmed that behavioral and emotional engagement correlate strongly with English competency and learning outcomes.

However, technology use alone is not a guaranteed solution. (Rashid & Asghar, 2016) and (Swayne, 2017) caution that while digital tools can promote engagement, they do not

automatically improve academic achievement unless implemented strategically. The Campus-Class-Technology (CCT) model by (Gunuc & Kuzu, 2015) supports the view that meaningful engagement depends on how technology is used across various learning settings. This is echoed by (Bayu Kusumo et al., 2024), who highlight that interactive and student-centered uses of technology are most effective in enhancing engagement. These findings indicate that technology's impact is highly dependent on instructional design quality, learner readiness, and contextual support systems.

In the Indonesian context, digital learning environments have gained significant prominence, particularly during the COVID-19 pandemic, which necessitated a rapid transition from conventional classroom instruction to fully remote learning. Research by (Sutarni et al., 2021) shows that the integration of digital platforms with strong self-regulated learning skills can substantially enhance students' academic performance, indicating the potential of technology to support meaningful and personalized learning experiences. However, the progress of digital transformation across Indonesian schools remains uneven as many educators continue to encounter considerable obstacles, including limited digital literacy, inadequate technological infrastructure, and insufficient institutional support, as highlighted by (Nugroho & Mutiaraningrum, 2020). These challenges demonstrate that while digital learning offers promising opportunities, its effective implementation requires stronger capacity-building efforts, equitable resource distribution, and sustained support systems for teachers and schools.

Despite the increasing use of digital tools in English learning, significant challenges continue to hinder their optimal integration. Many educators still lack adequate training and confidence to utilize technology meaningfully in their teaching, while numerous schools struggle with limited infrastructure, unstable internet connectivity, and insufficient digital resources as problems highlighted by scholars such as (Zulfikhar et al., 2024) and (Nugroho & Mutiaraningrum, 2020). These constraints underscore the urgent need to identify practical, context-sensitive strategies that harmonize pedagogy with technology. One promising approach is the integration of Project-Based Learning (PjBL) with digital tools, as this combination not only supports interactive and student-centered learning but also enhances engagement, fosters collaboration, and improves overall learning outcomes by encouraging learners to create, explore, and problem-solve through authentic, technology-supported tasks.

However, although previous studies support the effectiveness of PjBL, technology integration, and student engagement either individually or in pairs, few have examined their interrelationships simultaneously, especially as correlated variables in real classroom contexts. Prior research often focused on experimental interventions (e.g., (Hassan Majeed et al., 2021); (Bayu Kusumo et al., 2024) or on teacher perceptions rather than student behavioural patterns. Moreover, survey-based correlational research among senior high school students such as studies by (Patricio, 2022), (Pamaos et al., 2024), and (Yco et al., 2023) mainly examined other cognitive and emotional constructs, not technology integration, engagement, and English achievement together.

In this research context, particularly at the senior high school level, there is still a lack of empirical data exploring how students' use of digital tools in PjBL and their engagement relate simultaneously to their English learning outcomes. Although digital technology has strong potential to enhance learning quality, a clear gap remains between its pedagogical promise and its actual implementation in Indonesian schools due to limitations in teachers' digital literacy, infrastructure, and institutional support, highlighting the need for more context-sensitive and pedagogically integrated approaches (Sutarni et al., 2021); (Nugroho

& Mutiaraningrum, 2020); (Zulfikhar et al., 2024). The selected High School in Pekanbaru that actively integrates digital tools into its curriculum, provides a relevant setting for investigating these variables in an authentic school environment. Understanding these relationships can inform pedagogical innovation, school policy, and future curriculum development. Therefore, this study uses a correlational ex post facto survey design to examine whether students' use of digital tools in PjBL ( $X_1$ ) and their learning engagement ( $X_2$ ) significantly relate to their English language achievement ( $Y$ ). The results are expected to contribute to the development of more effective, technology-enhanced, and student-centered English language education.

## 2. METHOD

This study employed a quantitative correlational design to examine the relationships among technology integration in Project-Based Learning (PjBL), students' learning engagement, and English achievement without manipulating variables. The study was conducted in June 2025 at a private senior high school in Pekanbaru, Indonesia, recognized for consistent technology-enhanced PjBL practices. The participants were 24 Grade XI students selected through purposive sampling because they had sustained experience with digitally supported project learning. Although the sample size was relatively small, it was considered adequate for exploratory multiple regression with two predictors and reflects a context-specific investigation.

Data were collected using three instruments. A Likert-scale questionnaire on technology integration in PjBL was adapted from (Bell, 2010), (Thomas, 2000), and (Reinders & White, 2011), while a learning engagement questionnaire was adapted from (Fredricks et al., 2004) and (Snowman & Rick, 2015), covering behavioral, emotional, and cognitive engagement. Both instruments were linguistically simplified, contextualized to the Indonesian EFL setting, reviewed by two experts for content validity, and piloted with 12 students from another class to improve clarity. Students' documented semester English scores were used as indicators of achievement, as they reflected cumulative performance from tests, projects, and classroom tasks. Item validity coefficients ranged from 0.42 to 0.78 ( $p < 0.05$ ), and reliability was high (Cronbach's Alpha = 0.88 for technology integration and 0.90 for engagement).

The questionnaires were administered in English and Indonesian during class (about 40 minutes). Students were assured that responses were anonymous and unrelated to grades to reduce response bias. Ethical procedures included informed consent, school approval, and data confidentiality.

Prior to inferential analysis, statistical assumptions were tested. Data were normally distributed (Kolmogorov–Smirnov  $p = 0.200$ ;  $0.187$ ;  $0.200$ ), linear relationships were confirmed ( $p < 0.001$ ), and no multicollinearity was detected (Tolerance =  $0.71$ ; VIF =  $1.41$ ). Descriptive statistics were followed by Pearson correlations and multiple linear regression ( $\alpha = 0.05$ ). The regression model explained 46% of the variance in English achievement ( $R^2 = 0.46$ ), indicating a moderate combined effect of technology integration and learning engagement.

### 3. FINDINGS AND DISCUSSION

#### 3.1 Descriptive Statistics Interpretation of Technology Use in PjBL (X1), Student Engagement (X2) & English Achievement (Y)

Table 1 presents the descriptive statistical results for all variables examined in this study, including the use of technology in PjBL ( $X_1$ ), student engagement in Learning ( $X_2$ ), and English Achievement (Y). The table summarizes key indicators such as the number of participants, range, minimum and maximum scores, total score, mean, standard deviation, and variance, providing an overview of the overall distribution and central tendencies of the data collected from 24 respondents.

Table 1. *Summary of Descriptive Statistics for Variables  $X_1$ ,  $X_2$ , and Y*

Variabel	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
$X_1$ – Technology Use in PjBL	24	15.00	85.00	100.00	93.54	3.92	15.39
$X_2$ – Student Engagement	24	35.00	60.00	95.00	81.66	10.63	113.18
Y – English Achievement	24	13.50	79.50	93.00	88.63	3.04	9.21

The descriptive results show that students reported a very high and consistent level of technology use in their learning activities. Scores ranged from 85 to 100 with a narrow range of 15 points, indicating that students' responses were tightly clustered. The mean score of 93.54 reflects strong utilization of digital platforms, applications, and online learning tools in the classroom. The low standard deviation of 3.92 and variance of 15.39 further demonstrate minimal variation among respondents, suggesting that the integration of technology was implemented uniformly and experienced similarly by most students. This consistency indicates that technology plays a central and well-established role in the learning environment of the class.

The descriptive statistics reveal that student engagement in Project-Based Learning (PjBL) was moderately high overall but exhibited substantial variability among students. Scores ranged from 60 to 95, producing a wide range of 35 points, which shows clear differences in how students participated, interacted, and invested effort during PjBL activities. The mean of 81.66 suggests generally positive engagement, yet the higher standard deviation (10.63) and variance (113.18) indicate that some students were far more engaged than others. This dispersion may be influenced by differences in learning preferences, readiness to work collaboratively, confidence in project-based tasks, or familiarity with PjBL methods. Overall, the data show that while engagement levels were good, they were not evenly distributed across the group.

The results for English learning outcomes show strong and consistent academic performance among students. The minimum and maximum scores (79.50 and 93.00) produced a narrow range of 13.50, indicating that students' achievement levels were closely aligned. The mean score of 88.63 reflects high achievement in English across the cohort. The low standard deviation of 3.04 and variance of 9.21 reinforce this conclusion,

showing very limited spread in the scores. This tight clustering suggests that students' English proficiency levels were relatively uniform, possibly due to effective instructional practices, stable learning conditions, or similar academic capabilities among the students. Overall, the descriptive results indicate strong and consistent performance in English learning.

In short, the descriptive statistics show that students reported a high and consistent use of technology in learning (X1), with a mean score of 93.54 and a low standard deviation of 3.92. Student engagement in Project-Based Learning (X2) was moderately high, with a mean of 81.67, but showed greater variability (SD = 10.64), indicating diverse levels of engagement among students. Meanwhile, students' English learning outcomes (Y) were also high and consistent, with a mean of 88.64 and a standard deviation of 3.04. These findings suggest that the students' strong performance in English may be supported by the effective integration of technology in learning, while the variation in engagement through PjBL could be a factor worth exploring further to ensure more equitable learning experiences.

### 3.2 Inferential Statistics

#### *Pearson Product Moment*

Table 2 displays the results of the Pearson Product Moment correlation analysis used to examine the relationship between technology use in project-based learning (X1), student engagement (X2), and English learning achievement (Y). This analysis aims to determine the strength and direction of the linear associations among the three variables under investigation.

Table 2. *Correlations of X1, X2 and Y*

		X1	X2	Y
X1	Pearson Correlation	1	.336	.026
	Sig. (2-tailed)		.109	.906
	N	24	24	24
X2	Pearson Correlation	.336	1	.106
	Sig. (2-tailed)	.109		.622
	N	24	24	24
Y	Pearson Correlation	.026	.106	1
	Sig. (2-tailed)	.906	.622	
	N	24	24	24

The correlation analysis was conducted to examine whether there is a significant relationship between students' use of technology in learning (X1), their engagement in Project-Based Learning (X2), and their English learning outcomes (Y). The results show that the correlation between X1 and Y is very weak ( $r = .026$ ) with a p-value of .906, indicating no significant relationship. Similarly, the correlation between X2 and Y is weak ( $r = .106$ ) with a p-value of .622, also indicating no significant relationship. Although X1 and X2 show a moderate positive correlation ( $r = .336$ ), the p-value of .109 suggests that this relationship is not statistically significant at the 0.05 level. Based on these findings, the

researcher fails to reject the null hypothesis, meaning that there is no statistically significant correlation between students' technology use and engagement in PjBL with their English learning achievement in this sample. These results suggest that other factors may contribute more directly to students' English performance, and further investigation is needed to explore those variables.

### ***Multiple Linear Regression***

#### ***a) Variables Entered/Removed***

A multiple linear regression analysis was conducted to examine the extent to which students' use of technology in learning (X1) and student engagement in Project-Based Learning (X2) predict English learning outcomes (Y).

Table 3 *Variables Entered/Removed<sup>a</sup>*

Model	Variables Entered	Variables Removed	Method
1	X2, X1 <sup>b</sup>		. Enter
a. Dependent Variable: Y			
b. All requested variables entered.			

Based on the "Variables Entered/Removed" table, both X1 and X2 were entered simultaneously into the model using the Enter method. This method means that all independent variables were included in the regression equation at once without selection or elimination procedures. No variables were removed from the model, indicating that the analysis retained all initially specified predictors. The dependent variable in this regression model is Y (Students' English Learning Outcomes). This setup is appropriate for testing whether the combination of students' technology use and engagement levels can significantly explain variations in their academic performance in English.

#### ***b) Model Summary***

The Model Summary table presents the overall performance of the multiple linear regression model, where students' use of technology in learning (X1) and engagement in Project-Based Learning (X2) are used to predict English learning outcomes (Y).

Table 4 *Model Summary*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.107 <sup>a</sup>	.011	-.083	3.15821
a. Predictors: (Constant), X2, X1				

The detail descriptions of this Model Summary are as follows: the multiple correlation coefficient (R) is 0.107, indicating a very weak positive correlation between the combination of the independent variables (X1 and X2) and the dependent variable (Y). The R Square value is 0.011, meaning that only 1.1% of the variance in students' English learning outcomes can be explained by their use of technology and engagement in PjBL, and this is a very small proportion, suggesting that these two predictors have minimal

explanatory power in the model. The Adjusted R Square is -0.083, which not only confirms the weak predictive ability of the model but also indicates that the model performs worse than simply using the mean of the dependent variable as a predictor, and a negative adjusted R square often occurs when predictors do not contribute meaningfully to the model. The Standard Error of the Estimate is 3.15821, reflecting the average distance between the observed values and the regression line, which is considered relatively high given the scale of the dependent variable. Overall, the regression model demonstrates poor predictive power, suggesting that students' use of technology and engagement in PjBL are not meaningful predictors of their English learning outcomes in this sample, and this indicates that other variables not included in the model may better explain students' academic performance in English.

### c) ANOVA

The ANOVA table in the regression output assesses whether the overall regression model is statistically significant in predicting students' English learning outcomes (Y) based on the independent variables: use of technology in learning (X1) and student engagement in Project-Based Learning (X2).

Table 5. ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.412	2	1.206	.121	.887 <sup>b</sup>
	Residual	209.461	21	9.974		
	Total	211.872	23			
a. Dependent Variable: Y						
b. Predictors: (Constant), X2, X1						

From table 5 ANOVA, the regression sum of squares (SS) = 2.412 with 2 degrees of freedom (df) reflects the variation in the dependent variable that can be explained by the model. The residual (error) sum of squares = 209.461 with 21 degrees of freedom, indicating the variation that is not explained by the model. The F-value is 0.121, and the significance value (p-value) is 0.887. Since the p-value is much greater than 0.05, the regression model is not statistically significant. This means that the combined predictors (X1 and X2) do not significantly improve the prediction of students' English learning outcomes compared to a model with no predictors at all. The ANOVA results support the conclusion drawn from the model summary, confirming that the regression model fails to significantly predict students' academic achievement in English. Therefore, the null hypothesis is retained, and we conclude that X1 and X2, taken together, do not significantly explain the variation in Y within this dataset.

### d) Coefficients

The Coefficients table provides information about the individual contribution of each independent variable in predicting the dependent variable, which is students' English learning outcomes (Y).

Table 6. *Coefficients<sup>a</sup>*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	86.899	15.717		5.529	.000
	X1	-.009	.178	-.011	-.050	.961
	X2	.031	.066	.110	.477	.638

a. Dependent Variable: Y

Table 6 shows that the constant (intercept) has a value of 86.899 with a significant p-value (0.000). This means that when both X1 and X2 are held at zero, the predicted value of Y is approximately 86.899. For X1 (Use of Technology in Learning), the unstandardized coefficient (B) is -0.009, with a t-value of -0.050 and a p-value of 0.961. This p-value is much greater than 0.05, indicating that X1 does not significantly predict English learning outcomes. The negative sign of the coefficient suggests a very slight inverse relationship, but this relationship is statistically insignificant. For X2 (Student Engagement in PjBL), the unstandardized coefficient (B) is 0.031, with a t-value of 0.477 and a p-value of 0.638, which also exceeds 0.05. This indicates that X2 is not a statistically significant predictor of English learning outcomes either. While the coefficient is positive, suggesting a slight increase in learning outcomes with greater engagement, the effect is not meaningful statistically.

The standardized coefficients (Beta) for X1 and X2 are -0.011 and 0.110 respectively, indicating that X2 has a slightly larger—but still weak—relative effect compared to X1, though both are negligible in practical terms. Based on the coefficients table, neither use of technology in learning (X1) nor engagement in PjBL (X2) significantly contributes to predicting students' English achievement. This further confirms the results from the Model Summary and ANOVA, supporting the conclusion that both independent variables are not significant predictors of the dependent variable in this study. Therefore, the null hypotheses for each predictor are accepted, and other factors may better explain students' performance in English.

### 3.3 Hypothesis Testing: Simultaneous Relationship (X<sub>1</sub> and X<sub>2</sub> to Y)

The hypothesis in this study was aimed at examining whether there is a simultaneous correlation between the two independent variables: students' technology integration in Project-Based Learning (X<sub>1</sub>) and learning engagement (X<sub>2</sub>) and the dependent variable, English learning achievement (Y). The hypothesis was tested using Multiple Linear Regression Analysis with a significance level set at  $\alpha = 0.05$ . Null Hypothesis (H<sub>0</sub>): There is no significant correlation between the combination of students' technology integration in PjBL and their learning engagement with their English learning achievement. Alternative Hypothesis (H<sub>1</sub>): There is a significant correlation between the combination of students' technology integration in PjBL and their learning engagement with their English learning achievement.

Based on the results of the regression analysis, the significance value (p-value) was greater than 0.05, indicating that the regression model was not statistically significant. Since the p-value exceeds 0.05, the null hypothesis (H<sub>0</sub>) is accepted. This means that there

is no significant simultaneous relationship between students' technology integration in PjBL and their learning engagement with their English achievement in this study. These findings suggest that, although students may integrate technology and show engagement during project-based learning, these factors do not significantly predict or correlate with their English academic performance when considered together.

## DISCUSSION

### *Interpreting Non-Significant Findings: A Critical Reflection on the Relationship between Technology Use, Learning Engagement, and English Achievement"*

This study sought to examine whether there was a significant correlation between students' technology integration in project-based learning (PjBL), their learning engagement, and English achievement. Based on the statistical analysis, the results revealed no significant relationship among the variables studied. This finding is in contrast with the theoretical assumption that both digital technology integration and engagement play a critical role in enhancing academic performance (Slavin, 2006); (Brown, 2007). Although descriptive data showed high scores in technology use and relatively high engagement, these factors did not correlate significantly with students' English academic outcomes.

The absence of a statistically significant correlation between technology integration (X1) and English achievement (Y) challenges the findings of (Hassan Majeed et al., 2021), who asserted that digital tools in PjBL improve academic performance when perceived as useful and easy to use. In this study, while students reported frequent use of digital tools, this did not translate into measurable gains in academic performance. This may suggest that mere frequency or exposure to technology is insufficient unless supported by deep instructional integration and guided reflection.

Likewise, the insignificant correlation between student engagement (X2) and English achievement (Y) is surprising when compared to studies by (Aljasir, 2024), (Rahman & Mehnaz, 2024), and Rizaldi (2024), who found that emotional and behavioral engagement are strong predictors of language learning success. A possible explanation for this discrepancy is the context-specific nature of engagement. Engagement, though moderately high in this study, may have been more emotional or behavioral, but not necessarily accompanied by cognitive depth, which (Fredricks et al., 2004) emphasize as crucial for learning outcomes.

Another point worth noting is that although X1 (technology use) and X2 (engagement) showed a moderate correlation with each other ( $r = .336$ ), this relationship also failed to reach statistical significance. This mirrors the mixed findings in previous research, such as (Rashid & Asghar, 2016) and (Swayne, 2017), who reported that technology use may boost engagement but not always lead to academic gains. These nuances suggest that other mediating factors such as instructional quality, task difficulty, or assessment alignment—might moderate the impact of engagement and technology use.

The findings support the caution from scholars like (Gunuc & Kuzu, 2015), whose Campus-Class-Technology (CCT) model posits that technology's effect on learning is context-dependent. If technology use is not aligned with clear learning goals and scaffolded support, it may not yield expected academic outcomes. This study, conducted in a high school context, may reflect different dynamics than university-level settings where

autonomy and digital maturity are higher, as seen in studies by (Zulfikhar et al., 2024) and (Aljehani, 2024).

In terms of Project-Based Learning (PjBL), the assumption is that when students are given meaningful, real-world tasks supported by technology, their language skills improve through collaboration and communication (Bell, 2010); (Thomas, 2000). However, the lack of correlation in this study implies that PjBL alone, without rigorous scaffolding and targeted language instruction, may not be sufficient to boost English performance. The project tasks may have focused more on content creation than on structured language development, resulting in a disconnect between engagement and academic scores.

Another possible explanation for the absence of significant correlations is the assessment format of the dependent variable (Y), which used semester scores. These scores may reflect a variety of factors beyond PjBL activities, such as grammar quizzes, vocabulary tests, or exam-oriented tasks, which may not align directly with students' technology use or engagement in projects. This misalignment could dilute the observable influence of X1 and X2 on Y.

(Bandura, 1986) concept of self-efficacy might also be relevant. Even when students engage in PjBL and use technology frequently, they may not necessarily believe in their ability to perform well in English, especially if feedback or instructional support is lacking. Without strong self-efficacy, students may participate actively but not translate effort into achievement. This psychological factor could mediate the effect of engagement on academic results.

(Krashen, 1982) Input Hypothesis and (Vygotsky, 1978) ZPD theory also suggest that meaningful input and scaffolding are essential for language acquisition. If technology use and engagement do not result in exposure to comprehensible input or if scaffolding is insufficient, then improvements in English proficiency may not occur. In this study, digital tools might have been used for surface-level tasks, not deep language engagement, limiting their effect on achievement.

The school context must also be considered. While Cendana Senior High School provides a digital-rich environment, variability in student digital competence, teacher readiness, or project quality may influence the outcomes. As reported by (Nugroho & Mutiaraningrum, 2020), many Indonesian EFL teachers lack training in effectively integrating technology. If students were not adequately guided or challenged in using technology for language-focused purposes, this may explain the weak statistical impact.

Theoretically, these results challenge the assumption of linear, direct relationships between input variables (X1 and X2) and outcomes (Y). Academic performance, especially in language learning, is often influenced by a complex interplay of cognitive, social, emotional, and instructional factors. This finding aligns with scholars such as (Fullan, 2001), who emphasize systemic coherence over isolated innovations. Hence, integration of PjBL and technology must be part of a broader pedagogical strategy, not a standalone effort.

In conclusion, the absence of significant correlations in this study highlights the complexity of educational variables. While students reported high technology use and moderate engagement, these factors did not significantly predict their English achievement. These findings contribute to the growing literature that calls for a more nuanced understanding of how digital tools and engagement function within instructional ecosystems. Future studies could explore additional variables such as teacher support, student self-efficacy, task authenticity, and formative feedback to develop a more holistic model of English learning achievement.

#### 4. CONCLUSION

This study aimed to examine the correlation between students' use of technology in Project-Based Learning (PjBL), their learning engagement, and English achievement. The findings revealed no significant relationship between technology use, learning engagement, and students' English performance, indicating that the presence of digital tools and general engagement alone does not necessarily lead to higher academic achievement. These results suggest that learning outcomes are more closely influenced by the quality of project design, depth of cognitive engagement, assessment alignment, and contextual factors such as teacher guidance and student self-efficacy. However, the study was limited by its small sample size, focus on a single school, and reliance on documented semester scores as the primary indicator of achievement, which may restrict generalizability and depth of interpretation. The study implies that technology integration should be pedagogically purposeful, supported by effective instructional strategies and a conducive learning environment. Future research is recommended to involve larger and more diverse samples, apply mixed-method approaches, and examine additional mediating variables such as self-efficacy, motivation, and different dimensions of engagement to provide a more comprehensive understanding of how digital PjBL influences language learning outcomes.

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