The Effect of Infrastructure and the Utilization of Information Technology in Learning on the Quality of Education

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Abstract. This research was conducted to find the effect of infrastructure and information technology on learning. The problem in this study is the difference in the quality of education in the North Lombok Regency Junior High School, which has a different infrastructure and uses information technology in learning. This study uses a quantitative descriptive approach with comparative causal research methods. The population in this study consisted of 270 ASN teachers spread across 16 public junior high schools in North Lombok Regency. The sampling technique used proportional random sampling in each sub-population, and the sample was determined randomly. The sample in this study amounted to 160 teachers, and hypothesis testing was done using Analysis of Variance (ANOVA). The research results show that the infrastructure is adequate (69.04%). The use of information technology in learning is reasonably sufficient (68.51%), and the quality of education is quite good (81.04%). The results of hypothesis testing with a significance level of = 0.05 concluded: 1) Infrastructure has a positive effect on the quality of education (p=0.001); 2) The use of information technology in learning has a positive impact on the quality of education (p=0.000); 3) There is no interaction effect of infrastructure and the use of information technology in learning to improve the quality of education (p=0.140).

Keywords: Infrastructure; Utilisation of Information Technology in Learning; Quality of Education.

INTRODUCTION

The education sector is one of the fields that is relied on in preparing human resources to face the challenges of the times. In the implementation of education, it is necessary to have quality, equitable education planning and fulfil all supporting aspects. The readiness and availability of facilities and infrastructure in education are needed to support education implementation. In addition, the rapid advancement of information technology requires us to continue to hone our skills to keep up with the times. Therefore, advances in information technology need to be used as an educational tool that can assist in implementing education. Information technology in education can not only be utilised as a means of broadcasting learning programs in one direction or interactively. Still, it can also be used in the context of equal educational distribution and improving education quality. Information technology support is critical in the learning process and management in the world of education because it can accelerate and facilitate the governance of educational services.

To realise the implementation of quality education, the government has attempted to provide educational services by improving the quality standards of school graduates, fulfilling educational facilities, and digitising schools. However, the compensation from the results of the fulfilment of educational services has not been significant in raising the quality of education. There are still many academic units where the availability of infrastructure is not being met, and teachers are not making full use of information technology. Government support for the use of information technology on the Ministry of Education and Culture's GTK Service Portal as one of the supporting media shows that the services pro-

vided support the use of information technology to improve the quality of education.

Teachers and school principals can participate in training programs to develop and improve competencies to be applied in the management of educational institutions and the learning process. However, the availability of information technology facilities does not align with its use in learning. Most teachers have not demonstrated optimal use of information technology. The commitment of teachers to improving competence also requires special attention as one of the supporting factors for enhancing the quality of education. In addition, several schools with adequate information technology facilities have not been maximally utilised for learning.

Note that North Lombok Regency has 16 Junior High Schools (known with SMP) with state status spread over five sub-districts, namely Pemenang sub-district, as many as two junior high schools, Tanjung sub-district as many as four junior high schools, Gangga sub-district as many as three junior high schools, Kayangan sub-district as many as three junior high schools, and Bayan sub-district as many as 4 Middle School. Based on the results of the researcher's monitoring of the physical condition of SMP Negeri 1 Tanjung and SMP Negeri 3 Tanjung, information was obtained that the availability of facilities and infrastructure in the two schools was very contrasting. The physical condition of the building and the availability of study rooms at SMP Negeri 1 Tanjung are very well met. However, the opposite is seen in SMP Negeri 3 Tanjung. The condition of the building and the availability of study rooms have not been met.

The development of educational facilities in North Lombok Regency still needs to be addressed. There are various problems that principals and teachers complain about in North Lombok Regency, including unfulfilled classrooms, inadequate media rooms, sports fields that do not meet specifications, and various other educational infrastructure facilities that are not yet available according to standard requirements. This problem arises due to the limited budget owned by the regional government and communication problems with the central government regarding the proposed fulfilment of these infrastructure facilities. The non-fulfilment of these infrastructure facilities certainly has a systemic impact on the management of educational units,

especially teaching and learning activities in schools.

The Regulation of the Minister of Education and Culture of the Republic of Indonesia No 28 of 2016 concerning the Quality Assurance System for Primary and Secondary Education states that to map the quality of education, it is necessary to integrate all data and information, which includes eight components, namely educational outcomes, educational content, educational processes, assessment of education, teachers and education personnel, educational facilities and infrastructure, education financing, and education management. Thus, determining the quality of education in an academic unit can be done by looking at the achievements of all these components. Components of educational infrastructure and components of teachers and education personnel affect the quality of education.

In maintaining and improving the quality of education, special attention is needed from various aspects. The availability of educational infrastructure has an impact on the quality of education. Therefore, educational infrastructure needs to be used optimally according to the characteristics of students, and regular maintenance needs to be carried out. Another aspect that needs to be considered is the support of information technology, which is expected to play a positive role in the quality of education. One of the teacher's innovations in improving the quality of education is using information technology in learning to overcome the problems faced. Besides that, no matter how sophisticated information technology and complete infrastructure in the world of education are, it is not essential if they do not impact improving the quality of education.

METHOD

This study uses a quantitative descriptive approach with comparative causal research methods. The population in this study consisted of 270 ASN teachers spread across 16 public junior high schools in North Lombok Regency. The sampling technique used proportional random sampling in each sub-population, and the sample was determined randomly. The sample in this study amounted to 160 teachers. Data analysis techniques used include descriptive statistics, prerequisite tests, and data analysis with inferential statistics on comparative research hypotheses. Data analysis with descriptive statistics is pre-

sented as frequency distribution tables and pie charts. The prerequisite test uses a normality test and a homogeneity test. At the same time, the data was analysed with inferential statistics using the Analysis of Variance (ANOVA). Hypothesis testing in this study was carried out with the help of the IBM SPSS Statistics Version 25 application.

RESULTS AND DISCUSSION

The data obtained in this study aims to provide an overview of the infrastructure, the use of information technology in learning, and the quality of education at the North Lombok Regency Junior High School in 2022. Data on infrastructure and the use of information technology in learning in this study were obtained from filling out questionnaires. At the same time, this study's data on the quality of education comes from secondary data in the form of a documentation instrument that refers to the final grades of class IX students in 2022 from 16 SMP Negeri Lombok Utara Regency. The final score is obtained from the average 5-semester report cards and final exam scores.

In determining the category of achievement of facilities and infrastructure, the use of information technology in learning, and the quality of education at SMP Negeri Lombok Utara by the results of this study, the guidelines for the category of achievements are used according to the achievements of the National Education Standards (known with SNP) which are described in Table 1.

Table 1 – Guidelines for the category of facilities and infrastructure achievements, the use of information technology in learning, and the quality of education according to the achievements of the SNP

SNP interval	Value Interval	Category
0.00 – 2.04	00.00 – 29.21	Very less
2.05 – 3.70	29.22 – 52.93	Not enough
3.71 – 5.06	52.94 – 72.36	Enough
5.07 – 6.66	72.37 – 95.21	Well
6.67 – 7.00	95.22 – 100.00	Very good

The data obtained from the data collection of infrastructure variables, the use of information technology in learning, and the quality of education at SMP Negeri Lombok Utara Regency can be described in the form of the lowest value (Xmin), the highest value (Xmax), the average value (M),

mean (Me), mode (Mod), and standard deviation (SD). The recapitulation of research data can be seen in Table 2 and Table 3 below.

Table 2 – Description of Research Result Data

Description	Infrastructure	Utilisation of Information Technology in Learning	Education Quality
Minimum Value	67	63	70
Maximum Value	162	108	88
Average	115.99	84.96	81.04
median	117	81	81
Mode	126	77	80
Standard Deviation	15.70	10.38	3.40

Table 3 – Description of Research Results Based on Combination of Categories

Education Quality	A1		A2	
B1	Description	Score	Description	Score
	A1B1-Y	7,300	A2B1-Y	2019
	Mean A1B1-Y	82.02	Mean A2B1-Y	80.76
B2	Description	Score	Description	Score
	A1B2-Y	2,567	A2B2-Y	1080
	Mean A1B2-Y	80.22	Mean A2B2-Y	77.14

Notes: A1 – Facilities Fulfilled; A2 – Infrastructure Not Fulfilled; B1 – Utilisation of Information Technology in High-Intensity Learning; B2 – Utilisation of Information Technology in Low-Intensity Learning.

Of the four categories that have been described, it can be seen that the first combination, A1B1-Y, is the category with the highest average score of 82.02. This shows that the value of the quality of education is strongly influenced by the infrastructure that is fulfilled and the use of information technology in high-intensity learning. The following describes the data processed for each variable in this study.

Description of Infrastructure Variable Data. The data on the infrastructure facilities owned by the schools that were used as research sites were obtained based on the results of filling out questionnaires regarding the existing infrastructure at the school. Based on the guidelines for the cat-

egory of achievement of infrastructure standards by the achievement of the National Education Standards (SNP), the average value of 69.04 indicates that the achievement of infrastructure standards at SMP Negeri Lombok Utara Regency is in the sufficient category. An overview of the accomplishments of the infrastructure owned by the North Lombok Regency Public Junior High School, which is used as the research location, can be seen in Table 4 and Figure 1 below.

Table 4 – Overview of Infrastructure at SMP Negeri Lombok Utara Regency

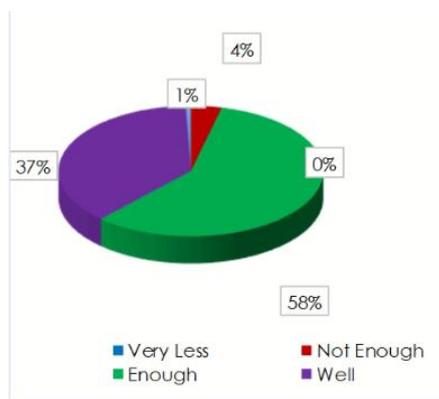| n	XMin	XMax	Mean	Median	Mode	Standard Deviation
160	39.88	96.43	69.04	69.64	75.00	9.34

Figure 1 – Distribution of Respondents' Perceptions About Infrastructure at SMP Negeri Lombok Utara Regency

Description of Variable Data Utilization of Information Technology in Learning. Variable data on the use of information technology in learning was obtained by filling out a questionnaire regarding the use of information technology in learning at SMP Negeri Lombok Utara Regency. Based on the guidelines for the category of standard achievement of the use of information technology in learning according to the achievement of the National Education Standards (SNP), the average value of 68.51 indicates the category of achievement of standards for the use of information technology in learning at SMP Negeri Lombok Utara is in the sufficient category. An overview of the successes of using information technology in learning at SMP Negeri Lombok Utara is seen in Table 5 and Figure 2 below.

Table 5 – Overview of Information Technology Utilization in Learning at SMP Negeri Lombok Utara Regency

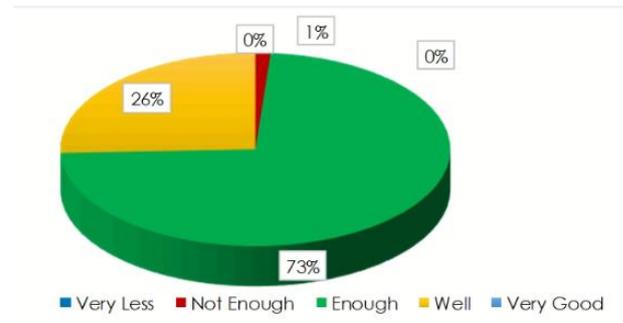| n	XMin	XMax	Mean	Median	Mode	Standard Deviation
160	50.81	87.10	68.51	65.32	62.10	8.37

Figure 2 – Distribution of Respondents' Perceptions About the Use of Information Technology in Learning at SMP Negeri Lombok Utara Regency

Description of Education Quality Variable Data. Data on the variable quality of education in this study was measured using secondary data in the form of a documentation instrument that refers to the final grade (NA) of class IX students in 2022, which relates to the achievements achieved by students based on the Regulation of the Minister of Education and Culture No 20 of 2016 concerning Graduate competence standard. The data collected is in the form of final grades (NA) for class IX students in 2022. Based on the guidelines for the category of educational quality achievement following the National Education Standards (SNP) achievements, the average value indicates that education quality achievement in North Lombok Regency Junior High Schools is classified as a good category. An overview of the quality of education at SMP Negeri Lombok Utara can be seen in Table 6 and Figure 3 below.

Table 6 – Overview of the Education Quality of North Lombok Regency Junior High Schools

n	XMin	XMax	Mean	Median	Mode	Standard Deviation
160	70	88	81.04	81	80	3.40

The normality test in this study was carried out using the Shapiro-Wilk test with the condition that if the significance value was > 0.05, then the

residual value was normally distributed, and vice versa. The residual value was not normally distributed if the significance value was < 0.05. The tests carried out on the research sample are used to conclude whether the population observed in research activities is commonly spread. The results of normality testing for this research variable can be seen in Table 7.
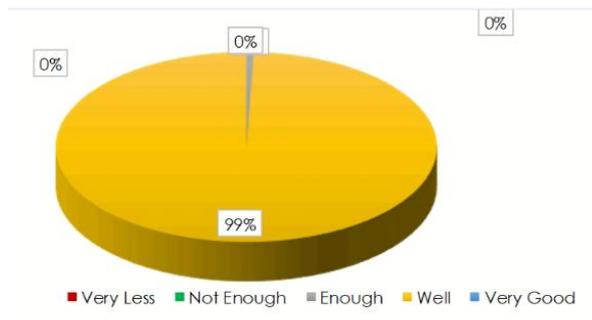

Figure 3 − Distribution of Education Quality Achievements in North Lombok Regency Junior High Schools

Table 7 − Normality Test Results of Education Quality Data at the Significance Level = 0.05

Data Group	Shapiro-Wilk Statistics	df	Significance
Facilities Fulfilled	0.980	121	0.609
Infrastructure Not Fulfilled	0.959	39	0.166
Utilisation of Information Technology in High-Intensity Learning	0.981	114	0.150
Utilisation of Information Technology in Low-Intensity Learning	0.958	46	0.095

From the results of the Shapiro-Wilk test in Table 7, it can be seen that the significance value of the education quality data for the infrastructure data group is fulfilled = 0.069; infrastructure data group is not met = 0.166; utilisation of information technology in high-intensity learning = 0.105; and the use of information technology in low-intensity learning = 0.095 with a significance level of = 0.05 having a significance value greater than 0.05. Thus, the data on the quality of education for the data group on infrastructure and the

use of information technology in learning is categorised as normally distributed.

The homogeneity test aims to see whether two or more sample data groups come from populations with the same variance. A homogeneity test was conducted to determine whether the data in the variables X and Y were homogeneous. If homogeneous sample data has been obtained, the data is analysed through Analysis of Variance (ANOVA) to prove the proposed hypothesis. To test the homogeneity of the data in this study using Levene's test.

Table 8 − Homogeneity Test Results Using Levene test

	Levene Statistics	df1	df2	Significance
Education Quality	1.323	3	156	0.269

Based on the results of Levene's test in Table 8, a significance value of 0.269 was obtained. Because the significance value of 0.269 is more significant than 0.05, it can be concluded that the variance of the education quality variable is homogeneous.

Research hypothesis testing aims to conclude whether the empirical data collected supports the proposed research hypothesis. To test the theory proposed in this study, the Two Ways ANOVA technique (Two Way Variance Analysis) was used at a significant level of = 0.05. The results of the ANOVA test using the IBM SPSS Statistics Version 25 application can be seen in Table 9 below.

Table 9 − Hypothesis Testing Results with Significance Level = 0.05 on Education Quality Variables

Source	Number of Squares	df	Square Mean	F	Sig.
Infrastructure (A)	122.285	1	122.285	12,619	0.001
Utilisation of Information Technology in Learning (B)	190.923	1	190.923	19,702	0.000
A * B	21.366	1	21.366	2,205	0.140

From the analysis results shown in Table 9, the significance value for the infrastructure variable is 0.001, which is smaller than 0.05. This means

that the significance value for the infrastructure variable is significant. The average quality of education in the fulfilled infrastructure group was 82.02, which was greater than that in the unfulfilled infrastructure group of 80.76. Based on the analysis results, it can be concluded that the quality of education in the North Lombok Regency Junior High School group of fulfilled infrastructure is higher than that of the group of unfulfilled infrastructure.

The significance value for using information technology in learning is 0.000, which is less than 0.05. This means that the significance value for the variable of the use of information technology in learning is significant. The average quality of education in the group using information technology in high-intensity learning is 82.02, which is greater than the average quality of education in the group using information technology in low-intensity learning, which is 80.22. Based on the analysis results, it can be concluded that the quality of education in the North Lombok Regency Junior High School in the group using information technology in high-intensity learning is higher than in the group using information technology in low-intensity learning.

The significance value for the interaction of the infrastructure variable with the variable of the use of information technology in learning is 0.140, greater than 0.05. This shows that the significant value of infrastructure interaction with information technology in education is insignificant. Based on the analysis results, it can be concluded that there is no effect of the interaction of infrastructure and the use of information technology in learning on improving the quality of education at the North Lombok Regency Junior High School because research data do not support it.

The Effect of Infrastructure on the Quality of Education at SMP Negeri Lombok Utara. The Minister of National Education Regulation No 24 of 2007 has regulated the standardisation of infrastructure facilities in education units. This standard is used as a standard reference to fulfil the needs of education unit infrastructure. Each educational unit is responsible for providing the necessary infrastructure because infrastructure is a factor, either directly or indirectly, that contributes to the smooth running of learning activities.

Infrastructure has a vital role in various learning theories and learning methods. In the social learning theory (social learning theory) proposed by Albert Bandura, the learning process is carried out through 4 phases, namely the attention phase, the retention phase, the reproduction phase, and the motivation phase. These four phases require adequate facilities such as learning media and textbooks in the learning process [1]. Outdoor education is learning outside the classroom, which also involves the availability of infrastructure for learning activities. Learning is carried out through out-of-school activities outside the classroom/school and in the wild, such as playing in schools, parks, farming/fishing villages, camping, and adventurous activities.

The results of other studies that support this study include research conducted by [2], which state that infrastructure significantly influences the quality of education. Author [3] also revealed a similar result, namely that the infrastructure standard substantially affects the quality of education. This shows that the infrastructure component plays a vital role in improving the quality of education. If the infrastructure is fulfilled, it can enhance the quality of education. On the other hand, if the infrastructure condition decreases, the education quality will also decrease [4].

The results of this study are also in line with the results of research [5], which states that infrastructure significantly influences education quality, where facilities are more dominant than infrastructure in affecting the quality of education. Even specifically, authors [6] state that infrastructure has a vital role in improving the quality of teaching and developing student achievement in sports, science, and technology.

From the research that has been carried out, theoretical studies, and several research results relevant to this research, it can be concluded that infrastructure dramatically influences the quality of school education. Infrastructure is equipment or equipment that is directly or indirectly used and supports the educational process, especially the learning process in schools. Complete infrastructure in a school is undoubtedly conducive and facilitates the educational process, especially for teachers in the learning process. This is because the learning process requires tools to clarify further the concepts being studied. In addition to learning aids, the condition of classrooms and facilities owned by schools affects the quality of learning. A clean, comfortable, and fulfilling room will make teachers and students feel comfortable in the learning process. Therefore, it can be concluded that the infrastructure owned by the

school dramatically influences the quality of the school's education.

The Influence of Information Technology in Learning on the Quality of Education in SMP Negeri Lombok Utara. Information technology is the science needed to manage information to search for or recover data easily and quickly [7]. Technology can be utilised by integrating information technology into the teaching and learning process to inspire and modernise education, increase inclusivity, and encourage the achievement of teaching and learning objectives [8].

Information technology has an essential role in learning. Information technology allows the learning process to shift from passive assimilation of learning materials to conscious knowledge, making the learning process more exciting and effective [9]. By utilising information technology, it is also possible to make lessons more dynamic and interactive without taking a long time to design learning scenarios and designing learning media [10].

The results of other studies that support this study are research conducted by [11], which states that the use of information technology can improve the quality of education, even being very helpful in ensuring the quality of education. The utilisation of information technology contributes to enhancing the quality of education. The higher the level of utilisation of information technology, the higher the quality of education will increase because it can support effectiveness, productivity, and efficiency in education [12]. This shows that government programs related to school digitisation are relevant in improving education quality.

Improving education quality through information technology in learning can be done using information technology-based learning media such as learning videos, learning applications, and electronic textbooks [13]. The use of digital books and virtual learning is a tangible manifestation of information technology in learning to make the learning process more effective, interactive, and fun [14]. For this reason, an effort needed to be produced by the school, namely, to complete the information technology infrastructure and motivate teachers to attend workshops and training related to the use of information technology in learning.

Based on the description above, it can be concluded that using information technology in

learning affects the quality of education at SMP Negeri Lombok Utara Regency. The results of research data analysis show that using information technology in learning significantly influences the quality of education. Thus, the use of information technology in learning needs to be done optimally so that the quality of education can be further improved.

The Effect of Infrastructure Interaction with the Utilization of Information Technology in Learning on the Quality of Education in SMP Negeri Lombok Utara Regency. The results of the research data analysis show no interaction effect between infrastructure and the use of information technology in learning on the quality of education at SMP Negeri Lombok Utara Regency. The interaction referred to in this case is the influence of the independent variable on one of the sample categories on the dependent variable [15].

Many factors influence the quality of education. In this study, two factors that affect the quality of education are seen, namely the infrastructure owned by the school and the use of information technology in learning carried out by teachers. The infrastructure factors have each category: the infrastructure facilities are fulfilled and not fulfilled. Factors for using information technology in learning with the category of using information technology in high and low-intensity learning.

The interaction between variables in the third hypothesis is the interaction between infrastructure and the use of information technology in high-intensity learning and the use of information technology in low-intensity learning. Two possibilities can occur in this interaction. First, schools that use information technology in high-intensity learning and low-intensity learning will improve the quality of education if the infrastructure in the school is enhanced. Second, schools using information technology in high-intensity learning will still have a better quality of education than schools using information technology in low-intensity learning, even though there is no improvement in school infrastructure.

Research results show the use of information technology in high- and low-intensity learning will continue to rise together with infrastructure improvement. Therefore, to improve the quality of education based on the results of this study, efforts are made to increase the value of the two independent variables. The two variables do not show an interaction. If the school has the ability,

the ideal thing to do is to fulfil infrastructure facilities and increase the use of information technology in learning to achieve efforts to improve the quality of education, especially at SMP Negeri Lombok Utara Regency.

Based on the results of the analysis of hypothesis testing, it is found that the significance value for the interaction between infrastructure and the use of information technology in learning is greater than the specified significance value. This shows that there is no interaction between infrastructure and the use of information technology in learning to influence the quality of education at SMP Negeri Lombok Utara Regency. The data obtained show that the quality of education in schools using information technology in high-intensity learning and the use of information technology in low-intensity learning will increase along with the fulfilment of infrastructure. To improve the quality of education, infrastructure and the use of information technology in learning do not interact with each other.

CONCLUSIONS

From the results of the analysis of research data that has been carried out, it is concluded that the infrastructure owned by 16 public junior high schools in North Lombok Regency is quite adequate, the use of information technology in learning at SMP Negeri Lombok Utara is quite fair, and the quality of education in SMP Negeri Lombok Utara is classified as good. From the results of testing the research hypotheses that have been carried out, the following conclusions are obtained: 1) There is a positive influence of infrastructure on the quality of education at SMP Negeri Lombok Utara Regency; 2) There is a positive influence of the use of information technology in learning on the quality of education in SMP Negeri Lombok Utara Regency; and 3) There is no effect of the interaction of infrastructure and the use of information technology in learning on improving the quality of education in SMP Negeri Lombok Utara Regency.

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