JOURNAL OF ISLAMIC RESEARCH AND THOUGHT
Juli 2026. Vol.13. No.3
2014-2026 j.al-ulum Islamic University of Madura
ISSN. 2355-0104 ojs.uim.ac.id E-ISSN. 2549-3833

THE EFFECT OF COMPUTER LABORATORY UTILIZATION ON COGNITIVE LEARNING OUTCOMES

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Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh sarana prasarana laboratorium komputer terhadap hasil belajar peserta didik di salah satu smk negeri di karawang dengan pendekatan kuantitatif, melibatkan 78 peserta didik sebagai sampel, serta menggunakan angket yang dianalisis melalui IBM SPSS Statistics 25. Hasil penelitian menunjukkan bahwa sarana prasarana laboratorium komputer berada pada kategori sedang dengan rata-rata skor 2,70 (64% responden kategori sedang), dengan nilai tertinggi pada penggunaan perangkat pendukung seperti keyboard dan mouse, serta terendah pada ketersediaan fasilitas utama seperti komputer dan internet. Hasil belajar peserta didik juga berada pada kategori sedang dengan rata-rata skor 2,69 (68% responden kategori sedang), meskipun masih terdapat beberapa aspek yang perlu ditingkatkan. Uji regresi linear sederhana menunjukkan adanya pengaruh positif dan signifikan dengan nilai signifikansi 0,000 < 0,05, koefisien determinasi (R^2) sebesar 0,332 yang berarti kontribusi sebesar 33,2%, serta koefisien regresi sebesar 0,869 yang menunjukkan bahwa peningkatan sarana prasarana akan diikuti peningkatan hasil belajar. Dengan demikian, sarana prasarana laboratorium komputer memiliki peran penting dalam menunjang hasil belajar peserta didik dan perlu ditingkatkan terutama pada fasilitas utama agar hasil belajar lebih optimal.

Kata Kunci: Fasilitas laboratorium komputer, hasil belajar, pendidikan kejuruan.

Abstract

This study aims to determine the influence of computer laboratory infrastructure on the learning outcomes of students at one of the state vocational schools in Karawang with a quantitative approach, involving 78 students as a sample, and using a questionnaire analyzed through IBM SPSS Statistics 25. The results showed that computer laboratory infrastructure facilities were in the medium category with an average score of 2.70 (64% of medium category respondents), with the highest value in the use of supporting devices such as keyboards and mice, and the lowest in the availability of main facilities such as computers and the internet. Students' learning outcomes were also in the medium category with an average score of 2.69 (68% of respondents in the medium category), although there are still several aspects that need to be improved. A simple linear regression test showed a positive and significant influence with a significance value of 0.000 < 0.05, a determination coefficient (R^2) of 0.332 which means a contribution of 33.2%, and a regression coefficient of 0.869 which indicates that an improvement in infrastructure facilities will be followed by an increase in learning outcomes. Thus, computer laboratory infrastructure has an important role in supporting student learning outcomes and needs to be improved, especially in the main facilities so that learning outcomes are more optimal.

Keywords: Computer laboratory facilities, learning outcomes, vocational education.

Introduction

Developments in the field of Information and Communication Technology (ICT) have had a great impact on education, especially in the way of learning in schools. The use of technology in the learning process has encouraged a shift from a teacher-dominated approach to a more student-focused approach, so that students are expected to be more proactive in searching, processing, and understanding information through various technology-based media (an Herliani & Wahyudin, 2018). The integration of technology in teaching can also increase student participation as well as help them understand the material in a more efficient and interactive way through various learning resources available digitally. One way that can help in carrying out technology-based learning in schools is the existence of a computer laboratory.

Computer laboratory infrastructure is one of the important factors in supporting the success of technology-based learning in schools. The availability of complete facilities and in good condition allows all existing devices to be used optimally in learning activities. Computer laboratories supported by adequate infrastructure can create a more interactive, relevant, and meaningful learning atmosphere for students, as students not only receive the material in theory, but can also directly practice the skills learned (Ramadani et al., 2025)

A computer laboratory is an educational facility that offers a variety of technological devices, such as computers, internet access, and software that supports the learning process practically. Through practical activities in the computer laboratory, students can improve their critical thinking skills, technical skills, and competencies in accordance with technological advances (Lina Herlina, 2025) Therefore , the availability of good infrastructure, including laboratory rooms, furniture, equipment, and lighting, is very important to support the continuity of learning in computer laboratories. Adequate infrastructure will help create a comfortable, safe, and conducive learning atmosphere for students when practicing. Thus, computer laboratory infrastructure not only functions as a supporting facility, but also becomes an important factor in supporting the smooth learning process and improving student learning outcomes.

However, these ideal conditions are not always in accordance with the reality that occurs on the ground. Based on initial observations made by researchers in class X majoring in Computer Network and Telecommunication Engineering at one of the State Vocational Schools in Karawang, it was revealed that in the subject of the basics of computer network and telecommunication engineering, all students did not use the computer laboratory facilities available at school. Some students use personal laptops for practicums, while some students do not have their own devices, so they have to adjust to existing facilities. This situation shows that the use of computer laboratories is not optimal

and has the potential to create an imbalance in the practical learning process. In addition, the difference in the availability of learning tools also affects student learning outcomes. Based on information on the report card scores of the first semester, it is known that students who have laptops get an average score of 84.10, while students who do not have laptops get an average score of 79.95. Thus, there is a difference of 5.19%, where students who have laptops tend to get higher learning outcomes. The difference in values shows that there is a gap in the practical learning process, where students who have personal devices can participate in practical activities more optimally compared to students who do not have devices. This condition indicates that limited access to technological tools can affect the smooth running of practical activities and the level of students' understanding of the material learned.

In addition, an effective and well-organized learning atmosphere is able to increase students' enthusiasm and participation in the learning process. Therefore, adequate computer laboratory infrastructure is considered an important element that is suspected to have an influence on student learning outcomes, especially in practical activities in subjects in the Department of Computer Network and Telecommunication Engineering.

There is a research gap between ideal conditions and the reality in the field regarding the availability of computer laboratory infrastructure. Ideally, complete, feasible, and ready-to-use infrastructure facilities can effectively support the learning process and improve student learning outcomes. However, in reality, in the field, the availability and utilization of computer laboratory infrastructure facilities has not been fully optimal, and there has not been much specific study on its relationship with student learning outcomes, especially in class X of the Department of Computer Network and Telecommunication Engineering.

Therefore, this research has novelty by focusing on computer laboratory infrastructure as the main variable that is specifically studied, including the availability, completeness, and condition of facilities, as well as its influence on student learning outcomes. The selection of the population in grade X students was considered because they were in the early stages of vocational competency development as well as the process of adjustment to practice-based learning in computer laboratories. In this way, this research is expected to make a new contribution to the development of technology-based educational management, especially in improving computer laboratory management to support the achievement of student learning outcomes.

The urgency of this research lies in the need to present concrete evidence on how computer laboratory infrastructure can help improve student participation and learning outcomes. With more

effective infrastructure, it is hoped that the practical learning process can take place more optimally so that it has an impact on improving the learning outcomes of class X students.

Research Methods

This study uses a quantitative approach with a simple linear regression analysis method to test the influence of computer laboratory infrastructure on student learning outcomes. The quantitative approach is used because this study analyzes the relationship between variables in the form of statistically processed numerical data (Supandi et al., 2024) The independent variable in this study is the infrastructure of the computer laboratory, while the bound variable is the learning outcomes of students.

The research population is all students of class X of the Department of Computer Network and Telecommunication Engineering at one of the public vocational schools in Karawang which totals 78 people. The sampling technique uses saturated samples, i.e. the entire population is used as a research sample (Sugiyono, 2013)

Data collection techniques include observation, questionnaires, and documentation. Observations were carried out to observe the condition of computer laboratory infrastructure and learning activities. Questionnaires are used as the main instrument to obtain data from respondents, while documentation is used to complement research data such as school profiles, number of students, and learning outcome data (Fadli, 2021) The data obtained was then analyzed using statistical techniques to determine the influence between variables.

Research Findings and Discussion

Results of Validity Test of Computer Laboratory Infrastructure (X)

Question	R Count	R Table	Remarks	Verdict
1.	.376**	0.2199	VALID	Used
2.	.584**	0.2199	VALID	Used
3.	.684**	0.2199	VALID	Used
4.	.277*	0.2199	VALID	Used
5.	.508**	0.2199	VALID	Used
6.	.528**	0.2199	VALID	Used
7.	.510**	0.2199	VALID	Used
8.	.303**	0.2199	VALID	Used
9.	.297**	0.2199	VALID	Used
10.	.382**	0.2199	VALID	Used
11.	.603**	0.2199	VALID	Used
12.	.592**	0.2199	VALID	Used

Based on the results of the validity test that has been carried out using *the Pearson Bivariate correlation* technique (*Product Moment*), it is known that all statements in the research instrument have a greater calculated r value compared to the r table at a significance level of 0.05. This shows that each item has a significant relationship with the total score. Thus, all statements in the instrument are declared valid and able to measure the variables being studied appropriately. Therefore, the instrument is suitable to be used as a data collection tool in this study. The results of the validity test of the Student Learning Outcome Questionnaire are:

Results of the Validity Test of Student Learning Outcomes (Y)

Questions	R Count	R Table	Remarks	Verdict
1.	.376**	0.2199	VALID	Used
2.	.584**	0.2199	VALID	Used
3.	.684**	0.2199	VALID	Used
4.	.277*	0.2199	VALID	Used
5.	.508**	0.2199	VALID	Used
6.	.528**	0.2199	VALID	Used
7.	.510**	0.2199	VALID	Used
8.	.303**	0.2199	VALID	Used
9.	.297**	0.2199	VALID	Used
10.	.382**	0.2199	VALID	Used
11.	.603**	0.2199	VALID	Used
12.	.592**	0.2199	VALID	Used
13.	.564**	0.2199	VALID	Used
14.	.564**	0.2199	VALID	Used
15.	.395**	0.2199	VALID	Used
16.	.317**	0.2199	VALID	Used

Reliability Test Results of Variables X and Y

Variable	*Cronbach's Alpha*	Remarks
Computer Laboratory Infrastructure	0,616	Reliabel
Student Learning Outcomes	0,737	Reliabel

Based on the table above, the reliability value shows that the level of reliability of the questionnaire in the variable (X) of computer laboratory infrastructure and the variable (Y) of student learning outcomes is in the reliable category, with Cronbach's Alpha values of 0.616 and 0.737, respectively. The value is greater than 0.60, so that the research instrument can be declared consistent and suitable for use in research at one of the state vocational schools in Karawang.

Descriptive Analysis

Based on descriptive analysis, the average computer laboratory infrastructure is 32.4487 with a median of 32.00, showing a relatively even distribution of data. The value is in the 95% confidence

interval between 31.7241–33.1733, so the average estimate is relatively stable. The standard deviation of 3.21380 indicates a variation in the data in the medium category, with a minimum value of 26.00 and a maximum of 42.00 (range 16.00). The distribution of data tends to be normal, indicated by a skewness of 0.280 (slightly positive) and a kurtosis of -0.024. Overall, computer laboratory infrastructure facilities are in the medium category with no significant distribution deviations.

Results of Descriptive Analysis of Variable X (Computer Laboratory Infrastructure)

Descriptives

			Statistic	Std. Error
Computer Laboratory Infrastructure	Mean		32,4487	0,36389
	95% Confidence Interval for Mean	Lower Bound	31,7241	
		Upper Bound	33,1733	
	5% Trimmed Mean		32,3875	
	Median		32,0000	
	Variance		10,329	
	Std. Deviation		3,21380	
	Minimum		26,00	
	Maximum		42,00	
	Range		16,00	
	Interquartile Range		5,00	
	Skewness		0,280	0,272
	Kurtosis		-0,024	0,538

Furthermore, the categorization is presented in a frequency distribution table based on respondent questionnaire data.

Computer Laboratory Infrastructure Categorization Table (X)

Category	**Interval**	**Frequency**	**Percentage**	**Remarks**
$X < (\mu\text{-}1{,}0\sigma)$	$X \leq 29{,}23$	15	19%	Rendah
$(\mu\text{-}1{,}0\sigma) \leq X < (\mu + 1{,}0\sigma)$	$29{,}23 \leq X \geq 35{,}66$	50	64%	Sedang
$(\mu + 1{,}0\sigma) \leq X$	$35{,}66 \leq X$	13	17%	Tinggi
Quantity		78	100%	

Based on the results of the research, there are categories of computer laboratory infrastructure facilities listed in the table above. By paying attention to the number of samples of 78 respondents, it was found that computer laboratory infrastructure facilities were in the low category of 19%, medium category of 64%, and high category of 17%. Thus, it can be concluded that the level of computer laboratory infrastructure facilities majoring in Computer Network and Telecommunication Engineering at one of the state vocational schools in Karawang is in the medium category.

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The results of calculating the mean, median and standard deviation values on the Student Learning Outcomes questionnaire are as follows:

Results of Descriptive Analysis of Variable Y (Student Learning Outcomes)

Descriptives				
			Statistic	Std. Error
Student Learning Outcomes	Mean		43,0000	0,54866
	95% Confidence Interval for Mean	Lower Bound	41,9075	
		Upper Bound	44,0925	
	5% Trimmed Mean		42,9288	
	Median		43,0000	
	Variance		23,481	
	Std. Deviation		4,84567	
	Minimum		31,00	
	Maximum		57,00	
	Range		26,00	
	Interquartile Range		8,00	
	Skewness		0,205	0,272
	Kurtosis		-0,094	0,538

Based on descriptive analysis, the average learning outcomes of students were 43.00 with a median of 43.00, which shows that the data is distributed relatively evenly. The average value is in the 95% confidence interval between 41.9075–44.0925, so the estimate is relatively stable. The standard deviation of 4.84567 indicates the level of variation in the data in the medium category, with a minimum value of 31.00 and a maximum value of 57.00 (range of 26.00). The distribution of data tends to be normal, indicated by skewness of 0.205 (slightly positive) and kurtosis of -0.094. Overall, the learning outcomes of students were in the medium category and did not show significant distribution deviations. Furthermore, the categorization is presented in a frequency distribution table based on respondent questionnaire data.

Categorization of Student Learning Outcomes (Y)

Category	Interval	Frequency	Persentase	Remarks
$X < (\mu\text{-}1{,}0\sigma)$	$X \leq 38{,}15$	13	17%	Rendah
$(\mu\text{-}1{,}0\sigma) \leq X < (\mu + 1{,}0\sigma)$	$38{,}15 \leq X \geq 47{,}84$	53	68%	Sedang
$(\mu + 1{,}0\sigma) \leq X$	$47{,}84 \leq X$	12	15%	Tinggi
Quantity		78	100%	

Based on the results of the research, there is a categorization of student learning outcomes listed in the table above. By paying attention to the number of samples of 78 respondents, it was found that

the low category was 17%, the medium category was 68%, and the high category was 15%. Thus, it can be concluded that the level of learning outcomes of students majoring in Computer Network and Telecommunication Engineering at one of the state vocational schools in Karawang is in the medium category.

Prerequisite Test

Normality Test Results

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		78
Normal Parameters[a,b]	Mean	0,0000000
	Std. Deviation	3,96022047
Most Extreme Differences	Absolute	0,084
	Positive	0,084
	Negative	-0,078
Test Statistic		0,084
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Based on the results of the normality test on residual regression (Unstandardized Residue) with a sample number of (N) of 78, an Asymp value was obtained. Sig. (2-tailed) is 0.200. The value is greater than 0.05 (0.200 > 0.05), so it can be concluded that the data in this study are normally distributed. Thus, the assumption of normality in the regression analysis has been fulfilled and the data is feasible for use in subsequent testing.

Linearity Test

Linearity Test Results

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Hasil Belajar* Sarana Prasarana Laboratorium Komputer	Between Groups	(Combined)	860,335	14	61,452	4,085	0,000
		Linearity	600,382	1	600,382	39,913	0,000
		Deviation from Linearity	259,953	13	19,996	1,329	0,221
	Within Groups		947,665	63	15,042		
	Total		1808,000	77			

Based on the results of the linearity test, the significance value *of Deviation from Linearity* was 0.221. Since this value is greater than 0.05 (0.221 > 0.05), it can be concluded that the relationship between the variables of computer laboratory infrastructure facilities and learning outcomes is linear.

Inferential Analysis

Simple Linear Regression Test Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	14,807	4,609		3,213	0,002
	Sarana Prasarana Laboratorium Komputer	0,869	0,141	0,576	6,147	0,000
a. Dependent Variable: Learning Outcomes						

Koefisien Regresi

a = constant number of *unstandardized coefficients*. In this study, the score was 14.807. This figure shows that if there is no computer laboratory infrastructure (X) or the value is considered 0, then the value of the students' learning outcomes (Y) is 14.807.

b = regression coefficient number, the value is 0.869. This figure means that for every 1 unit increase in the computer laboratory infrastructure (X), the learning outcomes of students (Y) will increase by 0.869.

Because the value of the regression coefficient is positive (+), this shows that the variable of computer laboratory infrastructure (X) has a positive influence on the learning outcomes of students (Y). Thus, the regression equation formed is: Y = 14.807 + 0.869X.

Test Hypotheses in Simple Linear
Hypothesis Test Results

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	600,382	1	600,382	37,784	.000[b]
	Residual	1207,618	76	15,890		
	Total	1808,000	77			
a. Dependent Variable: Learning Outcomes						
b. Predictors: (Constant), Computer Laboratory Infrastructure						

Based on the results of the ANOVA test output, an F value of 37.784 was obtained with a significance value (Sig.) of 0.000 which is smaller than 0.05. Thus, it can be concluded that H0 is rejected and Ha is accepted, which shows that there is a "significant influence of computer laboratory infrastructure on student learning outcomes".

Coefficient Determination Test (R2)

Determination Coefficient Test Results

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.576[a]	0,332	0,323	3,986
a. Predictors: (Constant), Computer Laboratory Infrastructure				

Based on the output in the *Model Summary table, the* R Square value of 0.332 *was obtained* . This shows that 33.2% of the learning outcome variables of students (Y) are influenced by computer laboratory infrastructure (X). Meanwhile, the remaining 66.8% was influenced by other factors outside the variables studied in this study.

Educational facilities and infrastructure are one of the important factors that support the success of the learning process because they function as supporting facilities in achieving educational goals effectively and efficiently. According to (Ramadani et al., 2025) educational facilities include tools and equipment that are used directly in learning activities, while infrastructure is supporting facilities such as learning rooms and educational environments. This opinion is strengthened by (Sugiyono, 2013) which states that the quality of educational facilities and infrastructure affects the effectiveness of students' learning processes. In the context of vocational education, especially in the Department of Computer Network and Telecommunication Engineering, computer laboratories have an important role as a practice-based learning medium that integrates theory and technological skills. The existence of a computer laboratory allows students to obtain a more concrete, interactive, and applicative learning experience so that it can support the improvement of students' cognitive learning outcomes.

Based on the results of research at one of the state vocational schools in Karawang, computer laboratory infrastructure facilities are in the medium category. The results of the descriptive analysis showed an average value of 32.4487 with a median of 32.00 which showed a relatively even distribution of data. Based on the results of the categorization, as many as 64% of respondents were in the medium category, 19% in the low category, and 17% in the high category. The findings show that computer laboratory facilities are available and can be used in the learning process, but they are not yet fully optimal. Several obstacles such as the limitation of computer equipment, the quality of facilities, and the use of laboratories that have not been maximized are still obstacles in supporting students' practice activities optimally.

The cognitive learning outcomes of students in this study are also in the medium category. According to (Hamalik, 2003) learning outcomes are changes in students' abilities after participating in the learning process, especially in the aspects of knowledge, attitudes, and skills. In this study, the

main focus is directed to cognitive learning outcomes which include the ability to understand, apply, analyze, and evaluate learning materials (Firmansyah et al., 2025) The results of the descriptive analysis showed an average learning outcome score of 43.00 with a median of 43.00, which indicates a relatively even distribution of data. Based on the results of the categorization, as many as 68% of students were in the medium category, 17% in the low category, and 15% in the high category. This condition shows that most students have good enough ability to understand computer-based learning materials, but the achievement of cognitive learning outcomes is still not optimal.

The results of simple linear regression analysis showed that there was a positive influence between computer laboratory infrastructure facilities on students' cognitive learning outcomes. The regression equation obtained shows that any improvement in the quality of computer laboratory infrastructure will be followed by an increase in student learning outcomes. In addition, the value of the determination coefficient (R Square) of 0.332 shows that computer laboratory infrastructure contributes 33.2% to the cognitive learning outcomes of students, while the rest is influenced by other factors such as learning motivation, learning methods, teacher competence, and learning environment.

The results of the hypothesis test showed a significance value of $0.000 < 0.05$ which means that there is a positive and significant influence between computer laboratory infrastructure facilities on students' cognitive learning outcomes. Marliany et al., (2025) Marliany et al., (2025). Baharuddin et al., (2024) Baharuddin et al., (2024)

Ideally, computer laboratory infrastructure has an important role in supporting the success of the learning process, especially in the Department of Computer Network and Telecommunication Engineering which requires direct practical activities. Computer laboratories equipped with computer devices, internet networks, comfortable practice rooms, and other supporting facilities are expected to be able to help students understand learning materials, improve practical skills, and achieve optimal learning outcomes. Adequate educational infrastructure can support the learning process effectively and efficiently. In addition, technology-based learning facilities can improve students' understanding because learning becomes more interactive and interesting. This opinion is strengthened by the fact that learning outcomes are influenced by external factors, one of which is adequate learning facilities. Thus, the better the quality and utilization of computer laboratory infrastructure, the learning outcomes of students also tend to increase both in cognitive, affective, and psychomotor aspects.

Overall, the results of the study show that computer laboratory infrastructure has an important role in supporting the improvement of students' cognitive learning outcomes. Adequate facilities help students understand the material more easily, increase engagement in the learning process, and support thinking and problem-solving skills in practice-based learning. Therefore, improving the

quality, completeness, and utilization of computer laboratory infrastructure facilities needs to be carried out so that students' cognitive learning outcomes can be improved more optimally.

Conclusion

In this study, the researcher involved 78 students as a sample and collected data through a questionnaire that had been filled out by the respondents, then processed using the IBM SPSS Statistics 25 application. Based on the results of a study on the influence of computer laboratory infrastructure on the learning outcomes of students at one of the State Vocational Schools in Karawang, it is known that computer laboratory infrastructure facilities are in the medium category with an average score of 2.70, where most of the respondents (64%) are in the medium category. The highest score was found in item X7 of 2.97 which indicates that the use of devices such as keyboards and mice is very good, while the lowest value is found in item X3 of 2.50 which indicates that basic facilities such as computers and internet are still inadequate. Students' learning outcomes were also in the medium category with an average score of 2.69 and the majority of respondents (68%) were in the medium category. The highest score was found in item Y15 of 2.86 which showed that one aspect of learning outcomes had been achieved well, while the lowest score was found in item Y3 of 2.56 which showed that there were still aspects of learning outcomes that needed to be improved. In addition, the results of the simple linear regression test showed a positive and significant influence between computer laboratory infrastructure facilities on student learning outcomes with a significance value of 0.000 < 0.05 so that the alternative hypothesis (Ha) was accepted. The determination coefficient value (R^2) of 0.332 showed that computer laboratory infrastructure contributed 33.2% to student learning outcomes, while the remaining 66.8% was influenced by other factors outside the study. The regression coefficient of 0.869 also shows that any improvement in computer laboratory infrastructure will be followed by an increase in student learning outcomes. Thus, computer laboratory infrastructure has an important role in supporting student learning outcomes so that there needs to be improvement, especially in the completeness of the main laboratory facilities so that the learning process and student learning outcomes can be more optimal.

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