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The Influence of the Learning System on Industrial Engineering Student Learning Motivation

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A R T I C L E I N F O

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A B S T R A C T

The learning system in higher education is the interaction of students with lecturers, education staff, fellow students, and other factors . Students in carrying out learning activities need certain encouragement so that their learning activities can produce learning achievements that are in line with the expected goals. Maximum student learning achievement certainly needs to take into account various factors that encourage students to study effectively. One of the causal factors that influences this is learning motivation. The motivation obtained by students will make them more responsible for their attitudes, both in the academic and social fields. The research objective of this study is to find out whether the Learning System has an effect on Learning Motivation and wants to know the magnitude of the direct and indirect influence of the Learning System on Learning Motivation. This research has 3 independent variables, namely Facilities, Environment and Learning Administration , 1 intervening variable namely Learning System and 1 dependent variable namely Learning Motivation. The results of this research are known to have a positive and significant effect. The most dominant variable in influencing learning motivation, where the learning system is the connecting variable, is the environmental variable of 5.763. The environment will have an impact on motivating students to study hard

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INTRODUCTION

Since education is one of the most important things in life, everyone has the right to obtain it and should want to continue learning. (Mustari & Rahman, 2014) . A good learning system in higher education should be able to help students develop themselves optimally and be able to achieve their goals learning, in accordance with a student-based learning system (student by learning) (Muhsin, 2021) . Students in carrying out learning activities need certain encouragement so that their learning activities can produce learning achievements that are in line with the expected goals (Mediawati, 2010) .Maximum student learning achievement certainly needs to take into account various factors that encourage students to study effectively. One of the causal factors that influences this is learning motivation. The motivation obtained by students will make them more responsible for their attitudes, both in the academic and social fields. (Batubara & Ammy, 2018)

LITERATURE REVIEW

Based on observations made on students of the Industrial Engineering Study Program, there are many students who experience a decrease in motivation to study, as seen from the increase in attendance, decreased participation in doing assignments, active discussion and feedback in class decreases. Both internal and external stimuli can inspire motivation in an individual. According to Nuryasana and Desiningrum (2020), motivation is the power that propels learning activities, giving them direction and ensuring their continuity, enabling predefined goals to be met throughout teaching and learning activities. Both the current educational system and the students themselves are frequently to blame for the issues that arise.

Learning system in higher education is the interaction of students with lecturers, educational staff, fellow students, and other factors . (Mutia & Leonard, 2015) . These two factors are phenomena that cannot be separated from the learning process, so it is interesting to examine the influence of these factors on learning motivation in the Industrial Engineering Study Program at Medan Area University. Apart from that, student learning motivation cannot be separated from the learning environment, such as facilities and infrastructure, learning methods, learning administration.

METHODOLOGY

Framework of thinking in this research as in Figure 1 below.

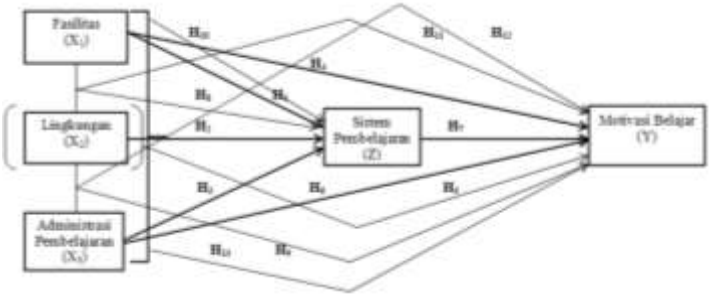

Figure 1. Research Thinking Framework

The Industrial Engineering Study Program at Medan Area University Faculty of Engineering, Campus I, was the site of this research. 163 students from 4 classes in the 2021 and 2022 Stambuk and Industrial Engineering programs at Medan Area University made up the study's population. The number of samples needed, according to the Slovin equation (Sugiyono, 2016), is 116 pupils. surveys or surveys sent to responders with the following G-Form link: https://forms.gle/yrcJiHPPXwvnKz4s7. With the aid of SPSS version 21, data processing employs path analysis and descriptive analysis.

Data Processing and Discussion

Validity Test

The validity test was carried out with the help of a computer using the SPSS (*Statistical Package for Social Science*) program using the *product moment correlation formula* (Janna & Herianto, 2021) , as in table 1 below.

Table 1. Validity Test Results

Variable	Statement	r_{count}	r_{table}	Information
Facilities (X_1)	$X_1.1$	0.539	0.268	Valid
	$X_1.2$	0.290	0.268	Valid
	$X_1.3$	0.434	0.268	Valid
	$X_1.4$	0.403	0.268	Valid
	$X_1.5$	0.691	0.268	Valid
Environment (X_2)	$X_2.1$	0.659	0.268	Valid
	$X_2.2$	0.655	0.268	Valid
	$X_2.3$	0.646	0.268	Valid
	$X_2.4$	0.646	0.268	Valid
	$X_2.5$	0.678	0.268	Valid
Learning Administration (X_3)	$X_3.1$	0.569	0.268	Valid
	$X_3.2$	0.460	0.268	Valid
	$X_3.3$	0.346	0.268	Valid
	$X_3.4$	0.466	0.268	Valid
Learning System (Z)	Z_1	0.849	0.268	Valid
	Z_2	0.736	0.268	Valid
	Z_3	0.679	0.268	Valid
	Z_4	0.822	0.268	Valid
Learning Motivation (Y)	Y_1	0.631	0.268	Valid
	Y_2	0.618	0.268	Valid
	Y_3	0.684	0.268	Valid
	Y_4	0.602	0.268	Valid
	Y_5	0.797	0.268	Valid

Reliability Test

Test using the *Cronbach Alpha formula* means that the value level of an instrument is said to be reliable or not, if the α value ≥ 0.60 means it has a high

level of reliability (Janna & Herianto, 2021) . The SPSS output results for the reliability test are as in table 2 below.

Table 2 . SPSS Reliability Test Output Results

Reliability Statistics	
Cronbach's Alpha	N of Items
0.831	23

Normality Test

K To determine if the data was regularly distributed or not, the olmogrov-Smirnov test was employed. Based on the probability value (Sig), the Kolmogrov-Smirnov test criteria are applied: if sig > 0.05, the data is normally distributed; if sig < 0.05, the data is not.(Lubis et al., 2021)

Table. 3: Normality Test Results of the Learning System as an *Intervening Variable* using the *Kolmogrov-Smirnov Method*

One-Sample Kolmogorov-Smirnov Test		
		standardized Residuals
		116
rmal Parameters [a, b]	an	0.0000000
	. Deviation	1.10156028
st Extreme ferences	solute	0.048
	itive	0.048
	gative	-0.042
tistical Tests		0.048
mp. Sig. (2-tailed)		,200 [c,d]
est distribution is Normal.		
alculated from data.		
illiefors Significance Correction.		
his is a lower bound of the true significance.		

Table 3 provided the significant value of 0.200 for the Kolmogrov-Smirnov test. Since this value is higher than 0.05, it may be said that the examined data has a normal distribution. Table 4 below displays the findings of the Normality Test of Learning Motivation as a Dependent variable using the Kolmogrov-Smirnov Method.

Table. 4 . Results of the Normality Test of Learning Motivation as a *Dependent variable* using the *Kolmogrov-Smirnov Method*

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residuals
		116
Normal Parameters [a, b]	Mean	0.0000000
	Std. Deviation	1.30828191

Most Extreme Differences	Absolute	0.061
	Positive	0.051
	Negative	-0.061
Statistical Tests		0.061
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 Table 4 , the significance value of the *Kolmogrov-Smirnov test is* 0.200. This value is greater than 0.05, so it can be concluded that the data tested is normally distributed.

Multiple Linear Regression Analysis

Three different types of variables are employed in this analysis: the independent variables, which are facilities, environment, and learning administration; the dependent variable, which is learning motivation; and the intervening variable, which is the learning system. The computations and data analysis of the multiple linear regression analysis used to determine the impact of the independent variable on the dependent variable are presented below. (Lubis, 2021)

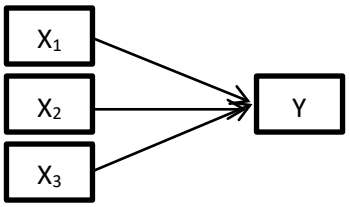

Figure 2. Multiple Linear Regression

Anova Test Results (F Test) Facilities, Environment and Learning Administration on the Learning System .

Table 5: Anova Test Results (F Test) Facilities, Learning Environment and Administration on the Learning System

ANOVA a						
Model		Sum of Squares	df	an Square	F	Sig.
1	Regression	75,170	3	25,057	20,111	,000 b
	Residual	139,545	112	1,246		
	Total	214,716	115			
a. Dependent Variable: Tot_Z						
b. Predictors: (Constant), Tot_X3, Tot_X1, Tot_X2						

The calculated F value is 20.111 > F table is 3.08 and the significance value in the ANOVA table is 0.000 < 0.005 so that Ha is accepted, where ρzx1x2x3 ≠ 0,

there is an influence of facilities, environment and learning administration on learning motivation. The results of the Multiple Linear Regression Analysis of Learning Facilities and Administration on the Learning System can be seen in table 6 below.

Table 6. Multiple Linear Regression Analysis of Learning Facilities and Administration
Against the Learning System

Coefficients [a]						
Model		Unstandardized Coefficients		Standardized Coefficients	Q	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,027	1,471		2,057	0.042
	Tot_X1	0.035	0.022	0.132	1,564	0.121
	Tot_X2	0.450	0.078	0.492	5,763	0,000
	Tot_X3	0.158	0.108	0.135	1,454	0.149
a. Dependent Variable: Tot_Z						

Based on table 5, the linear regression equation results are obtained, namely:
$Z = 3.027 + 0.035 X_1 + 0.450 X_2 + 0.158 X_3$.

Testing Direct and Indirect Effects between Variables
Substructure 1

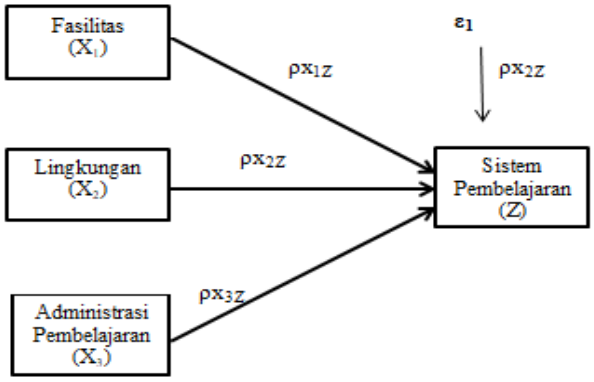

Figure 3. Substructure configuration 1

Correlation Test Results (Adam, 2018) Substructure 1 can be seen in table 7 below.

Table 7. Substructure Correlation Test Results 1

Correlations					
		Tot_Z	ot_X1	ot_X2	ot_X3
	_Z	1,000	0.192	0.551	0.395

rson rrelation	_X1	0.192	1,000	0.012	0.399
	_X2	0.551	0.012	1,000	0.420
	_X3	0.395	0.399	0.420	1,000
(1-tailed)	_Z		0.019	0,000	0,000
	_X1	0.019		0.450	0,000
	_X2	0,000	0.450		0,000
	_X3	0,000	0,000	0,000	
	_Z	116	116	116	116
	_X1	116	116	116	116
	_X2	116	116	116	116
	_X3	116	116	116	116

The results of the Substructure 1 *Summary Model* Test can be seen in table 8 below.

Table 8 : *Model Summary* Substructure 1 Test Results

Model Summary									
					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	,592 [a]	0.350	0.333	1.11622	0.350	20,111	3	112	0,000
a. Predictors: (Constant), Tot_X3, Tot_X1, Tot_X2									

The value of the R-Square Determination coefficient (R) = 0.350, which means that the contribution of the influence of the learning facility, environment and administration variables is 35% on the learning system variables, and the remaining influence is ρεzx1x2x3= $\sqrt{1-0{,}350}$ =0.806 or can be read as 80.6%. The R Square value has a strong influence on learning facilities, environment and administration on learning motivation. Based on the significance value of 0.000 <0.05, it can be concluded that the independent variables simultaneously have a correlation with the learning system variables. The results of the Anova Test (F Test) for Substructure 1 can be seen in table 9 below.

Table 9: Anova Test Results (F Test) Substructure 1

ANOVA [a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	75,170	3	25,057	20,111	,000 [b]
	Residual	139,545	112	1,246		
	Total	214,716	115			
a. Dependent Variable: Tot_Z						
b. Predictors: (Constant), Tot_X3, Tot_X1, Tot_X2						

The significance value in the ANOVA table is 0.000 < 0.05 so that H_0 is rejected, where ρzx1x2x3 ≠ 0, there is a simultaneous influence of facilities, environment and learning administration on the learning system. The results of Substructure Path Coefficient 1 can be seen in Table 10 below:

Table 10 : Results of Substructure Path Coefficient 1

Between Variables	Path Coefficient	Q	F	Test Results	R Square	Variable Coefficient
X_1 against Z	0.132	1,564	20,111	H_0 is accepted	0.350	(**0.806**) ^{2} = 0.649
X_2 against Z	0.492	5,763		is rejected		
X_3 against Z	0.135	1,454		is accepted.		

So the form of the equation is **$Z = 0.132X_1 + 0.492X_2 + 0.135X_3 + 0.649\varepsilon_1$**

Substructure 2

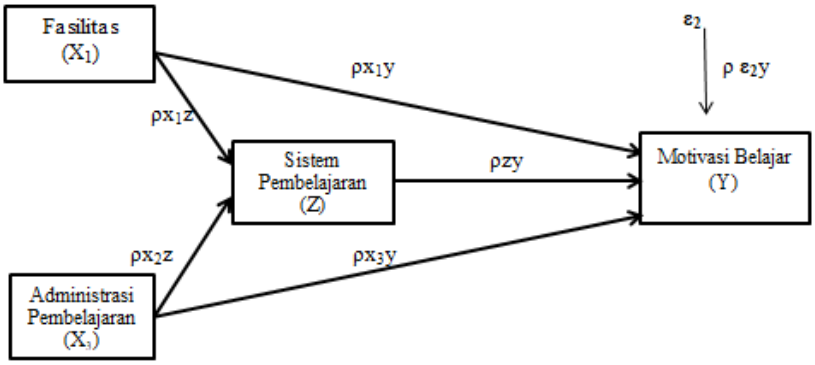

Figure 4. Substructure 2 configuration

Table 11 . Substructure Correlation Test Results 2

Correlations					
		Tot_Y	Tot_X1	Tot_X3	Tot_Z
Pearson Correlation	Tot_Y	1,000	0.233	0.502	0.637
	Tot_X1	0.233	1,000	0.399	0.192
	Tot_X3	0.502	0.399	1,000	0.395
	Tot_Z	0.637	0.192	0.395	1,000
Sig. (1-tailed)	Tot_Y		0.006	0,000	0,000
	Tot_X1	0.006		0,000	0.019
	Tot_X3	0,000	0,000		0,000
	Tot_Z	0,000	0.019	0,000	
N	Tot_Y	116	116	116	116
	Tot_X1	116	116	116	116
	Tot_X3	116	116	116	116
	Tot_Z	116	116	116	116

Tables 1 2 . *Model Summary* Substructure 2 Test Results

Model Summary									
					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	,693 [a]	0.481	0.467	1.38308	0.481	34,538	3	112	0,000
a. Predictors: (Constant), Tot_Z, Tot_X1, Tot_X3									

Table 1 3. Partial Test Results (t Test) Substructure 2

Coefficients [a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	0.792	1,755		0.451	0.653
	Tot_X1	0.006	0.027	0.017	0.232	0.817
	Tot_X3	0.467	0.128	0.290	3,652	0,000
	Tot_Z	0.720	0.103	0.519	7,001	0,000
a. Dependent Variable: Tot_Y						

Table 14. Anova Test Results (F Test) Substructure 2

ANOVA [a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	198,202	3	66,067	34,538	,000 [b]
	Residual	214,246	112	1,913		
	Total	412,448	115			
a. Dependent Variable: Tot_Y						
b. Predictors: (Constant), Tot_Z, Tot_X1, Tot_X3						

Table 15. Results of Substructure Path Coefficient 2

Between Variables	**Path Coefficient**	**Q**	**F**	**Test Results**	**R Square**	**Variable Coefficient**
X_1 against Y	0.017	0.232	34,538	H_0 is accepted	0.481	(**0.519**) ^{2} = 0.269

X_3 against Y	0.290	3,652		H_0 is rejected		
Z against Y	0.519	7,001		H_0 is rejected		

So the form of the equation is $\mathbf{Y = 0.017X_1 + 0.290X_3 + 0.519Z + 0.519\varepsilon_2}$

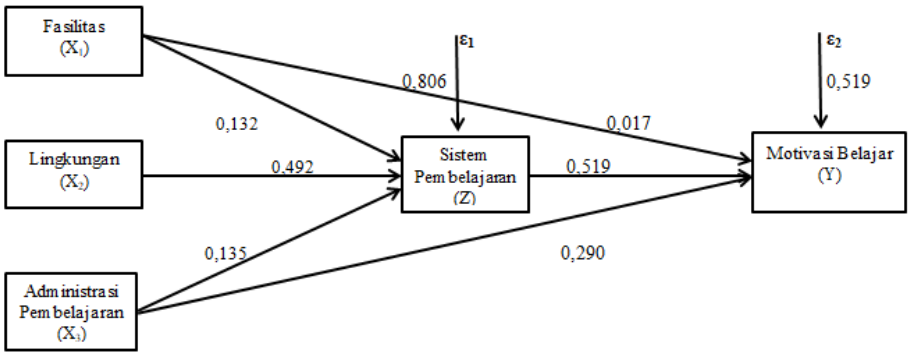

Figure 5. Overall Path Coefficient Structure

RESEARCH RESULT AND DISCUSSION

The data analysis results indicate that facilities, environment, learning administration, and learning systems, as intervening variables, have a significant positive influence on students' learning motivation in the Medan Area Industrial Engineering Study Program. The most dominant variable in influencing learning motivation, where the learning system is the connecting variable, is the environmental variable of 5.763. The environment will have an impact on motivating students to study hard. The environment in this research is the unity of space in formal educational institutions which has an influence on the learning process on campus which consists of facilities and infrastructure in accordance with the needs of the learning process (laboratories, classrooms, etc.) teaching methods for lecturers in classrooms that are fun on campus, such as students with the head of study program. , lecturers, staff. According to the findings of a study conducted at Medan Area University on simultaneous influence, all three independent variables, one intervening variable, and the dependent variable have a positive and substantial influence.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the tests carried out, conclusions can be drawn regarding the influence of the learning system on learning motivation, namely:

1. Learning System variables have a significant effect on Learning Motivation Variables .
2. The indirect influence of Facilities on Learning Motivation through the Learning System is large, and the total influence of Facilities on Learning Motivation is 0.06 and 0.0855

3. The large indirect influence of the environment on learning motivation through the learning system, and the total influence of the environment on learning motivation is 0.2553
4. The direct influence of Learning Administration on Learning Motivation is 0.290 and the indirect influence of Learning Administration on Learning Motivation through the Learning System is 0.150, and the total influence of Learning Administration on Learning Motivation is 0.360 .

ADVANCED RESEARCH

In writing this article the researcher realizes that there are still many shortcomings in terms of language, writing, and form of presentation considering the limited knowledge and abilities of the researchers themselves. Therefore, for the perfection of the article, the researcher expects constructive criticism and suggestions from various parties.

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