

FACTORS AFFECTING THE SATISFACTION OF STUDENTS, LECTURERS FROM THE FACULTY OF TECHNOLOGY AND SUSTAINABLE DEVELOPMENT WITH THE LABORATORY AT THU DAU MOT UNIVERSITY

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Abstract

The laboratory can be seen as an environment where students can enhance their skills by transferring theoretical knowledge into practice. The purpose of this study is to evaluate the factors affecting the satisfaction of students and lecturers majoring in Chemistry, Biotechnology, and Food Technology from the Faculty of Technology and Sustainable Development at Thu Dau Mot University. A total of 300 students from freshman to seniors and their lecturer were surveyed using a questionnaire comprising 25 observed variables. The obtained information were subsequently analyzed using Exploratory Factor Analysis (EFA) and linear regression modeling. The results indicated that the proposed model consists of four independent factors (laboratory facilities, service competence, responsiveness, and school support) and one dependent factor (satisfaction), which demonstrated reliability with Cronbach's Alpha coefficients greater than 0.6 and total variable correlation coefficients above 0.3. The EFA results of 19 accepted observed variables showed correlations among them, with a KMO value of 0.931, a Bartlett's test significance of 0.000, and a total extracted variance of 70.435%. These 19 observed variables were grouped into four independent factors that correlated with the dependent factor (satisfaction with four observed variables), with sig = 0.000. The linear regression analysis confirmed the appropriateness of the model regarding the observed variables, with no signs of autocorrelation or multicollinearity. The factors influencing the satisfaction of student and lecturer with the laboratory were ranked, in order of importance, as follows: school support ($\beta = 0.683$), responsiveness ($\beta = 0.130$), and facilities ($\beta = 0.129$). All standardized residuals of the observed variables lay on a straight line, indicating that they followed a normal distribution.

Keywords: EFA, laboratory, linear regression model, satisfaction

1. Introduction

Vietnamese education is increasingly transforming to adapt to the development of the country, in which, laboratories are becoming essential conditions for enhancing the practical skills of the students. With the purpose of taking the learner as the center, the provision of modern facilities contributes to training a highly skilled workforce that meets the practical requirements of enterprises. According to Nguyen Van Diep and Nguyễn Phước Quý Quang (2018) and Beard et al. (2012), facilities play a key role in improving the quality of teaching, learning, and research. In particular, laboratories should be equipped with specialized instruments and equipment (Litzinger et al., 2011), research-supporting Wi-Fi systems (Tianbo, 2012), and must be appropriate for each discipline (Sharma et al., 2009). These are critical foundations that enable students to apply theory into practice and develop their professional competence. However, student satisfaction with laboratories in many universities today still does not fully meet the needs in the context of rapidly advancing technology. This limitation leads to difficulties in attracting students to choose the programs that require a high level of hands-on practice. To enhance competitiveness, universities should pay attention to student feedback, assess the level of satisfaction regarding laboratory facilities, and accordingly develop suitable improvement plans. Only by making comprehensive and effective investments in laboratories can universities truly create high-quality training environments, contributing to the sustainable development of higher education in Vietnam. Moreover, numerous domestic studies have identified factors influencing student satisfaction in education quality, notably the competence of lecturers, facilities, institutional reliability, and training programs (Châu et al., 2013; Liên, 2016; Việt, 2017; Vũ et al., 2021; Tân et al., 2023; Thị, 2023). Additionally, in the research of Giao et al. 2020 on student satisfaction with laboratories and practical training quality at Ho Chi Minh City University of Education, found that facilities, empathy, service competence, and reliability significantly affected satisfaction after surveying 323 second-, third-, and fourth-year students (Giao et al., 2020). Moreover, Duy et al. 2023 studied satisfaction with the operations of several functional departments at Can Tho University, analyzing data from 250 students, and found that staff attitudes, facilities and expertise, and working procedures had clear impacts on students (Duy et al., 2023).

All studies indicate that laboratory quality and student satisfaction are closely and positively correlated, with laboratory quality determining student satisfaction. The better the laboratory quality factors, the higher the level of satisfaction. However, there has been very little research specifically on student satisfaction with laboratories. Therefore, this study was conducted to examine the factors affecting the satisfaction of the student and lecturer with laboratories at Thu Dau Mot University, thereby proposing solutions to address existing limitations and improve the stability and sustainability of practical training quality.

2. Experimental

2.1. Research subjects

The laboratory satisfaction of 300 students and lecturers in the Faculty of Technology and Sustainable Development at Thu Dau Mot University, distributed in three majors: Chemistry, Biotechnology, and Food Technology, from freshman to seniors. The survey was conducted in March and April 2025.

2.2. Methods

2.2.1. Student satisfaction evaluation model for laboratory services

Based on the SERVPEF research model developed in both international and domestic studies (Cronin et al., 1992; Huong et al., 2016), this research designed an appropriate measurement scale tailored to the specific conditions. The factors influencing the satisfaction of the student and lecturer at the Faculty of Technology and Sustainable Development was established including four groups of factors (*Figure 1*): Hypothesis H01: The laboratory facilities; H02: The service competence of laboratory support staff; H03: The responsiveness of laboratory support staff; H04: The care and attention provided by the university. The more effectiveness of the factors, the greater the student satisfaction.

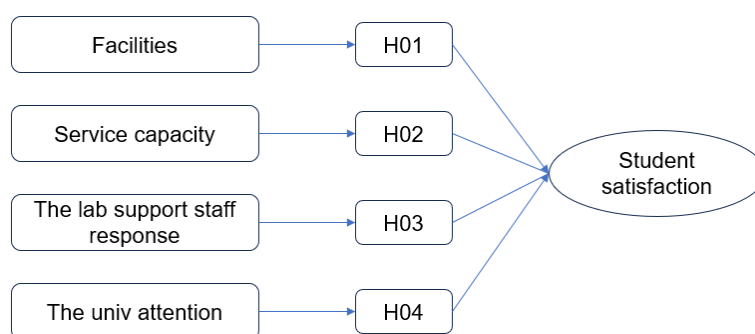


Figure 1. Proposed model for evaluating student satisfaction with laboratory services.

2.2.2. Method for evaluating student satisfaction with laboratories at Thu Dau Mot University

The questionnaire consists of two sections: Section 1 collects the respondent information of the student, and Section 2 measures the satisfaction of the student and lecturer with the laboratories. The questionnaire comprises 25 observed variables categorized into five factors, four independent factors including laboratory facilities, service competence, responsiveness, and care from the university, corresponding to 5, 4, 6, and 6 observed variables, respectively. And one dependent factor satisfaction including 4 observed variable assessing the satisfaction of the student and lecturer with the laboratory. All observed variables were presented in *Table 1*, using a five-point Likert scale (Likert, 1932) to measure the level of satisfaction, where: (1) Completely Disagree; (2) Disagree; (3) Neutral; (4) Agree; (5) Completely Agree. We selected Exploratory Factor Analysis (EFA) and linear regression analysis. Therefore, the minimum sample size required for factor analysis is at least 5 observations per variable (Hair et al., 1998, 2006). Given that our research model includes 5 groups of factors with a total of 25 observed variables, the study required a minimum of 125 survey responses.

After collecting the completed questionnaires, data were coded, entered, and processed using SPSS 20.0 software. We performed descriptive statistics and assessed the reliability of the measurement scales through Cronbach's Alpha to examine the internal consistency of the items (Trọng et al., 2008). Items with Cronbach's Alpha below 0.6 were excluded. We conducted EFA to evaluate the impact of factors on the satisfaction of the student and lecturer with laboratories, followed by linear regression analysis. Variables with factor loadings below 0.5 were eliminated. To ensure stability, we set the threshold for factor loadings above 0.5 (Sarstedt et al., 2021).

TABLE 1. Measurement scale of the satisfaction of the student and lecturer with the laboratory.

Observed variable	Coded	Measurement items
Laboratory facilities	CSVC1	The system of laboratories, practical rooms, equipment, and materials is fully equipped and suitable for practical teaching and scientific research in Chemistry, Biology, and Food Technology (Việt, 2017).
	CSVC2	Laboratory systems and equipment are regularly maintained, repaired, and function properly (Huong et al., 2016).
	CSVC3	All necessary documents are readily available in the laboratory for users (Huong et al., 2016).
	CSVC4	Safety equipment and waste collection systems are adequately installed and in good working condition (Nguyễn Văn Điệp and Nguyễn Phước Quý Quang, 2018).
	CSVC5	Laboratory users can access the Internet anytime, anywhere to register and use the laboratories (Liên, 2016).
Service Competence	NLPV1	Laboratory staff are well-resourced and always willing to serve laboratory users (Việt, 2017).
	NLPV2	Laboratory usage procedures are established and easy to follow for users (new proposal).
	NLPV3	Facilities are adequately provided to meet practical teaching and research needs (new proposal).
	NLPV4	Laboratory users can easily look up information and register for use (Nguyễn Văn Điệp and Nguyễn Phước Quý Quang, 2018).
Responsiveness	DU1	Laboratory staff have at least intermediate qualifications, are trained, and can handle laboratory safety incidents (Nguyễn Văn Điệp and Nguyễn Phước Quý Quang, 2018).
	DU2	Laboratory staff are always punctual in addressing assigned tasks (Nguyễn Văn Điệp and Nguyễn Phước Quý Quang, 2018).
	DU3	Laboratory staff maintain a courteous and respectful attitude when working with users (Liên, 2016; Châu et al., 2013; Nguyễn Văn Điệp and Nguyễn Phước Quý Quang, 2018).
	DU4	Laboratory staff can answer all inquiries related to laboratory activities (Việt, 2017).
	DU5	The number of laboratory staff is adequate to meet operational and usage demands (Huong et al., 2016).
	DU6	Damaged equipment is tagged and has appropriate replacement plans (new proposal).
Care from the University (school support)	QT1	Laboratory users receive training on occupational safety when working in laboratories (Huong et al., 2016).
	QT2	All suggestions from laboratory users are heard and addressed by the university (Huong et al., 2016).
	QT3	The university organizes regular dialogue sessions, user surveys, or collects feedback (Huong et al., 2016).
	QT4	Laboratory users are trained in safety procedures, equipment usage, and compliance with laboratory regulations when working and studying in the laboratory (Huong et al., 2016).
	QT5	Laboratory staff understand their mission and demonstrate empathy for users' needs when problems arise (new proposal).
	QT6	The university consistently plans to improve and modernize laboratory facilities (Huong et al., 2016).
Satisfaction	HL1	The entire process of registering and using laboratories is simplified and convenient for users (new proposal).
	HL2	Laboratory users always trust the competence of laboratory service staff (Duy et al., 2023).
	HL3	Laboratory users are satisfied with the facilities provided (Huong et al., 2016).
	HL4	Laboratory users are satisfied with the university's commitment to improving the quality of teaching and learning services (Duy et al., 2023).

3. Results and discussion

3.1. The characteristics of survey sample

A total of 300 valid questionnaires were collected and evaluated by students and lecturers. The results are presented in *Table 2*. Among the respondents, 29.00% were male and 71.00% were female. Students accounted for 93.00% and lecturers accounted for 7.00%. Regarding majors, 23.67% were Biotechnology students, 12.67% were Chemistry students, and 63.66% were Food Technology students. By academic year, 25.09% were second-year students, 43.47% were third-year students, and 31.54% were fourth-year students. This indicates that the majority of surveyed students were female, in their third year, and majoring in Food Technology. All 300 questionnaires were used for Cronbach's Alpha analysis, EFA, and linear regression analysis.

TABLE 2. Description of the research sample.

Sample Characteristics		Frequency	Percentage (%)
Gender	Male	87	29.00
	Female	213	71.00
Object	Student	279	93.00
	Lecturer	21	7.00
Year of Study	2	70	25.09
	3	121	43.37
	4	88	31.54
Major	Biotechnology	71	23.67
	Chemistry	38	12.67
	Food Technology	191	63.66

3.2. The results of Cronbach's Alpha analysis

TABLE 3. The results of Cronbach's Alpha reliability testing.

Coded	A	B	C	D	Coded	A	B	C	D
CSVC1	0.629	0.787	0.824	5	DU5	0.452	0.857		
CSVC2	0.562	0.805			DU6	0.634	0.814		
CSVC3	0.686	0.769			QT1	0.718	0.931	0.933	6
CSVC4	0.571	0.803			QT2	0.813	0.920		
CSVC5	0.649	0.781			QT3	0.828	0.918		
NLPV1	0.745	0.806	0.860	4	QT4	0.810	0.920		
NLPV2	0.712	0.819			QT5	0.812	0.920		
NLPV3	0.664	0.838			QT6	0.838	0.916		
NLPV4	0.704	0.823			HL1	0.569	0.607	0.713	4
DU1	0.627	0.816	0.842	6	HL2	0.484	0.662		
DU2	0.698	0.801			HL3	0.438	0.700		
DU3	0.731	0.796			HL4	0.533	0.635		
DU4	0.636	0.814							

A: Corrected Item-Total Correlation; B: Cronbach's Alpha if Item Deleted; C: Cronbach's Alpha; D: N of Items

The reliability of the measurement scales was evaluated using Cronbach's Alpha coefficient. This coefficient assesses the consistency among observed variables. According to Hair et al. (2006), a Cronbach's Alpha coefficient below 0.6 is considered unacceptable and should be excluded from the research model; a coefficient from 0.6 to 0.7 is acceptable for exploratory studies; from 0.7 to 0.8 is satisfactory; and from 0.8 to 0.95 is considered good. Additionally, any items with an item-total correlation coefficient below 0.3 are considered "irrelevant variables" and should be removed from the factor (Peterson, 1994). The results in *Table 3* show that 5 factors (4 independent factors CSVC,

NLPV, DU, QT and 1 dependent factor HL) had Cronbach's Alpha coefficients greater than 0.6. Moreover, all observed variables had item-total correlations exceeding 0.3 (Hair et al., 2006; Peterson, 1994), demonstrating that the model was reliable and that the measurement scales in this study were statistically valid. Therefore, these factors were retained for further EFA.

3.3. The results of Exploratory Factor Analysis (EFA)

TABLE 4. The result of total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.836	46.503	46.503	8.836	46.503	46.503	4.852	25.536	25.536
2	2.247	11.827	58.330	2.247	11.827	58.330	3.104	16.337	41.873
3	1.246	6.558	64.888	1.246	6.558	64.888	2.857	15.036	56.909
4	1.054	5.546	70.435	1.054	5.546	70.435	2.570	13.526	70.435
5	0.661	3.481	73.916						
6	0.598	3.146	77.062						
7	0.569	2.993	80.055						
8	0.520	2.739	82.794						
9	0.472	2.483	85.278						
10	0.408	2.149	87.427						
11	0.360	1.892	89.319						
12	0.346	1.823	91.142						
13	0.313	1.648	92.791						
14	0.276	1.453	94.244						
15	0.260	1.370	95.614						
16	0.245	1.290	96.904						
17	0.222	1.170	98.074						
18	0.193	1.017	99.091						
19	0.173	0.909	100.000						

Extraction Method: Principal Component Analysis.

A total of 21 independent variables were used for EFA, applying the Principal Component Analysis (PCA) extraction method and Varimax rotation. Among them, two observed variables, DU5 and DU6 (under the factor Responsiveness), had rotated factor loadings less than 0.5 in the first round of EFA, and were therefore removed from the model (Hair et al., 1998) because they did not satisfy the significant loading condition. As a result, 19 independent variables remained and were used in the EFA, with the outcomes shown in Table 4 and Table 5. The results show that Bartlett's Test returned a significance value of $\text{sig} = 0.000 < 0.05$, and $0.5 \leq \text{KMO} = 0.931 \leq 1$. The total variance explained was $70.435\% \geq 50\%$, indicating that 70.435% of the observed variables were explained by the extracted components. These results demonstrate that the observed variables are valid and correlated with one another (Hair et al., 2006; Anderson et al., 1988), and were grouped into four factors. Furthermore, observed variables with factor loadings > 0.5 are considered to be of good quality (Hair et al., 2006). The observed variables within each factor demonstrated convergent validity, as they clustered into distinct groups with loadings above 0.5, confirming a strong and consistent correlation between the variables and their respective factors (Bùi et al., 2024). Thus, it can be concluded that the observed variables in the factor groups of this study are appropriate and have been appropriately classified. This confirms that the hypotheses and structure of the initial research model are statistically meaningful, demonstrating the appropriateness of the factor analysis.

TABLE 5. Results of exploratory factor analysis Rotated Component Matrixa.

	Component			
	1	2	3	4
QT6	0.864			
QT2	0.847			
QT3	0.840			
QT4	0.810			
QT5	0.804			
QT1	0.662			
DU3		0.800		
DU2		0.750		
DU4		0.685		
DU1		0.609		
DU6		0.581		
CSV3			0.817	
CSV5			0.759	
CSV1			0.725	
CSV4			0.649	
CSV2				0.823
NLPV1				0.766
NLPV4				0.626
NLPV3				0.608
Kaiser-Meyer-Olkin Measure of		Sampling Adequacy		0.931
		Approx. Chi-Square		3711.555
Bartlett's Test of Sphericity		df		171
		Sig.		0.000

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. The rotation converged after 7 iterations

For the dependent variable (Satisfaction), the results are presented in Table 6. The EFA results show that sig = 0.000, KMO = 0.729, and one factor was extracted with an eigenvalue = 2.181 and Total Variance Explained = 54.533% > 50%. The factor loadings of the four observed variables were all greater than 0.5, which is considered acceptable, indicating that these dependent variables have sufficient correlation to justify factor analysis.

TABLE 6. Total variance explained and KMO and Bartlett's Test of the satisfaction factor.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.181	54.533	54.533	2.181	54.533	54.533
2	0.764	19.107	73.640			
3	0.566	14.158	87.798			
4	0.488	12.202	100.000			
Kaiser-Meyer-Olkin Measure of				Sampling Adequacy		0.729
				Approx. Chi-Square		229.974
Bartlett's Test of Sphericity				df		6
				Sig.		0.000

Extraction Method: Principal Component Analysis.

The KMO value in our EFA is also consistent with previous studies by Liên (2016); Hương et al. (2016); Giao et al. (2020); Duy et al. (2023), and Búi et al. (2024), all of which reported $KMO > 0.5$ when evaluating student satisfaction with training quality, facilities, and laboratory practices. In addition, our Total Variance Explained result is also similar to that of Búi et al. (2024) with a total variance of 69.8%, and Hương et al. (2016) with 59.78%. Furthermore, the correlation analysis between the independent factors and the dependent factor showed that 19 observed variables were grouped into 4 independent factors, all of which were correlated with the dependent factor (comprising 4 observed variables), with $\text{sig} = 0.000 < 0.05$ for all independent factors. The results are presented in Table 7. All observed variables of these independent and dependent factors were used in the linear regression analysis.

TABLE 7. The correlation between independent and dependent factors.

		CSVctb	NLPVtb	DUtb	QTtb	HLtb
CSVctb	Pearson Correlation	1	0.568**	0.619**	0.496**	0.531**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000
	N	300	300	300	300	300
NLPVtb	Pearson Correlation	0.568**	1	0.582**	0.647**	0.561**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000
	N	300	300	300	300	300
DUtb	Pearson Correlation	0.619**	0.582**	1	0.491**	0.528**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000
	N	300	300	300	300	300
QTtb	Pearson Correlation	0.496**	0.647**	0.491**	1	0.791**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000
	N	300	300	300	300	300
HLtb	Pearson Correlation	0.531**	0.561**	0.528**	0.791**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	
	N	300	300	300	300	300

**. Correlation is significant at the 0.01 level (2-tailed).

3.4. The results of Linear Regression analysis

The R^2 value is used to measure the goodness of fit of the research model. According to Hair et al. (2021), R^2 values of 0.25, 0.5, and 0.75 indicate weak, moderate, and strong levels of model fit, respectively. In our study, an R^2 value of 0.661 (Table 8) indicates that 66.1% of student satisfaction is explained by the independent factors in the model, which reflects a moderate level of model fit. In addition, the ANOVA analysis (Table 8) yielded an F-value of 143.731 with $\text{sig} = 0.000$, demonstrating that the linear regression model fits the observed variables well and is applicable. In other words, the test confirms the appropriateness of the regression model for the observed data. Moreover, the Durbin-Watson value = 1.557, which falls between 0 and 3, indicates no first-order autocorrelation, meaning there is no presence of autocorrelation in the model (Nam, 2008). Furthermore, the Variance Inflation Factor (VIF) values for all factors in the model (ranging from 1.816 to 2.146, Table 9) are all less than 10, indicating no multicollinearity. In fact, the VIF values in our model are below 5, which confirms the reliability of the regression coefficients (Hair et al., 2021).

TABLE 8. The results of model summary^a and ANOVA analysis^b.

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	R ² Change	Change Statistics F Change	df1	df2	Sig. F Change	Durbin-Watson
1	0.813 ^a	0.661	0.656	0.47231	0.661	143.731	4	295	0.000	1.557

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	128.254	4	32.063	143.731	0.000 ^a
	Residual	65.808	295	0.223		
	Total	194.062	299			

a. Predictors: (Constant), QTtb, CSVctb, NLPVtb, DUtb
b. Dependent Variable: HLtb

The results of the standardized regression coefficients (β) (Table 9), with three factors in the model (CSVc, DU, QT) having $\text{sig} < 0.05$ and one factor (NLPV) having $\text{sig} > 0.05$, it indicates that the three independent variables (CSVc, DU, QT) have an impact on the satisfaction of students and lecturers with the laboratory. In addition, the β coefficients also assess the magnitude of the impact of each factor: the larger the standardized β coefficient, the greater the influence of that factor on students' satisfaction. Based on the β coefficients, we ranked the importance of the factors affecting students' satisfaction with the laboratory from highest to lowest. Accordingly, school support ($\beta = 0.683$) has the strongest influence on satisfaction, next is responsiveness ($\beta = 0.130$), followed by facilities ($\beta = 0.129$), corresponding to 68.3%, 13.0%, and 12.9% impact on students' satisfaction with the laboratory, respectively. The factors school support, responsiveness, and facilities all have positive correlations with the satisfaction of the student and lecturer and are statistically significant. Meanwhile, the service competence factor has a negative β coefficient, indicating a negative effect with students' satisfaction. This may be due to the fact that laboratory staff at Thu Dau Mot University have good professional qualifications and positive attitudes, so regardless of whether students are dissatisfied or satisfied, this factor is still rated highly. When school support, responsiveness, facilities, and service competence increase by one unit, the satisfaction of the student and lecturer with the laboratory increases by 0.683, 0.130 and 0.129 units, respectively. The standardized regression equation expressing the change in the dependent variable (students' satisfaction with the laboratory) according to the independent variables is presented as follows: $HL = 0.683*QT + 0.130*DU + 0.129*CSVc$.

TABLE 9. The regression coefficients.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	β			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	0.388	0.151		2.567	0.011					
CSVctb	0.136	0.049	0.129	2.799	0.005	0.531	0.161	0.095	0.540	1.851
NLPVtb	-0.030	0.050	-0.030	-0.598	0.550	0.561	-0.035	-0.020	0.466	2.146
DUtb	0.137	0.049	0.130	2.797	0.005	0.528	0.161	0.095	0.532	1.880
QTtb	0.568	0.038	0.683	14.940	0.000	0.791	0.656	0.507	0.551	1.816

a. Dependent Variable: HLtb

In addition, Figure 2 shows the frequency histogram of the standardized residuals, indicating that they are normally distributed with a standard deviation of 0.993. All residuals of the factors in the model are distributed around the diagonal line from the origin

upward (P-P Plot), running from left to right. This demonstrates that the input data used for analysis are normally distributed, and the residuals also follow a normal distribution. Therefore, the above linear regression model is considered appropriate. The results of the regression analysis in our study are consistent with previous studies by Liên (2016); Việt (2017) and Thị (2023), when evaluating students' satisfaction with training quality.

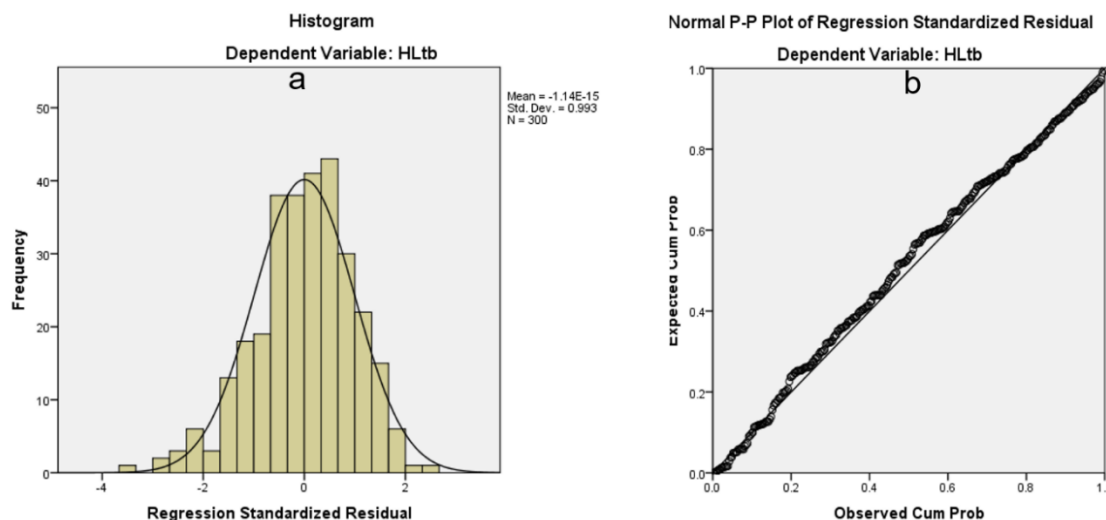


Figure 2. Frequency chart of standardized residuals (a) and P-P plot (b).

The assumptions in our study include facilities, responsiveness and the support of the university that all affect the satisfaction of the student and lecturer with the laboratory. Based on the above analysis results, it is possible to affirm that the proposed research model is in accordance with research data and accept three research hypotheses because when increasing the factors in the study, it will increase the level of the satisfaction of the student and lecturer. With 3 groups of factors, interest, responsiveness, and facilities affect the satisfaction of the student and lecturer with the laboratory in order. In which, the factor with the greatest impact requires prioritized efforts for improvement. To improve the satisfaction of the student and lecturer with the laboratory, the school needs to implement the following methods:

- (i) The group of solutions is about interest, the school needs to supplement, improve, fully equip and modernize the necessary laboratory equipment for students to practice, do scientific research, address the needs and ideas of laboratory users in a modern and effective manner. Receiving services to regularly organize classes to use laboratory equipment and safety so that students can understand and confidently work in the laboratory.
- (ii) The group of solutions in terms of responsiveness, the school needs to add more equipment, regularly maintain and replace broken equipment in a timely manner to meet the needs of scientific practice and research. In addition, laboratory staff should be attentive, responsive, and supportive to laboratory users, answers questions, and pays more attention to laboratory users, making them feel more satisfied.
- (iii) The group of solutions for laboratory facilities, schools need to invest in modernizing equipment, practice rooms, as well as periodic repair and maintenance to help equipment work well, supplement the number of equipment when there is a damage that needs to be replaced promptly. Next, it is necessary to improve the internet system to help students find information related to scientific research practice more well.

4. Conclusion

Improving the satisfaction of the student and lecturer with the laboratory is a challenge for most universities, as it helps enhance the reputation of the university and standing among employers and businesses and aids in retaining and attracting more new students into technology-related fields. The proposed research model consists of four independent factors (Facilities, Service Competence, Responsiveness, School Support) and one dependent factor (Satisfaction), with a total of 25 observed variables, based on a survey of 300 students, and is proven to be appropriate and reliable. The results show that students' satisfaction with the laboratory can be categorized into four groups of factors with 19 observed variables, ranked by impact as follows: the strongest influence is School Support ($\beta = 0.683$), followed by Responsiveness ($\beta = 0.130$), Facilities ($\beta = 0.129$). The proposed research model explains 66.1% of the overall relationship between the observed variables and satisfaction. The model also demonstrates a relatively good model fit, and three of the proposed hypotheses (school support, responsiveness, and facilities) were supported. To further enhance the satisfaction of the student and lecturer with the laboratory, related recommendations have also been mentioned. Based on this model and the observed variables in this study, educational institutions can apply these insights to improve laboratory facilities and services.

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