ISET 11 (2025) Postgraduate School UNNES: 256-262 e-ISSN 2964-4291
International Conference on Science, Education and Technology https://proceeding.unnes.ac.id/ISET

Analysis of Service Quality in MIPA Laboratory Management Based on Work Culture and Impact on Student Loyalty

Muchsin Muchsin, Agus Wahyudi, Arief Yulianto, Eko Handoyo

Universitas Negeri Semarang, Semarang, Indonesia

*Corresponding Author: muchsin@students.unnes.ac.id

Abstract. This study aims to analyze the influence of MIPA (Natural Sciences and Mathematics) laboratory service quality on work culture and student loyalty in a higher education setting. Employing a quantitative approach with a survey method, the research involved 116 students from Mathematics Education, Chemistry, Biology, and Physics programs at Jabal Ghafur University. The research instruments were tested for validity and reliability using Partial Least Square-Structural Equation Modeling (PLS-SEM). The results reveal that service quality has a positive and significant influence on work culture and a highly significant direct impact on student loyalty. Conversely, work culture exhibits no direct or mediating influence on student loyalty. This underscores that students' perceptions of service quality are the primary factor shaping their institutional loyalty, while work culture plays a more internal organizational role. These findings imply that enhancing laboratory service quality particularly in areas like tangibility, empathy, and reliability should be prioritized in strategies to boost student loyalty. Although work culture remains vital for internal management, it does not serve as a significant intermediary between service quality and student loyalty.

Keywords: service quality; work culture; student loyalty

INTRODUCTION

The Regulation of the Minister of Education and Culture of the Republic of Indonesia in 2015 concerning the National Standards for Higher Education states that every higher education institution must fulfill the infrastructure requirements to implement the Tridharma of higher education. Laboratories are one of the crucial supporting facilities that play a strategic role in the implementation of the education system, especially in higher education. Generally, their role and function are to provide services for research development (research laboratories) as well as to serve as reliable teaching laboratories to realize the existence of the laboratory.

According to the National Accreditation Board for Higher Education Regulation Number 2 of 2022 concerning Accreditation Instruments for Study Programs in the Education Sector, the implementation and evaluation of accreditation related to facilities and infrastructure are included in criterion 5. The Independent Accreditation Institute for Education (LAMDIK) demands that laboratory management units provide quantity, quality, and relevance. Higher education institutions, as educational entities, are required to provide excellent services to their customers, which can drive the advancement of the institution and serve as a learning platform for individuals to have a better future (Gazali, 2013). One way to improve the quality of educational institution services is by continuously developing service facilities and infrastructure with the aim of achieving customer satisfaction.

The demand for the quality of graduates from both public (PTN) and private universities (PTS) is increasing. This pushes every graduate to have superior competencies or abilities to be competitive. These capabilities are necessary because only graduates with advantages are considered able to survive. Universities must prioritize the quality of educational services and their institutional image to enhance student satisfaction and loyalty in higher education (Masserini, Bini, and Pratesi, 2018). It is important for universities to focus on building a positive institutional image to increase student satisfaction and loyalty, especially for new and less prestigious universities competing in a more deregulated and market-driven environment (Brown and Mazzarol, 2009).

Higher education institutions must be able to manage the services they offer well. Good services provided to users can fulfill the expectations of users. The users of higher education services include students, lecturers, staff, and the community who use the graduates. Laboratory

services in higher education are integrated units that function to provide services for research, training, testing, government agencies, and the business and industrial world (DUDI). Managing laboratory infrastructure with high service quality can significantly improve the teaching and learning process. Management should consider providing more training to staff not only to enhance their technical skills in handling laboratory facilities but also to improve customer service skills (Cerna & Neda, 2016). This research concluded that the quality of university teaching laboratory services must be timely and necessary, and the results can be used as a basis for total quality management policies.

The level of student satisfaction is influenced by the quality of laboratory services provided, including physical facilities, equipment, staff competence, communication, and personalized attention. Therefore, by ensuring high-quality services in laboratories, educational institutions can increase student satisfaction and improve the overall learning experience (Lukum & Paramata, 2015). Laboratory support can be realized through improving human resources and service quality. The quantity of instruments and materials for analysis is also very important. Ideal laboratory services demonstrate that the existence of laboratories is essential as places to practice theory or even develop scientific knowledge. Therefore, an academic environment must always be the hallmark of laboratories.

A good laboratory should grow so that service users feel the benefits during and after activities in the laboratory. It serves as a reference for laboratory staff in providing services according to their respective work portions. The quality of laboratory services, especially in MIPA laboratories, is very important to understand considering the crucial role of laboratories in meeting graduate demands; therefore, the quality of MIPA laboratory services needs to be a focus of research.

METHODS

The research method used in this study is a quantitative approach employing questionnaires and Partial Least Squares Structural Equation Modeling (SEM-PLS) analysis. SEM-PLS is utilized in this research because it can predict and explain latent variables based on theory testing, as well as simultaneously assess the influence of various variables on an object. The primary test was conducted by distributing questionnaires. The sample size determination technique for a population used Slovin's formula (Consuelo, 1993). Slovin's formula is as follows:

$$n = \frac{N}{1 + N\ (e^2)}$$

The population of respondents in this study comprises all students from the Mathematics Education, Chemistry Education, Biology Education, and Physics Education departments at Jabal Ghafur University. The total sample used in this study consists of 116 respondents.

Table 1. Variables and Indicators Used in the Study

Variable Laten	Indicator
Service Quality (X_1)	1. Tangible 2. Responsiveness 3. Assurance 4. Empathy 5. Reliability
Work Culture (Z)	1. Discipline 2. Openness 3. Mutual Respect 4. Cooperation
Student Loyalty (Y)	1. Repeat 2. Attended 3. Recommendation

Source : (Parasuraman, 1998), (Ahmed & Shafiq, 2014), (Oliver, 1999).

The main analysis requirement testing is conducted to ensure that the measurement instruments used are appropriate for measurement (valid and reliable). Testing with PLS begins with the measurement model test (outer model) to examine the construct validity and instrument reliability. Validity testing is carried out to measure the instrument's ability to measure what it is supposed to measure (Cooper and Schindler, 2006). Construct validity in the reflective indicator model of PLS is tested through convergent validity, discriminant validity, and average variance extracted (AVE).

Reliability testing is used to measure the consistency of the measurement instrument in measuring a concept or to assess the consistency of respondents in answering the instrument. An instrument is said to be reliable if a respondent's answers to statements are consistent or stable over time. Reliability testing in PLS can be performed using composite reliability and Cronbach's alpha methods (Hartono and Abdillah, 2014).

RESULTS AND DISCUSSION

Measurement Model Testing (Outer Model)

Convergent Validity

The convergent validity value is the factor loading value of the latent variable along with its indicators. Convergent validity is assessed based on the correlation between the item scores/combined scores and the construct scores calculated using PLS. A reflective measure is considered high if it correlates more than 0.70 with the construct being measured. The following table shows the factor loadings for each indicator calculated using PLS.

Table 2. Validity Test in Measurement Model Testing (Outer Model)

Indicator	Loading Factor Value After Elimination
KL1	0.921
KL2	0.929
KL3	0.977
KL4	0.753
KL5	0.968
BK1	0.921
BK2	0.730
BK3	0.956
LM1	0.945
LM2	0.939
LM3	0.829

Source: Primary Data Analysis, 2025

The instrument test results can be presented in Table 2 below regarding the validity test. Based on Table 2, it can be seen that all indicators of the latent variables are usable because their loading factor values are greater than 0.7 (Devi et al., 2015). An indicator is considered valid or acceptable if its loading factor value is greater than 0.7, after which the next instrument testing can proceed.

Composite Reliability and Cronbach's Alpha

In addition to construct validity testing, construct reliability testing is also conducted, measured by composite reliability and Cronbach's alpha from the indicator blocks measuring the construct. The following are the results of the composite reliability and Cronbach's alpha tests from Smart PLS:

A construct is considered reliable if it has a composite reliability value above 0.70 and a Cronbach's alpha value above 0.70. The Smart PLS output in the table above shows that all constructs have composite reliability values above 0.70 and Cronbach's alpha values above 0.70. Therefore, it can be concluded that these constructs have good reliability (Bahri and Zamzam, 2021).

Table 3. Composite Reliability and Cronbach's Alpha

Variable	Cronbach's Alpha	Composite Reliability
Service Quality	0.948	0.961
Work Culture	0.839	0.906
Student Loyalty	0.890	0.932

Source: Primary Data Analysis, 2025

Structural Model Testing (Inner Model)

The structural model is evaluated using the R-squared value for the dependent variable and the path coefficient values for the independent variables, which are then assessed for significance based on the t-statistic value of each path.

R-squared

Changes in the R-squared value can be used to assess the impact of certain independent latent variables on the dependent latent variable to determine whether the variable has a substantive effect

Based on Table 4, it can be concluded that:

The R Square value for work culture is 0.163, indicating that 16.3% of the variation in the dependent variable (such as lecturer performance, job satisfaction, or similar) can be explained by the work culture variable. Meanwhile, the Adjusted R Square value of 0.156 reflects the actual contribution of work culture to the model after adjusting for the number of predictors and sample size.

The R Square value for student loyalty is 0.971, indicating that 97.1% of the variation in the dependent variable can be explained by student loyalty. The Adjusted R Square value of 0.970 also shows that the model is very stable and strong even after correction for model complexity.

Table 4. R-Squared Values

Variable	R Square	R Square Adjusted
Work Culture	0.163	0.156
Student Loyalty	0.971	0.970

Source: Primary Data Analysis, 2025

Student loyalty is a highly significant variable with a large influence on the dependent variable. The very high R Square value demonstrates the

model's exceptional strength in explaining the data. Conversely, work culture has a more limited influence, although it still makes a meaningful contribution in explaining part of the variability of the dependent variable.

Q-Square Stone-Geisser Test (Predictive Relevance)

The Q-square Stone-Geisser test assesses the predictive relevance and the t-test along with the significance of the structural path coefficient parameters. Q-square measures how well the observed values are generated by the model and its parameters. A Q-square value greater than 0 indicates that the model has predictive relevance, whereas a Q-square value less than 0 indicates that the model lacks predictive relevance.

Table 5. Stone-Geisser Q-Square Test

	SSO	SSE	Q^2 (=1-SSE/SSO)
Work Culture	348.000	307.735	0.116
Service Quality	580.000	580.000	
Student Loyalty	348.000	75.146	0.784

Source: Primary Data Analysis, 2025

VIF Values

Based on the VIF values in the table above, there are no VIF values greater than 10, indicating that there is no multicollinearity problem. This fact is supported by the absence of correlation among the independent variables. VIF values should be less than 10; values exceeding 10 indicate collinearity among constructs (Sarstedt et al., 2017).

Table 6. VIF Values

VIF	Work Culture	Student Loyalty
Service Quality	1.000	1.195
		1.195

Source: Primary Data Analysis, 2025

Hypothesis Testing

To test the hypotheses, the t-statistic values obtained from the PLS output are compared with the critical t-value from the table. The PLS output represents the estimation of latent variables, which are linear aggregates of indicators. The testing criteria at a 5% significance level (α) for a one-tailed test (positive/negative effect) are as follows: From the comparison of the table t-value and calculated t-value:

If $t_{count} > t_{table}$ (1,64) then H_0 is rejected, and H_1 is accepted.

If $t_{count} > t_{table}$ (1,64) then H_0 is accepted, and H_1 is rejected.

To test the significance of the effect between variables for a one-tailed test, the criteria are:

If the probability value sig /2 < 0,05, then the effect is significant.

If the probability value sig /2 > 0,05, then the effect is not significant.

The regression equation results show that work culture is positively influenced by service quality (0.404), indicating that this variable contributes significantly to work culture. Furthermore, student loyalty is influenced by service quality (0.987) and work culture (-0.004). The analysis results indicate that service quality has the greatest effect on student loyalty.

Table 7. Average Variance Extracted (AVE) Values

Variable	Average Variance Extracted (AVE)	Conclusion
Work Culture	0.766	Valid
Service Quality	0.834	Valid
Student Loyalty	0.821	Valid

Source: Primary Data Analysis, 2025

From the figure and table above, it can be observed that the AVE values are above 0.5. This indicates that all latent variables used in this study are valid as they meet the minimum AVE criteria (Ghozali, 2014). Furthermore, examining the cross-loading results shows that each indicator has a higher value for its respective latent variable compared to the indicators of other variables. The testing continues by reviewing the results of Cronbach's alpha and composite reliability.

Table 8. Reliability Test

Variable	Cronbach's Alpha	Composite Reliability	Conclusion
Work Culture	0.839	0.853	Reliable
Service Quality	0.948	0.953	Reliable
Student Loyalty	0.890	0.909	Reliable

Source: Primary Data Analysis, 2025

Table 8. Reliability Test shows that all tested variables have high reliability. The Cronbach's

Alpha values for each variable work culture (0.839), service quality (0.948), and student loyalty (0.890) are all above the minimum threshold of 0.7, indicating strong internal consistency. Additionally, the Composite Reliability values for each variable exceed 0.8, with service quality reaching the highest value of 0.953. This confirms that all variables are reliable and suitable for further analysis. Therefore, it can be concluded that the research instruments used in this study have adequate consistency and reliability to effectively measure the intended constructs.

Observation of the t-statistic and p-value is crucial during hypothesis testing. The table below presents the hypothesis testing results conducted in this study. Based on Table 9, it can be stated that not all hypotheses in this study are accepted. Results showing a p-value below or equal to 0.05 indicate

Direct Effect of Work Culture on Student Loyalty

Path analysis results show that the direct effect of work culture on student loyalty has a coefficient of 0.013 with a t-statistic of 0.345 and a p-value of 0.730. The p-value exceeding the significance threshold of 0.05 indicates that this relationship is not statistically significant. This finding suggests that institutional work culture does not directly contribute to the formation of student loyalty. This aligns with the research by Efe, T. (2021), which states that although organizational culture is important, its impact on customer or student loyalty is often indirect and mediated by other variables such as service quality or satisfaction.

Direct Effect of Service Quality on Work Culture

The direct effect of service quality on work culture shows strong significance. With a coefficient value of 0.072, a t-statistic of 5.620,

Table 9. Results of Bootstrapping Path Coefficient Analysis

Direct Effect	Path Coef.	T-Stat.	P-Values	Conclusion
Work Culture => Student Loyalty	0.013	0.345	0.730	Not Significant
Service Quality => Work Culture	0.072	5.620	0.000	Significant
Service Quality => Student Loyalty	0.006	171.635	0.000	Significant

Source: Primary Data Analysis, 2025

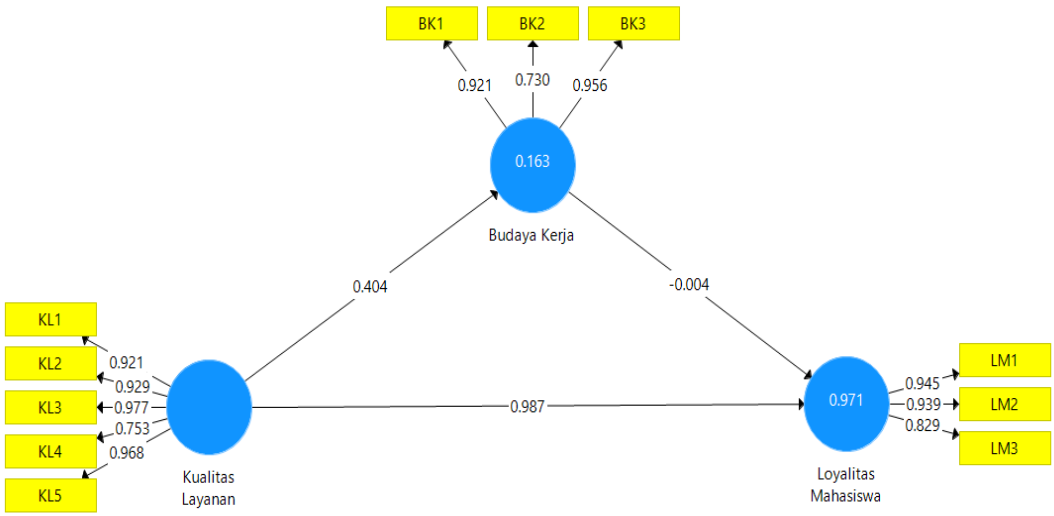

Figure 1. PLS Modeling Path Diagram

and a p-value of 0.000, it can be concluded that service quality has a positive and significant influence on work culture. This indicates that the higher the quality of service implemented, the stronger the development of a positive work culture within the institutional environment. According to Parasuraman, Zeithaml, and Berry (1996), high service quality encourages greater internal engagement from organizational personnel, which in turn strengthens shared work values and norms.

Direct Effect of Service Quality on Student Loyalty

The findings show that service quality has a highly significant relationship with student loyalty, with a path coefficient of 0.006, a t-statistic of 171.635, and a p-value of 0.000. Although the coefficient value is small, the extremely high t-value indicates an exceptionally strong statistical relationship. This implies that students' perceptions of service quality greatly influence the formation of their loyalty to the institution. This result is supported by studies from Oliver (1999) and Zeithaml et al. (1996), which affirm that service quality is a key predictor in creating customer or service user loyalty in the context of higher education.

Service quality has proven to be a key variable that directly affects both student loyalty and work culture, while work culture does not have a direct effect on student loyalty. These findings emphasize the importance of strengthening service quality as a primary strategy in building sustainable student loyalty, while also reinforcing the institution's internal work culture.

Table 10. Testing of Mediation/Intervening Variables

Indirect Effect	Koef	T-Stat	P-Values	Conclusion
KL => BK => LM	0.005	0.332	0.740	Not Significant

Source: Primary Data Analysis, 2025

The analysis of the indirect effect shows that the path from service quality to student loyalty through work culture has a coefficient of 0.005, with a t-statistic of 0.332 and a p-value of 0.740. The p-value, which is far above the significance threshold of 0.05, indicates that the mediating effect of work culture in the relationship between service quality and student loyalty is not statistically significant. In other words, work culture does not function as an effective mediator in strengthening the influence of service quality on student loyalty.

This finding suggests that although service quality significantly affects work culture and directly influences student loyalty, work culture does not play a mediating role between these variables. This can be explained by the possibility that students as service recipients are more sensitive to the quality of service they directly experience such as responsiveness, reliability, and empathy rather than internal institutional aspects like work culture. Research by Zeithaml, Berry, and Parasuraman (1996) supports this finding, stating that customers' (in this case, students') direct experiences have a greater impact on loyalty than perceptions of internal organizational factors. Meanwhile, work culture has more impact on internal performance and employee satisfaction than on the perceptions of end users of the service (Al-Hawary & Batayneh, 2010). Therefore, based on these results, strategies to enhance student loyalty are more effective when focused directly on improving service quality, rather than relying heavily on the mediation of work culture. Nonetheless, work culture remains important as an internal foundation for the institution but does not show a significant indirect contribution in building student loyalty.

CONCLUSION

Based on data analysis and discussion, this study concludes several important points regarding the influence of MIPA laboratory service quality based on work culture on student loyalty. The quality of MIPA laboratory services has a positive and significant effect on work culture within the higher education environment. This indicates that improving service quality aspects such as tangibility, responsiveness, reliability, empathy, and assurance can strengthen a positive internal work culture, including discipline, openness, and cooperation. Laboratory service quality has a very significant direct effect on student loyalty. Students' perceptions of service quality are the main factor in shaping their loyalty to the institution. Aspects such as physical facilities, staff competence, and responsive services strongly influence student satisfaction and loyalty. Work culture does not have a significant direct or mediating effect on student loyalty. This finding indicates that although work culture is important for internal organizational

management, its role does not directly influence student loyalty as service users. Work culture does not function as a mediator between service quality and student loyalty. In other words, the effect of service quality on student loyalty occurs directly without mediation by work culture.

REFERENCE

Abdillah, W. and Hartono, J. (2014). Partial Least Square (PLS). Yogyakarta: Penerbit Andi.

Ahmed, M., & Shafiq, S. (2014). The impact of organizational culture on organizational performance: A case study of telecom sector. Global journal of management and business research, 14(3), 21-30.

Al-Hawary, S. I. S., & Batayneh, A. M. I. (2010). The effect of marketing communication tools on non-Jordanian students' choice of Jordanian public universities: A field study. International Management Review, 6(2), 90.

Badan Akreditasi Nasional Perguruan Tinggi. (2022). Lampiran Peraturan Badan Akreditasi Nasional Perguruan Tinggi Nomor 22 Tahun 2022 tentang instrumen Pemantauan dan Evaluasi Peringkat Akreditasi Program Studi. Jakarta: Badan Akreditasi Nasional Perguruan Tinggi.

Brown, R. M., & Mazzarol, T. W. (2009). The importance of institutional image to student satisfaction and loyalty within higher education. Higher education, 58, 81-95.

Cerna, P., & Neda, S. (2016). Service quality assessment of instructional laboratories in Haramaya University: Basis for total quality management policy. American Journal of Operations Management and Information Systems, 1(1), 39-47.

Cooper, D. R. Dan Schindler. 2006. Metode Riset Bisnis. Jakarta: PT. Media Global.

Devi, Cynthia, B., Hoyyi, A., & Mukid, M. A. (2015). Analisa Faktor-Faktor Yang Memengaruhi Keputusan Pembelian Menggunakan Partial Lease Square (PLS). Jurnal Gaussian, 4(3), 485–495.

Efe, T. (2021). The Effect of Organizational Culture on Organizational Commitment in the Nigerian Breweries Industry. International Journal of Social Sciences, 4(2), 268-282.

Gazali, M. (2013). Optimalisasi peran lembaga pendidikan untuk mencerdaskan bangsa. Al-TA'DIB: Jurnal Kajian Ilmu Kependidikan, 6(1), 126-136.

Ir H Syamsul Bahri, M. M., Zamzam, H. F., & MM, M. (2021). Model Penelitian Kuantitatif Berbasis SEM-AMOS Pengujian Dan Pengukuran Instrumen. Deepublish.

Kemenristekdikti. (2015). Peraturan Kementerian Riset, Teknologi, Dan Pendidikan Tinggi Republik Indonesia Nomor 44 Tahun 2015 tentang Standar Nasional Pendidikan Tinggi. Jakarta: Kementrian Riset, Teknologi, Dan Pendidikan Tinggi.

Lukum, A., & Paramata, Y. (2015). Students' Satisfaction toward the Services of the Chemical Laboratory. International Journal of Evaluation and Research in Education, 4(1), 22-29.

Masserini, L., Bini, M., & Pratesi, M. (2019). Do quality of services and institutional image impact students' satisfaction and loyalty in higher education?. Social Indicators Research, 146(1), 91-115.

Oliver, R. L. (1999). Whence consumer loyalty?. Journal of marketing, 63(4_suppl1), 33-44.

Parasuraman, A. (1998). Customer service in business-to-business markets: an agenda for research. Journal of business & industrial marketing, 13(4/5), 309-321.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Treating unobserved heterogeneity in PLS-SEM: A multi-method approach. In Partial least squares path modeling: Basic concepts, methodological issues and applications (pp. 197-217). Cham: Springer International Publishing.

Zeithaml, V. A., Berry, L. L., & Parasuraman, A. (1996). The behavioral consequences of service quality. Journal of marketing, 60(2), 31-46.