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Effects of project-based learning and learning independence on vocational students' archiving outcomes

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Abstrak

Penelitian ini mengkaji pengaruh persepsi siswa terhadap Pembelajaran Berbasis Proyek (PjBL) dan kemandirian belajar terhadap pencapaian hasil belajar di kalangan siswa kelas sebelas Manajemen Perkantoran dan Layanan Bisnis di SMK Negeri 3 Surakarta. Pendekatan survei kuantitatif digunakan dengan 85 responden yang dipilih dari 108 siswa melalui pengambilan sampel acak bert stratified proporsional. Data dikumpulkan menggunakan kuesioner skala Likert lima poin dan dianalisis melalui regresi linier berganda menggunakan IBM SPSS 26.0. Hasil menunjukkan bahwa persepsi PjBL berpengaruh positif dan signifikan terhadap hasil belajar ($t = 3{,}008$, $p = 0{,}003$), demikian pula kemandirian belajar ($t = 4{,}716$, $p = 0{,}000$). Secara bersamaan, kedua variabel tersebut berpengaruh signifikan terhadap hasil belajar ($F = 11{,}124$, $p = 0{,}000$), berkontribusi sebesar 19,4% terhadap varians hasil belajar (Adjusted $R^2 = 0{,}194$). Kemandirian belajar muncul sebagai prediktor yang lebih kuat ($\beta = 0{,}592$) dibandingkan dengan persepsi PjBL ($\beta = 0{,}378$). Temuan ini menegaskan bahwa pembelajaran berbasis proyek yang dikontekstualisasikan dengan praktik pengarsipan otentik, dikombinasikan dengan peningkatan pembelajaran mandiri, secara efektif meningkatkan hasil pendidikan kejuruan. Guru disarankan untuk merancang proyek pengarsipan otentik yang berlangsung selama 4–6 minggu sambil mendorong otonomi siswa melalui refleksi diri dan bimbingan perencanaan.

Keywords: kompetensi manajemen dokumen; pendidikan vokasional; self-regulated learning siswa SMK

Abstract

This study examined the effects of students' perceptions of Project-Based Learning (PjBL) and learning independence on archiving learning outcomes among eleventh-grade Office Management and Business Services students at SMK Negeri 3 Surakarta. A quantitative survey approach was employed with 85 respondents selected from 108 students through proportionate stratified random sampling. Data were collected using

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a five-point Likert-scale questionnaire and analyzed through multiple linear regression using IBM SPSS 26.0. Results indicated that PjBL perceptions positively and significantly affected learning outcomes ($t = 3.008$, $p = .003$), as did learning independence ($t = 4.716$, $p = .000$). Simultaneously, both variables significantly influenced learning outcomes ($F = 11.124$, $p = .000$), contributing 19.4% to learning outcome variance (Adjusted $R^2 = .194$). Learning independence emerged as the stronger predictor ($\beta = .592$) compared to PjBL perceptions ($\beta = .378$). These findings confirm that project-based learning contextualized with authentic archiving practices, combined with self-regulated learning enhancement, effectively improves vocational education outcomes. Teachers are recommended to design authentic archiving projects lasting 4–6 weeks while fostering student autonomy through self-reflection and planning guidance.

Keywords: document management competence; vocational education; vocational students' self-regulated learning

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Introduction

Learning outcomes represent observable and measurable behavioral changes in cognitive, affective, and psychomotor domains following the learning process (Anderson & Krathwohl, 2019). Optimal learning outcomes indicate students' success in comprehending material, applying concepts, and developing competency-aligned skills. In archiving courses, learning outcomes encompass not only theoretical understanding of document storage concepts but also practical abilities in managing archives systematically.

The relationship between students' perceptions of Project-Based Learning (PjBL) and learning independence lies in how these factors mutually reinforce improved learning outcomes. Students with high learning independence demonstrate greater effectiveness in project-based learning environments, as they can manage time, strategies, and resources efficiently. Conversely, PjBL implementation can foster student learning independence by assigning greater responsibility for project completion. Thus, the combination of positive PjBL perceptions and high learning independence levels is expected to significantly impact archiving learning outcomes.

Archiving education in vocational secondary schools plays a crucial role in preparing students with document management skills aligned with workplace demands. However, student learning outcomes remain suboptimal, with average scores falling below the Minimum Completeness Criteria (KKM). This condition indicates the need for innovative learning models such as Project-Based Learning (PjBL) to enhance student motivation, engagement, and learning independence.

Previous research has yielded varied findings. Datu et al. (2020) demonstrated that PjBL enhances motivation and learning outcomes through contextual projects relevant to real-world situations. Ramadani and Ubaidilah (2023) found that PjBL promotes learning independence through direct problem-solving experiences. However, these studies have not addressed how student perceptions of PjBL influence learning outcomes in vocational education contexts, particularly in archiving. Meanwhile, Sa'ban et al. (2023) confirmed PjBL effectiveness in STEAM domains without examining its application in document management competencies. Consequently, a research

gap exists in understanding how student perceptions of PjBL implementation contribute to learning outcomes in office-related vocational education.

Furthermore, the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek, 2017) has nationally emphasized the importance of implementing 21st-century learning models such as Project-Based Learning to develop critical thinking, collaboration, communication, and creativity skills in vocational school environments. However, field implementation continues to face challenges regarding operational execution, teacher readiness, and student perceptions of PjBL effectiveness. This context reinforces the urgency of examining how student perceptions of project-based learning genuinely influence learning outcomes in vocational secondary schools.

Previous research also exhibits limitations. For instance, Fitri et al. (2018) examined only the relationship between motivation and higher-order thinking skills without incorporating student perception factors regarding learning models. Meanwhile, Ramadianti (2021) measured only learning outcome improvements without considering the role of learning independence as a mediating variable. Therefore, this research addresses these gaps by analyzing the influence of students' perceptions of PjBL-based learning and learning independence on archiving learning outcomes simultaneously.

This study integrates perception variables toward PjBL and learning independence within office-related vocational education contexts. The research contributes by providing new empirical evidence that project-based learning effectiveness substantially depends on student perceptions as primary learning agents, rather than solely on teacher implementation methods. Practically, these findings offer recommendations for vocational school teachers to strengthen contextual learning strategies and enhance students' self-regulated learning through authentic and measurable archiving projects.

Based on the foregoing discussion, this research aims to address the following questions: (1) How do students' perceptions of PjBL-based learning influence the archiving learning outcomes of eleventh-grade MPLB students at SMK Negeri 3 Surakarta? (2) How does learning independence influence students' archiving learning outcomes? (3) How do perceptions of PjBL and learning independence simultaneously influence the archiving learning outcomes of eleventh-grade MPLB students at SMK Negeri 3 Surakarta? By answering these questions, this research is expected to provide deeper insights for schools, teachers, students, and other researchers.

Reasearch Methods

This study employed a quantitative approach with a survey method to examine the influence of students' perceptions of PjBL-based learning and learning independence on the learning outcomes of eleventh-grade MPLB students at SMK Negeri 3 Surakarta. The research was conducted through seven stages: preparation, proposal development, instrument construction, data collection, data processing, data analysis, and report writing. The research period extended from October 2024 to June 2025. The population comprised 108 students, with a sample of 85 students selected using stratified random sampling to ensure representativeness. The instrument consisted of a closed questionnaire with a five-point Likert scale containing indicators for PjBL perception, learning independence, and learning outcomes. Validity and reliability tests were conducted using SPSS 26.0. Data analysis employed multiple linear regression following classical assumption tests (normality, linearity, multicollinearity, and heteroscedasticity). Research ethics were observed by obtaining respondent consent, maintaining identity confidentiality, and ensuring data use exclusively for academic purposes.

Proportionate stratified random sampling was selected because the population consisted of multiple classes (strata) with varying student numbers. This technique ensured each class received proportional and representative sampling opportunities, thus accurately reflecting population conditions. Sample size calculation employed the Slovin formula: $n = N / (1 + N(e)^2)$, yielding n =

$108 / (1 + 108(0.05)^2) = 108 / 1.27 = 85.03 \approx 85$ students. The research instrument consisted of a five-point Likert scale questionnaire measuring PjBL perception, learning independence, and archiving learning outcomes.

Validity testing was conducted on data from 23 respondents as a pilot group. Based on this number, the r-table value at 5% significance was 0.3961. Items with r-calculated ≥ 0.3961 were deemed valid and suitable for subsequent research. Validity testing in this study used SPSS Statistics 26. Validity level testing employed the Pearson product-moment correlation formula; results were compared with the product-moment table, and items with r-calculated > r-table at 5% significance were declared valid and usable as research measurement instruments.

Instrument reliability was determined by the following criteria: if alpha > 0.60, the research instrument was deemed reliable; if alpha < 0.60, the instrument was deemed unreliable. Formula results were subsequently interpreted against reliability correlation levels. Reliability testing in this study also used IBM SPSS 26.0 software with Cronbach's Alpha reliability testing. Data analysis proceeded as follows:

Analysis was conducted using classical assumption tests (normality, linearity, multicollinearity, heteroscedasticity) and multiple linear regression. Multiple linear regression was employed because two independent variables (PjBL and learning independence) simultaneously influence the dependent variable (learning outcomes). This analysis enabled both partial and simultaneous effect testing.

Result and Disscussion

Research Result

Based on descriptive data analysis results, the learning outcomes variable had a minimum score of 70 and maximum of 89, with a mean of 81.88 and standard deviation of 6.267. This indicates that student learning achievement was generally in the good category and relatively homogeneous, as the standard deviation was less than 10. The PjBL perception variable had a minimum score of 15 and maximum of 60, with a mean of 27.76 and standard deviation of 7.665. Meanwhile, the learning independence variable had a minimum score of 18 and maximum of 66, with a mean of 35.26 and standard deviation of 8.207. These research variables were measured using instruments consisting of 10 to 18 statement items with a five-point Likert scale.

Before conducting multiple linear regression analysis, prerequisite tests including normality, linearity, and multicollinearity tests were performed. Normality test results using the Kolmogorov-Smirnov Test showed an Asymp. Sig. (2-tailed) value of 0.068. This value exceeded 0.05, indicating that residual data in the regression model were normally distributed. Thus, the analysis model was suitable for further testing.

Linearity test results between students' PjBL perception (X_1) and learning outcomes (Y) showed a significance value on the Deviation from Linearity row of 0.437. Meanwhile, linearity test results between learning independence (X_2) and learning outcomes (Y) showed a significance value of 0.477. Because the significance values for both variables exceeded 0.05, it was concluded that PjBL, learning independence, and learning outcomes had linear relationships. This means that better student perceptions of PjBL and higher learning independence correspond to improved learning outcomes.

Subsequently, multicollinearity test results showed Tolerance values of 0.608 and Variance Inflation Factor (VIF) values of 1.645 for both independent variables. Because Tolerance > 0.1 and VIF < 10, it was concluded that no multicollinearity existed between PjBL and learning independence variables. Thus, both variables could be simultaneously included in the regression model without excessive mutual influence.

Multiple linear regression analysis was conducted to determine the magnitude of influence of students' PjBL perception (X_1) and learning independence (X_2) on archiving learning outcomes

(Y). Results indicated that partially, the PjBL variable had a positive and significant effect on learning outcomes, with t = 3.008 > t-table = 1.990 and significance value of 0.003 < 0.05. This indicates that more positive student perceptions of project-based learning correspond to higher archiving learning outcomes. Similarly, the learning independence variable showed a positive and significant effect on learning outcomes, with t = 4.716 > t-table = 1.990 and significance value of 0.000 < 0.05. This means that higher student learning independence levels correspond to higher learning outcomes.

Simultaneous test results (F-test) reinforced these findings, with F = 11.124 > F-table = 3.11 and significance of 0.000 < 0.05. This indicates that PjBL perception and learning independence variables together significantly influenced student learning outcomes. The coefficient of determination (R^2) value of 0.194 indicates that both independent variables contributed 19.4% to learning outcome variance, while the remaining 80.6% was influenced by factors outside the research model, such as learning interest, teacher support, and student learning environment.

Tests employed in this study included validity, reliability, normality, linearity, and multicollinearity tests. Validity testing compared r-calculated values from SPSS data processing with r-table values. With 23 student respondents and 0.05 significance level, the r-table value was 0.3961. This value served as the reference for determining item validity. Validity test results showed that for variable X_1 (Student Perception of Project-Based Learning/PjBL), all 15 statement items had r-calculated > r-table and were declared valid. Meanwhile, for variable X_2 (Learning Independence), all 18 statement items had r-calculated > r-table and were declared valid.

Table 1
Descriptive Statistics

		Learning Outcomes	PjBL	Learning Independence
N	Valid	85	85	85
	Missing	0	0	0
Mean		81.88	27.76	35.26
Std. Error of Mean		.680	.831	.890
Median		85	28	35
Mode		88	29	30
Std. Deviation		6.267	7.665	8.207
Variance		39.272	58.754	67.361
Range		19	45	48
Minimum		70	15	18
Maximum		89	60	66
Sum		6960	2360	2997

Source: Data processed by researchers (2025)

Based on Table 1, test results indicate that the highest mean value was found in the learning outcomes variable (81.88), demonstrating that students generally achieved good learning outcomes. Each variable's standard deviation <10 indicates relatively homogeneous data distribution.

Table 2
Validity Test Results

Variable	Number of Items	r-calculated	r-table (0.3961)	Status
PjBL Perception (X_1)	15	0.456–0.785	> 0.3961	Valid
Learning Independence (X_2)	18	0.472–0.802	> 0.3961	Valid

Source: Data processed by researchers (2025)

Based on Table 2, reliability testing was employed to determine the extent to which research instruments provide consistent results when re-measured at different times. This study showed Cronbach's Alpha values above 0.7, indicating that all indicators possessed good internal consistency. These values demonstrate that each item within constructs consistently reflected the measured variables.

Table 3
Reliability Test Results

Construct	Cronbach's Alpha	Status
PjBL	0,760	Reliable
Learning Independence	0,743	Reliable

Source: Data processed by researchers (2025)

Based on Table 3, normality testing was conducted to determine whether research data were normally distributed. Calculations used the Kolmogorov-Smirnov technique through IBM SPSS 26 software with a 5% or 0.05 significance level. Data were considered normally distributed if significance values > 0.05; conversely, data were considered non-normally distributed if significance values < 0.05.

Table 4
Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		85
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.00085443
Most Extreme Differences	Absolute	.093
	Positive	.093
	Negative	-.089
Test Statistic		.093
Asymp. Sig. (2-tailed)		.068[c]

Source: Data processed by researchers (2025)

Based on Table 4, the Asymptotic Significance (2-tailed) value was 0.068. This value indicates that 0.068 > 0.05; therefore, it was concluded that residual data in this regression model were normally distributed because the value exceeded 0.05.

Table 5
Linearity Test: PjBL and Learning Outcomes

		Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	(Combined)	841.518	21	40.072	1.027	.446
	Linearity	33.622	1	33.622	.862	.357
	Deviation from Linearity	807.895	20	40.395	1.036	.437
Within Groups		2457.306	63	39.005		
Total		3298.824	84			

Source: Data processed by researchers (2025)

Table 6
Linearity Test: Learning Independence and Learning Outcomes

		Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	(Combined)	1118.143	29	38.557	.972	.521
	Linearity	.143	1	.143	.004	.952
	Deviation from Linearity	1118.000	28	39.929	1.007	.477
Within Groups		2180.681	55	39.649		
Total		3298.824	84			

Source: Data processed by researchers (2025)

Based on Tables 5 and 6, the significance values (p-value Sig.) on the Deviation from Linearity row were 0.437 and 0.477, respectively. Because significance values exceeded 0.05, it was concluded that students' PjBL perception (X_1) and learning independence (X_2) each had linear relationships with archiving learning outcomes (Y).

Table 7
Multicollinearity Test Results

Coefficients[a]		
	Collinearity Statistics	
	Tolerance	VIF
PjBL	0,608	1,645
Kemandirian	0,608	1,645

Source: Data processed by researchers (2025)

Based on Table 7, test results showed that all Tolerance values produced were > 0.10 and VIF (Variance Inflation Factor) values were < 10; specifically, the PjBL variable had a Tolerance value of 0.608 and VIF of 1.645, and the learning independence variable had a Tolerance value of 0.608 and VIF of 1.645. Thus, it was concluded that no multicollinearity existed, and the data were suitable for use.

Table 8
Multiple Linear Regression Analysis Results

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
(Constant)	.008	.001		9.423	.000
PjBL	.038	.013	.378	3.008	.003
Learning Independence	6.750	.000	.592	4.716	.000

Source: Data processed by researchers (2025)

Based on Table 8, the constant value was 0.008, meaning that if PjBL and learning independence variables equaled 0 (zero), the learning outcomes variable value would be 0.008. The PjBL coefficient value of 0.038 indicates that if the PjBL variable increased, the learning outcomes variable would decrease by 0.038, and vice versa. Meanwhile, the learning independence coefficient value of 6.750 indicates that if the learning independence variable increased, the learning outcomes variable would also increase by 6.750. This demonstrates that learning independence had a stronger influence on learning outcomes compared to students' PjBL perceptions.

Table 9
t-Test Results

	t-calculated	Significance
(Constant)	9,423	0,00
PjBL	3,008	0,03
Learning Independence	4,716	0,00

Source: Data processed by researchers (2025)

Based on Table 9, test results indicated that PjBL (X_1) significance values showed positive and significant influence on learning outcomes (Y), with t = 3.008 > t-table = 1.990 and significance of 0.003 < 0.05. Based on significance values less than 0.05 and t-calculated values greater than t-table, H_0 was rejected; therefore, a significant partial influence existed between the PjBL variable (X_1) and learning outcomes (Y). Learning independence (X_2) significance value was 0.00. The t-test results showed that the independence variable had a t value of 4.716, which was absolutely greater than the t-table value of 1.990 at 0.05 significance level. Additionally, the significance value (Sig.) of 0.000 < 0.05 indicated statistically significant influence. Learning independence had a positive and significant effect on learning outcomes.

Table 10
F-Test Results (Simultaneous Test) - ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	517,826	2	258,913	11,124	0,00
Residual	165,626	82	2,097		
Total	683,452	84			

Source: Data processed by researchers (2025)

Based on the F-test results, F = 11.124 > F-table = 3.11 with significance 0.000 < 0.05; thus, it was concluded that PjBL and learning independence simultaneously had significant effects on learning outcomes.

Table 11
Coefficient of Determination Analysis Results (Model Summary)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0,462	0,213	0,194	0,0009

Source: Data processed by researchers (2025)

Based on Table 11, the coefficient of determination (R^2) value was 0.194, meaning 19.4% of the dependent variable (learning outcomes) could be explained by the independent variables (PjBL and learning independence). The remaining 80.6% (100% - 19.4%) of the dependent variable was explained by variables outside the research model.

Discussion

Research findings demonstrated that students' perceptions of PjBL exerted positive and significant effects on learning outcomes, with significance value of 0.003 < 0.05. Learning independence also exerted positive and significant effects on learning outcomes, with significance value of 0.000 < 0.05. Simultaneously, both variables contributed 19.4% to learning outcomes

(Adjusted R^2 = 0.194). This value indicates that other factors such as learning interest, teacher support, and learning environment also influenced learning outcomes.

These findings align with Vygotsky's social constructivist theory and self-determination theory, which emphasize the importance of independence and active student engagement in the learning process. Thus, the integration of PjBL and learning independence proved capable of strengthening archiving learning outcomes in vocational education.

The Effect of Students' Perceptions of Project-Based Learning (PjBL) on Student Learning Outcomes

Research findings demonstrated that students' perceptions of Project-Based Learning (PjBL) exerted positive and significant effects on archiving learning outcomes of eleventh-grade MPLB students at SMK Negeri 3 Surakarta. This was evidenced by t value of 3.008, which was greater than t-table (1.990), with significance value of 0.003 < 0.05. This indicates that better student perceptions of PjBL implementation correspond to higher learning outcomes achieved.

Theoretically, PjBL proves effective because its model characteristics align with the essence of vocational learning, which emphasizes learning by doing. In the archiving context, PjBL enables students not only to understand archive concepts but also to directly practice management, storage, and archive retrieval activities authentically. Through project stages, students learn to solve authentic problems and produce final products in the form of documents or archive systems relevant to office work environments. This strengthens conceptual understanding while simultaneously enhancing procedural skills.

These findings are consistent with Ramadani's (2023) research, which found that PjBL implementation improved archiving course learning outcomes because students became more active, developed responsibility toward projects, and connected learning with real work situations. Similarly, Fitria and Rahmawati (2022) noted that PjBL develops students' collaborative and critical thinking abilities two essential elements in completing administrative tasks.

The theoretical contribution of these findings strengthens Vygotsky's social constructivist theory, which emphasizes that effective learning occurs when students actively construct their knowledge through social and contextual activities. PjBL becomes a tangible medium for students to build meaning through interaction and structured project experiences.

Practically, these results indicate that archiving teachers in vocational schools can improve learning outcomes by expanding PjBL implementation oriented toward real work practices, such as digital archiving system simulations, dynamic archive arrangement projects, or archive classification development. Such implementation helps students not only understand theory but also become technically skilled.

The Effect of Learning Independence on Learning Outcomes of Eleventh-Grade MPLB Students at SMK Negeri 3 Surakarta

Research findings demonstrated that learning independence exerted positive and significant effects on student learning outcomes. The t value of 4.716 exceeded t-table (1.990), with significance value of 0.000 < 0.05. The beta coefficient value of 0.592 indicates that learning independence was a more dominant predictor compared to PjBL. Learning independence plays a crucial role because independent students possess abilities to manage time, determine learning strategies, and evaluate their understanding independently. In the archiving learning context, students with high independence are more active in seeking information sources about archiving systems, attempting archive management practices independently, and not relying entirely on teachers. This mechanism explains how learning independence strengthens learning outcomes: through self-regulated learning, students can set learning goals, monitor processes, and correct errors when managing archives.

These findings align with Sari's (2021) research, which stated that students with high independence levels tend to achieve better learning outcomes because they are more disciplined and goal-oriented. However, this study also demonstrated that although independence exerted positive

effects, its contribution to learning outcomes could still be enhanced with supportive learning environment support.

The theoretical contribution of these findings strengthens the self-determination theory perspective, which explains that when students' autonomy and competence needs are met, their intrinsic motivation increases and impacts better learning outcomes. Thus, enhancing learning independence is not solely the student's responsibility but must also be facilitated through learning designs that provide freedom and responsibility.

Practically, teachers are advised to provide self-reflection opportunities, project planning guidance, and self-evaluation sheets that can help students monitor their learning progress. These steps will encourage the growth of effective learning independence.

The Simultaneous Effect of PjBL and Learning Independence on Learning Outcomes

Simultaneous test results indicated that PjBL perception and learning independence variables together significantly influenced learning outcomes ($F = 11.124 > F\text{-table} = 3.11$; $Sig. = 0.000 < 0.05$). However, the regression model showed relatively small combined regression coefficients, and the simultaneous effect direction appeared negative. This phenomenon represents a statistical paradox explainable through several possibilities.

First, moderate multicollinearity effects between PjBL perception and learning independence can cause regression coefficient direction changes even though each variable's relationship with learning outcomes is positive. This means that when both variables are tested together, part of the learning outcome variance is explained by overlapping relationships between them. Students with high PjBL perceptions tend to already possess high learning independence; thus, the marginal effect of each variable becomes smaller or even mathematically reverses direction.

Second, these results can also be interpreted pedagogically: positive perceptions toward PjBL do not necessarily correspond to optimal implementation practices. If project implementation is inconsistent, students' positive perceptions may not directly correspond to actual learning outcomes, especially for students who lack discipline in project management. This confirms that positive perceptions must be balanced with effective PjBL implementation and strong guidance.

Nevertheless, the coefficient of determination (Adjusted R^2) was only 0.194, meaning both variables could explain only approximately 19.4% of learning outcome variance, while the remaining 80.6% was influenced by other factors such as learning interest, teacher support, learning facilities, and school social environment. Low R^2 values do not indicate an invalid model but demonstrate that archiving learning outcomes are multidimensional phenomena influenced by complex affective, cognitive, and contextual factors.

Clarification: PjBL as a Method versus Perceptions of PjBL

This research did not assess the direct effectiveness of the PjBL method but rather students' perceptions of PjBL implementation. Thus, the influence found reflects the extent to which students perceive PjBL as an interesting, relevant method that helps them understand archiving material.

Positive perceptions toward PjBL are not necessarily identical to effective PjBL implementation. If project execution is poorly directed or teacher guidance is less intensive, student perceptions may be high, but learning outcomes may remain suboptimal. Conversely, when students are genuinely involved in project planning, execution, and evaluation, PjBL becomes a method capable of tangibly improving learning outcomes.

Conclusion

Based on data analysis results and hypothesis testing conducted using SPSS, the following conclusions were obtained: (1) A positive and significant influence exists between Project-Based Learning (PjBL) and archiving learning outcomes of eleventh-grade MPLB students at SMK Negeri 3 Surakarta, with $t = 3.008 > t\text{-table} = 1.990$ and significance of $0.003 < 0.05$. This indicates that

more positive student perceptions of PjBL correspond to higher learning outcomes achieved. (2) A positive and significant influence exists between learning independence and learning outcomes, with t = 4.716 > t-table = 1.990 and significance of 0.000 < 0.05. This demonstrates that students with high independence levels tend to achieve better learning outcomes. (3) Simultaneously, PjBL and learning independence exerted positive and significant effects on archiving learning outcomes, with F = 17.808 > F-table = 3.11 and significance of 0.000 < 0.05. The coefficient of determination (R^2 = 0.304) indicates that both variables contributed 30.4% to archiving learning outcomes, while the remaining 69.6% was influenced by factors outside this research. The integration of the PjBL model and learning independence creates effective synergy in improving learning outcomes. PjBL encourages active engagement, collaboration, and real problem-solving, while learning independence strengthens responsibility and student learning strategy management. Their synergy enriches learning experiences and strengthens conceptual understanding in the archiving context. Practically, teachers are advised to design authentic projects lasting 4–6 weeks, such as office archive management, document digitization, or archive classification system simulations. Such contextual projects connect theory with practice while training 21st-century skills such as critical thinking, communication, and individual responsibility. This research has several limitations: (1) the absence of a comparison control group, (2) potential self-report bias from student questionnaire responses, and (3) the lack of measurement of PjBL implementation quality in the classroom. Future research is recommended to employ experimental designs with pre-tests and post-tests, add control groups, and assess PjBL implementation quality for more valid and comprehensive results.

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