

The Effect of Critical Thinking Skills, Computer Knowledge, and Learning Facilities on The Academic Achievement Of Students In The Accounting Vocational Program at Public Vocational High Schools In East Jakarta

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Abstract

The purpose of this study is to determine the influence of critical thinking skills, computer knowledge, and learning facilities on the learning outcomes of students in the accounting vocational program at public vocational high schools in the East Jakarta region. The research method used was a quantitative approach with proportional random sampling. The sample consisted of 108 students from three public vocational high schools in East Jakarta: SMK Negeri 22 Jakarta, SMK Negeri 40 Jakarta, and SMK Negeri 51 Jakarta. Research data were collected via questionnaires and analyzed using a t-test in accordance with the research objectives. The results of the study indicate that critical thinking skills, computer knowledge, and learning facilities have a positive and significant influence on student learning outcomes in the Spreadsheet course.

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1. INTRODUCTION

Education is a system aimed at improving the quality of a person's life in various aspects. Education is crucial for preparing competent human resources for the future. The role of education in human life is recognized as an integral and vital component. However, the quality of education is determined not only by access and its implementation but also by students' learning outcomes, which serve as an indicator of the success of the learning process.

In a global context, student learning outcomes in Indonesia still face significant challenges. According to data from the 2022 Programme for International Student Assessment (PISA), the majority of students in Indonesia fall into the "low-performing students" category—that is, students who have not yet achieved basic proficiency (Level 2) in mathematics, reading, and science. The percentage of Indonesian students below Level 2 is significantly higher than the OECD average. This situation indicates that Indonesian students' cognitive abilities in understanding concepts, reasoning, and problem-solving remain relatively low compared to international standards.

Vocational education at Vocational High Schools (SMK) aims to produce graduates who are ready for the workforce; however, the reality is that the competitiveness of SMK graduates in the job market remains low. Setiyana & Oktora (2024) note that SMK graduates have the highest open unemployment rate compared to other educational levels, at 9.42%, indicating a mismatch between graduates' competencies and the needs of the job

market (horizontal mismatch). This situation is influenced by graduates' limited ability to adapt to technological advancements, particularly in the field of accounting, which is increasingly reliant on software and digital systems (Ramadhani & Bahtiar, 2024). Therefore, students' ability to adapt to and effectively utilize technology has become a key requirement of vocational education to enhance work readiness, reduce competency gaps, and ensure that vocational high school graduates can meet the needs of an ever-evolving industry.

Preliminary observations at a public vocational high school in East Jakarta indicate that the learning outcomes of 10th-grade students in the Spreadsheet course during the odd semester of the 2025/2026 academic year are still suboptimal. Based on the results of daily assessments, nearly half of the students have not yet met the Minimum Proficiency Criteria (KKM) of 81; in fact, the proficiency rate on the second assessment declined compared to the first. This situation indicates problems in the learning process, one of which is related to the students' low critical thinking skills. Students still struggle to analyze, process, and evaluate information to solve spreadsheet problems because they are not yet accustomed to tackling problems that require higher-order thinking skills (HOTS). Furthermore, instruction that remains focused on rote memorization and technical procedures leaves students ill-equipped to understand concepts in depth and apply them to solve complex problems.

Learning outcomes in this study encompass the cognitive, affective, and psychomotor domains, with the cognitive domain serving as the primary focus of analysis. The affective and psychomotor domains are included as supporting indicators to provide a broader understanding of students' attitudes and skills in spreadsheet learning.

Critical thinking is the ability of students to analyze, evaluate, and solve problems logically in order to make sound decisions (Sari et al., 2024). In spreadsheet instruction, this ability plays a crucial role in understanding problems, selecting appropriate formulas, and processing data effectively. Various studies indicate that critical thinking has a positive effect on learning outcomes (Gusmala et al., 2023; Komariyah et al., 2018; Safina & Wulandari, 2022; Silas et al., 2024). However, Hasugian & Rahmadana (2025) found different results, so the relationship between critical thinking and learning outcomes still requires further study.

One external factor that influences learning outcomes is learning facilities. The availability of facilities and infrastructure—such as computer labs, technological devices, and digital learning resources—plays a role in supporting the effectiveness of technology-based learning. Data from the Badan Pusat Statistik (2024) show that DKI Jakarta Province has 207 villages equipped with vocational high school (SMK) facilities, indicating the availability of relatively adequate vocational education facilities. Therefore, learning facilities are considered an important factor that can support students' achievement of learning outcomes.

Previous research has shown mixed results regarding the influence of critical thinking skills, computer knowledge, and learning facilities on student learning outcomes. Furthermore, research that integrates these three variables into a single research model remains relatively limited, particularly in the context of spreadsheet instruction at vocational high schools. Therefore, this study offers a novel approach by analyzing the simultaneous effects of critical thinking skills, computer knowledge, and learning facilities on the learning outcomes of students in the Accounting vocational program at public vocational high schools in East Jakarta.

2. RESEARCH METHODS

The researcher used a quantitative research method to measure the degree of relationship between variables through measurable data and statistical analysis. A survey was the specific method applied in this study, which aimed to test hypotheses related to sociological and psychological variables within a population by utilizing instruments such as questionnaires or interviews for data collection. According to Sugiyono (2019), quantitative research methods are a research approach based on the philosophy of positivism, which aims to test hypotheses through the collection and analysis of statistical data from a specific population or sample using research instruments. In this study, the researcher used three primary data variables and one secondary data variable, consisting of three independent variables and one dependent variable. The independent variables used in this study include Critical Thinking, Computer Knowledge, and Learning Facilities, while the dependent variable is Learning Outcomes. The dependent variable used in this study is Learning Outcomes (Y). The research framework is as follows:

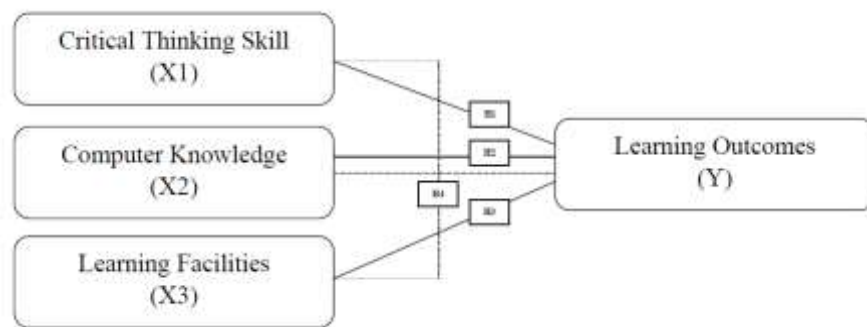


Figure 1. Research Conceptual Framework

Source: Data Compiled by the Researcher (2026)

The population used in this study consists of all 10th-grade students in the Institutional Accounting and Finance Specialization Program at public vocational high schools (SMK Negeri) in the East Jakarta region. Meanwhile, the accessible population in this study consists of 10th-grade students in the Institutional Accounting and Finance Specialization Program (AKL) at SMK Negeri 51 Jakarta, SMK Negeri 40 Jakarta, and SMK Negeri 22 Jakarta. The researcher selected a sample from 10th-grade students because the curriculum at that level includes material on data processing or spreadsheets.

In this study, the researcher used the Proportional Random Sampling technique to select the sample. The data obtained in this study were collected using a questionnaire as the research instrument. The sample used in this study consisted of 10th-grade students in the Institutional Accounting and Finance Vocational Program at public vocational high schools in the East Jakarta region, selected at random. The distribution of the student sample across each class is as follows:

Table 1. Population Distribution Within Reach

School	Class	Count Of Student	Sample Calculation	Total Sample
SMK Negeri 51 Jakarta	X AKL 1	36	$(36/144) \times 106$	27
SMK Negeri 40 Jakarta	X AKL 1	36	$(36/144) \times 106$	27

SMK Negeri 22 Jakarta	X AKL 1	36	$(36/144) \times 106$	27
	X AKL 2	36	$(36/144) \times 106$	27
Total		144		108

Source: Data Compiled by the Researcher (2026)

Learning outcomes in this study were measured through students’ cognitive achievement in spreadsheet learning, as reflected in the scores of Daily Assessment 1 and Daily Assessment 2. These assessments were used to evaluate students’ understanding and application of spreadsheet concepts and skills. Then for Critical thinking was measured using indicators of interpretation, analysis, inference, evaluation, and explanation. These indicators reflect students’ ability to understand information, analyze problems, draw logical conclusions, evaluate evidence, and provide clear reasoning when solving spreadsheet-related tasks (Bangun et al., 2024; Rodríguez-Rojas et al., 2024; Widiastuti & Hamidi, 2025).

Computer knowledge was measured through indicators related to students’ understanding of hardware, software, operating systems, data and file management, operational procedures, and problem-solving. These indicators represent the fundamental knowledge and skills required to effectively use computer technology in spreadsheet learning (Kusniawati & Listiadi, 2025; Ramadhani & Bahtiar, 2024; Rohmah & Susilowibowo, 2023; Wulandari & Rohayati, 2015).

Learning facilities were measured through indicators reflecting the availability and quality of educational facilities and infrastructure, the conduciveness of the school environment, and the utilization of technology to support learning activities. These indicators describe the extent to which the learning environment provides adequate resources to facilitate effective learning (Hasugian & Rahmadana, 2025; Maharani et al., 2025; Mauliddiyah & Wulandari, 2022).

3. RESULTS AND DISCUSSION (12 Pt)

3.1. Research Results

1. Descriptive Statistical Analysis

2. Analysis Results

Normality Test

The results of this study confirm the hypothesis and show that the data are significantly normally distributed. The results of the Kolmogorov-Smirnov (KS) normality test, conducted using IBM SPSS software, are presented below.

Table 2. Kolmogorov-Smirnov Test of Normality

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		108
Normal Parameters ^{a,b}	Mean	0.0000000
	Std. Deviation	4.8333
Most Extreme Differences	Absolute Positive	0.078
	Negative	0.064
		-0.078
Test Statistic		0.078

Asymp. Sig. (2-tailed)	.101 ^c
a. Test distribution is Normal.	
b. Calculated from data.	
c. Lilliefors Significance Correction.	

Source: IBM SPSS Data Analysis Results (2026)

The results of the normality test show that the significance value of the Kolmogorov-Smirnov test is $0.101 > 0.05$; therefore, it can be stated that the data for the variables in this study—Academic Achievement (Y), Critical Thinking Skills (X1), Computer Knowledge (X2), and Learning Facilities (X3)—are normally distributed. Thus, the assumption of normality in this study has been met. To facilitate the presentation of the normality test results, the data were then presented using a Normal Probability Plot in IBM SPSS software.

The normality of the research data can be observed by examining the distribution of data points on the Normal P-P Plot relative to the diagonal line. If the data points are widely scattered from the diagonal and do not follow its direction, it can be concluded that the data are not normally distributed. Conversely, if the data points are clustered around the diagonal line and follow the direction of the diagonal line, the data can be considered normally distributed.

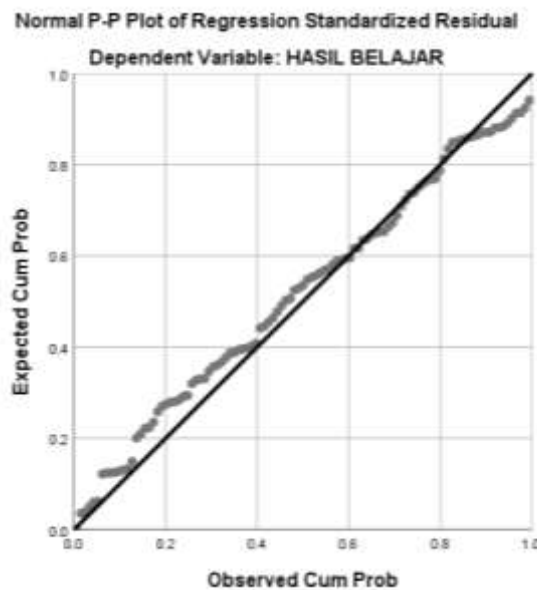


Figure 2. Results of the Normal Probability Plot Test

Source: IBM SPSS Data Analysis Results (2026)

Based on the Normal P-P Plot of Standardized Regression Residuals for the Learning Outcomes variable, it can be seen that the data points are scattered around the diagonal line and mostly follow the direction of the diagonal line. This indicates that the residuals in the regression model satisfy the assumption of normality. Thus, it can be concluded that the data in this study are normally distributed and are therefore suitable for further analysis.

Linearity Test

The linearity test is used to determine whether variables have a significant linear relationship or not. A decision regarding the linearity test can be made by examining the output in the ANOVA table as shown below in IBM SPSS software.

Table 3. Results of the Linearity Test for Critical Thinking Skills and Learning Outcomes

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Learning Outcomes * Critical Thinking Skills	Between Groups	(Combined)	1952.628	36	54.240	1.915	0.010
		Linearity	782.043	1	782.043	27.608	0.000
		Deviation from Linearity	1170.585	35	33.445	1.181	0.273
	Within Groups		2011.224	71	28.327		
	Total		3963.852	107			

Source: IBM SPSS Data Analysis Results (2026)

Based on the data in the table, it can be seen that the sig value in the linearity test is $0.00 < 0.05$. This indicates that the effect of Critical Thinking Skills (X1) on Learning Outcomes (Y) is linear, and it can be concluded that X1 meets the assumption of linearity.

Table 4. Results of the Linearity Test for Computer Knowledge and Learning Outcomes

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Learning Outcomes * Computer Knowledge	Between Groups	(Combined)	2359.685	39	60.505	2.565	0.000
		Linearity	768.691	1	768.691	32.584	0.000
		Deviation from Linearity	1590.995	38	41.868	1.775	0.020
	Within Groups		1604.167	68	23.591		
	Total		3963.852	107			

Source: IBM SPSS Data Analysis Results (2026)

Based on the data in the table, it can be seen that the significance value (sig) in the linearity test is $0.00 < 0.05$. This indicates that the effect of Computer Knowledge (X2) on Learning Outcomes (Y) is linear, and it can be concluded that X2 satisfies the assumption of linearity.

Table 5. Results of the Linearity Test for Learning Facilities and Learning Outcomes

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Learning Outcomes *	Between Groups	(Combined)	2237.947	21	106.569	5.310	0.000
		Linearity	1025.915	1	1025.915	51.120	0.000

Learning Facilities	Deviation from Linearity	1212.031	20	60.602	3.020	0.000
	Within Groups	1725.905	86	20.069		
	Total	3963.852	107			

Source: IBM SPSS Data Analysis Results (2026)

Based on the data in the table, it can be seen that the sig value in the linearity test is $0.00 < 0.05$. This indicates that the effect of Learning Facilities (X3) on Learning Outcomes (Y) is linear, and it can be concluded that X3 satisfies the assumption of linearity.

3. Analysis Prerequisite Test

Multiple linear regression analysis is used to predict the value of the dependent variable (Y) when the value of the independent variable (X) is increased or decreased. In addition, multiple linear regression analysis is used to examine the linear relationship between the independent variable and the dependent variable. The following are the results of the multiple linear regression test conducted using IBM SPSS software.

Table 6. Multiple Linear Regression Equation

		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	25.437	7.560		3.365	0.001
	Critical Thinking Skills	0.131	0.056	0.210	2.326	0.022
	Computer Knowledge	0.139	0.055	0.225	2.531	0.013
	Learning Facilities	0.377	0.094	0.348	4.017	0.000

a. Dependent Variable: Learning Outcomes

Source: IBM SPSS Data Analysis Results (2026)

The regression equation shows the relationship between the variables Critical Thinking Skills (X1), Computer Knowledge (X2), and Learning Facilities (X3) and Learning Outcomes (Y). The constant term of 25.437 indicates that if the variables Critical Thinking Skills, Computer Knowledge, and Learning Facilities are held constant or set to zero, the value of Learning Outcomes is 25.437.

The regression coefficient for the Critical Thinking Skills variable (X1), which is 0.131, indicates that a 1-unit increase in critical thinking skills will increase learning outcomes by 0.131 units, assuming all other variables remain constant. A significance value of $0.022 < 0.05$ indicates that Critical Thinking Skills have a significant effect on Learning Outcomes. This means that the better a student's critical thinking skills, the more their learning outcomes tend to improve.

The regression coefficient for the Computer Knowledge variable (X2) is 0.139, indicating that a 1-unit increase in Computer Knowledge will increase learning outcomes by 0.139 units, assuming all other variables remain constant. The

significance value of $0.013 < 0.05$ indicates that Computer Knowledge has a significant effect on Learning Outcomes. Thus, the higher students' knowledge of computers and technology, the better their learning outcomes.

The regression coefficient for the Learning Facilities variable (X3) is 0.377, indicating that a 1-unit increase in learning facilities will increase learning outcomes by 0.377 units, assuming all other variables remain constant. The significance value of $0.000 < 0.05$ indicates that Learning Facilities have a significant effect on learning outcomes. This variable also has the highest coefficient value compared to the other variables, so it can be said that learning facilities have the most dominant influence on student learning outcomes.

Based on these results, it can be concluded that Critical Thinking Skills, Computer Knowledge, and Learning Facilities have a partial, positive, and significant effect on Learning Outcomes. This means that an increase in these three variables will be followed by an increase in student learning outcomes.

4. Multiple Linear Regression Analysis

A partial significance test was conducted to determine whether the independent variable (X) has a real or significant effect on the dependent variable (Y). This test was conducted using a t-test at a significance level of 0.05. The test criteria are as follows: H0 is rejected if the calculated t-value is greater than the t-table. in this case, the correlation coefficient is considered significant. If the t-value is less than the t-table, the correlation coefficient is considered insignificant. The following are the results of the partial regression coefficient test using IBM SPSS software.

Table 7. Partial Regression Coefficient Test (T-Test)

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	25.437	7.560		3.365	0.001
Critical Thinking Skills	0.131	0.056	0.210	2.326	0.022
Computer Knowledge	0.139	0.055	0.225	2.531	0.013
Learning Facilities	0.377	0.094	0.348	4.017	0.000

a. Dependent Variable: Learning Outcomes

Source: IBM SPSS Data Analysis Results (2026)

From the t-test table above, it can be seen that the calculated t-value for Critical Thinking Ability is 2.326. Given a significance level of 0.05 and degrees of freedom (df) = n-k-1 (i.e., 108-3-1 = 104), the critical t-value is 1.983. Thus, it can be concluded that the t-value for Critical Thinking Ability (2.326) is greater than the critical t-value (1.983), indicating a positive relationship between Critical Thinking Ability and Learning Outcomes.

Furthermore, the results from the t-test table above show that the calculated t-value for Computer Knowledge is 2.531. Given a significance level of 0.05 and df = n - k - 1 (i.e., 108 - 3 - 1 = 104), the critical t-value is 1.983. Thus, it can be concluded that the t-value for Computer Knowledge (2.5331) is greater than the

critical t-value (1.983), and it can be concluded that there is a positive relationship between Computer Knowledge and Learning Outcomes.

Furthermore, the results from the t-test table above show that the calculated t-value for Learning Facilities is 4.017. Given a significance level of 0.05 and $df = n - k - 1$ (i.e., $108 - 3 - 1 = 104$), the critical t-value is 1.983. Thus, it can be concluded that the t-value for Learning Facilities (4.017) is greater than the critical t-value (1.983), and it can be concluded that there is a positive relationship between Learning Facilities and Learning Outcomes.

Furthermore, the results of the t-test table above show that the calculated t-value for Learning Facilities is 4.017. Given a significance level of 0.05 and $df = n - k - 1$ (i.e., $108 - 3 - 1 = 104$), the critical t-value is 1.983. Thus, it can be concluded that the t-value for Learning Facilities (4.017) is greater than the critical t-value (1.983), indicating a positive relationship between Learning Facilities and Learning Outcomes.

5. Hypothesis Testing

The simultaneous significance test aims to demonstrate the significant influence of independent variables on the dependent variable. The following are the results of the joint regression coefficient test (F-test) using IBM SPSS software.

Table 8. Joint Regression Coefficient Test (F-Test)

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1464.165	3	488.055	20.306	.000 ^b
Residual	2499.687	104	24.035		
Total	3963.852	107			
a. Dependent Variable: Learning Outcomes					
b. Predictors: (Constant), Learning Facilities, Computer Knowledge, Critical Thinking Skills					

Source: IBM SPSS Data Analysis Results (2026)

From the table, the calculated F-value is 20.306. The F-table value can be found in the statistical table at a significance level of 0.05. $Df1 = (\text{number of variables} - 1)$ or $4 - 1 = 3$, and $df2 = n - k - 1$ (where n is the number of respondents and k is the number of independent variables) or $108 - 3 - 1 = 104$. The F-table value is 2.69, so the calculated F-value of 20.306 is greater than the F-table value of 2.69. Therefore, it can be concluded that Critical Thinking Skills, Computer Knowledge, and Learning Facilities simultaneously have a significant effect on Learning Outcomes.

6. Test of the Coefficient of Determination (R²)

An analysis of the coefficient of determination is used to determine the percentage contribution of the independent variables, taken together, to the dependent variable. The following are the results of the coefficient of determination test using IBM SPSS software.

Table 9. Coefficient of Determination Test

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.608 ^a	0.369	0.351	4.903

a. Predictors: (Constant), LEARNING FACILITIES, COMPUTER KNOWLEDGE, CRITICAL THINKING SKILLS
 b. Dependent Variable: LEARNING OUTCOMES

Source: IBM SPSS Data Analysis Results (2026)

The R-squared value was 0.369, meaning that the variables Critical Thinking Skills, Computer Knowledge, and Learning Facilities collectively account for 36.9% of the variation in Learning Outcomes. The remaining 63.1% is influenced by other variables not examined in this study. The Adjusted R-Square value of 0.351 indicates that the regression model used is able to explain 35.1% of the variation in Learning Outcomes after adjusting for the number of independent variables and the number of respondents in this study.

3.2. Discussion

1. The Effect of Critical Thinking Skills on Learning Outcomes

Based on the results of the previous calculations, it was found that there is a positive relationship between critical thinking skills and the learning outcomes of students at public vocational high schools in the East Jakarta region. This is evidenced by the calculated T-score, which has a positive value of $2.326 > 1.983$; when compared to the critical T-value, it shows that the calculated T-score is greater than the critical T-value. Furthermore, the significance value for the critical thinking ability variable in relation to the learning outcomes variable is 0.0000, which is smaller than 0.005. This is further supported by the regression coefficient for the critical thinking ability variable in the multiple linear regression test, which is 0.131. This means that if critical thinking ability increases by 1 point, the learning outcomes of students at public vocational high schools in East Jakarta will increase by 0.131, with a constant of 25.437, assuming that X2 and X3 remain constant. The positive value of the X1 coefficient indicates that an increase in critical thinking ability leads to an improvement in students' learning outcomes in the spreadsheet program.

These results also indicate that students' higher-order thinking skills (HOTS) still need to be improved, particularly in terms of understanding and interpreting information before processing data. HOTS not only require students to recall and apply concepts but also to analyze, evaluate, and draw conclusions based on the available information. The high percentage on the evaluation indicator suggests that students have developed the ability to critically assess and review their work. However, the low level of interpretive skills indicates that students still struggle to understand the meaning of information and determine the appropriate steps when using spreadsheet formulas. Therefore, instruction that is more focused on developing HOTS is needed so that students can understand, analyze, and solve problems more effectively, thereby improving their learning outcomes.

The results of this study are consistent with the findings of a previous study conducted by Silas et al. (2024), which showed a significance level of $0.480 > 0.05$, indicating that critical thinking skills significantly influence students' learning outcomes. Furthermore, studies by Gusmala et al. (2023), Safina & Wulandari (2022) state that critical thinking skills have a positive effect on learning outcomes. Critical thinking skills are very important for students because they can help them make correct and quick decisions. By possessing critical thinking skills, students can make the right decisions, thereby improving their learning outcomes. Critical thinking skills help students better understand course material. Additionally, critical thinking helps students process the various pieces of information they receive,

enabling them to draw accurate conclusions and find logical solutions to the problems they face.

2. The Effect of Computer Knowledge on Learning Outcomes

Based on the previous calculations, it was found that there is a positive relationship between computer knowledge and the academic performance of students at public vocational high schools in the East Jakarta region. This is evidenced by the calculated t-score, which has a positive value of $2.531 > 1.983$; when compared to the critical t-value, it shows that the calculated t-score is greater than the critical t-value. Furthermore, the significance value for the relationship between computer knowledge and learning outcomes is 0.0000, which is less than 0.005. This is further evidenced by the regression coefficient for the computer knowledge variable in the multiple linear regression test, which is 0.139. This means that if critical thinking skills increase by 1 point, the learning outcomes of students at public vocational high schools in the East Jakarta region will increase by 0.139, with a constant of 25.437, assuming that X1 and X3 remain constant. The positive value of the coefficient for X2 indicates that an increase in computer knowledge leads to an improvement in students' learning outcomes in the spreadsheet program.

The results of this study are supported by previous research by Nurjanah & Hakim (2025), which states that computer knowledge has a positive and significant effect on learning outcomes. Technological developments have led to human knowledge becoming more structured and organized. Therefore, students' level of computer knowledge is an important asset for facing future developments. The higher students' computer knowledge, the more optimal their learning outcomes will be. Furthermore, the results of a study by Rohmah & Susilowibowo (2023) indicate that their study yielded a T-statistic of $2.506 > 1.984$ and a significance level of $0.014 < 0.05$. This indicates that computer knowledge influences students' learning outcomes.

Furthermore, the study by Ramadhani & Bahtiar (2024) draws on the behaviorist learning theory proposed by Edward L. Thorndike, specifically the law of readiness. This theory explains that students' readiness prior to learning can strengthen the connection between stimuli and responses, thereby supporting the achievement of optimal learning outcomes. In the context of spreadsheet learning, computer knowledge is a fundamental skill that students need to possess before studying more complex material. Thus, the better students' computer knowledge is, the easier it will be for them to understand the learning material and achieve better learning outcomes.

3. The Effect of Learning Facilities on Learning Outcomes

Based on the results of the previous calculations, it was found that there is a positive relationship between learning facilities and the academic performance of students at public vocational high schools in the East Jakarta region. This is evidenced by the t-calculated score, which has a positive value of $4.017 > 1.983$; when compared to the t-table value, it shows that the t-calculated score is greater than the t-table value. Furthermore, the significance value for the relationship between learning facilities and academic achievement is 0.0000, which is less than 0.005. Furthermore, this is evidenced by the regression coefficient for the critical thinking ability variable in the multiple linear regression test, which is 0.377. This means that if learning facilities increase by 1 point, the learning outcomes of vocational high school students in the East Jakarta region will increase by 0.377, with a constant of 25.437, assuming that X1 and X2 remain constant. The positive

value of the X3 coefficient indicates that an improvement in learning facilities leads to an increase in students' learning outcomes in the spreadsheet program.

Furthermore, on-the-ground observations indicate that school laboratories still use outdated computers, and most students do not yet own laptops or personal computers. This situation limits students' access to learning technology, both at school and at home. In fact, for learning activities that require hands-on practice—such as using spreadsheets—the availability of adequate devices is essential so that students can practice consistently. These limitations are believed to be one of the causes of the low percentage on the indicator of the availability of complete and well-maintained facilities and infrastructure; therefore, improvements to these facilities are needed to support a more effective learning process.

In their study, Hasugian & Rahmadana (2025) stated that learning facilities have a positive effect on learning outcomes, with a test result showing a significance value of $0.039 < 0.05$ and a regression coefficient of 0.206. This indicates that every 1-unit increase in learning facilities improves academic achievement by 0.206. The school facilities in question include all equipment, materials, and supplies used directly in the educational process at school, such as buildings, classrooms, learning media, desks, and chairs.

Furthermore, in studies by Maharani et al. (2025), Meliyana et al. (2023), Rahmawati & Rosy (2021), it was also stated that learning facilities have a positive impact on learning outcomes. The better the learning facilities students have or access, the higher the learning outcomes they can achieve. Conversely, limited learning facilities have the potential to lead to a decline in student learning outcomes. Therefore, the provision of adequate facilities and infrastructure must be a priority, as they play a crucial role in supporting the learning process. The availability of comprehensive and well-maintained facilities can create a conducive, comfortable, and enjoyable learning environment, thereby motivating students to engage in learning and achieve optimal learning outcomes. In addition, adequate facilities and infrastructure also support the smooth running of teaching and learning activities, especially in learning that requires the use of technology and hands-on practice.

4. The Effect of Thinking Skills, Computer Knowledge, and Learning Facilities on Learning Outcomes

Based on the results of the simultaneous test (F-test), it was found that the calculated F-value of 20.306 was greater than the critical F-value of 2.69 ($20.306 > 2.69$). These results indicate that critical thinking skills, computer knowledge, and learning facilities collectively have a positive and significant effect on the learning outcomes of students at public vocational high schools in the East Jakarta region. Thus, the hypothesis stating that there is a simultaneous effect of the three independent variables on learning outcomes can be accepted.

Furthermore, the coefficient of determination (R^2) of 0.369 indicates that critical thinking skills, computer knowledge, and learning facilities account for 36.9% of the variation in student learning outcomes. Meanwhile, the remaining 63.1% is influenced by other factors outside the research model that were not examined.

These findings suggest that improving critical thinking skills, computer knowledge, and the availability of adequate learning facilities can contribute to enhancing students' learning outcomes. However, since the R^2 value falls into the moderate category, students' learning outcomes are not determined solely by these three variables but are also influenced by various other factors that play a role in the learning process.

The findings of Gusmala et al. (2023) indicate that there is a simultaneous influence of critical thinking skills on learning outcomes. These findings align with the theory proposed by Yandi et al. (2023), which states that learning outcomes are influenced by various factors, such as learning resources, the school environment, and school culture. These findings are also supported by the research of Hidayah et al. (2025), which explains that students' cognitive development is influenced by environmental factors, maturity, and technology. Critical thinking skills develop through students' intellectual maturity; computer knowledge is acquired through the use of technology in learning; and learning facilities stem from adequate support within the learning environment. These three aspects contribute to enhancing students' abilities and competencies, thereby positively impacting their learning outcomes.

Furthermore, the significance of the simultaneous effects in this study indicates that learning outcomes are not determined solely by students' academic abilities but are also influenced by the availability of learning resources and their ability to utilize technology. In today's digital age, students are expected not only to understand course material but also to think critically and use technology effectively. Therefore, improving learning outcomes requires developing critical thinking skills, enhancing technological literacy, and providing adequate learning facilities so that the learning process can proceed optimally.

4. CONCLUSION

Based on an analysis of research data regarding the relationship between critical thinking skills, computer knowledge, and learning facilities and the learning outcomes of students at public vocational high schools in the East Jakarta region, the researcher concludes:

1. There is a positive and significant relationship between critical thinking skills and learning outcomes. This can be interpreted to mean that the higher a student's level of critical thinking skills, the better their learning outcomes will be. Conversely, the lower a student's level of critical thinking skills, the lower their learning outcomes will be.
2. There is a positive and significant relationship between computer knowledge and learning outcomes. This can be interpreted to mean that the higher a student's level of computer knowledge, the higher their learning outcomes will be. Conversely, the lower students' level of computer knowledge, the lower their learning outcomes will be.
3. There is a positive and significant relationship between learning facilities and learning outcomes. This can be interpreted to mean that the higher the level of learning facilities available to students, the better their learning outcomes will be. Conversely, the lower the level of learning facilities available to students, the poorer their learning outcomes will be.
4. There is a positive and significant relationship between critical thinking skills, computer knowledge, and learning facilities and learning outcomes. This can be interpreted to mean that the higher the level of students' critical thinking skills, computer knowledge, and learning facilities, the higher their learning outcomes will be. Conversely, the lower the students' levels of critical thinking skills, computer knowledge, and learning facilities, the lower their learning outcomes will be.

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