Analysis of Online Learning During the Covid-19 Period using the Ordinary Least Square (OLS) Method

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ABSTRACT

Education is the main capital to create quality human resources to face the challenges of the times that continue to develop rapidly. At the end of 2019, Indonesia experienced an outbreak of the COVID-19 pandemic. It makes learning activities carried out from home or online. Online learning aims to meet educational standards by utilizing information technology using a computer or mobile devices that are interconnected between students and teachers via an internet connection. However, there are several problems in the online learning process, both among teachers and students, as well as the facilities used in learning. The method of least squares (Ordinary Least Square) is one of the estimation methods used to analyze the relationship between the predictor variable (independent variable) and the response variable (dependent variable). This study aimed to identify and analyze online learning problems during the covid-19 pandemic. The data used in this study were sourced from Public Senior High School 11 Ambon, with the variables used being learning motivation (X_1), teacher's role (X_2), and student learning outcomes (Y). This study concluded that student learning outcomes in online learning at Public Senior High School 11 Ambon were in a low category, student motivation in learning is in the moderate category, and the role of the teacher is in the moderate category. In addition, the variables of learning motivation and the role of the teacher together have a positive effect on student learning outcomes. The amount of the contribution of the influence of learning motivation and the role of the teacher to student learning outcomes at Public Senior High School 11 Ambon is 61.9%, while other factors outside the study influence the remaining 38.1%.

1. Introduction

Education is one of the efforts to create quality human resources so that they can face the challenges of a world that continues to grow rapidly. The meaning of education is a conscious and planned effort to create a learning atmosphere in the learning process so that students actively develop their potential to have spiritual strength, religion, self-control, personality, intelligence, noble character, and skills needed for themselves, society, nation, and state [1].

The coronavirus outbreak is currently sweeping the world, including Indonesia. In addition, on March 11, 2020, the World Health Organization (WHO) announced the status of a global pandemic for the 2019 coronavirus, also called covid-19. Coronaviruses are a large family of viruses that cause disease in humans that cause respiratory tract infections ranging from the common cold to death [2].

To anticipate the transmission of the virus, the government has issued various policies, such as isolation and social and physical distancing to large-scale social restrictions (PSBB). This condition expects the whole community to continue to do activities, work, worship, and study at home. In addition, it requires the school to innovate in the learning process. One form of this innovation is online learning [3], [4].

Online learning aims to meet educational standards by utilizing information technology using computers or mobile phones that are interconnected between students and teachers via an internet connection [5]. In online learning, students can take part in the learning process anywhere and anytime, so the teaching and learning process can still be carried out well even though they are in the middle of the covid-19 pandemic. However, in online learning, problems still become obstacles in its implementation. Based on complaints from the community and the parents of a student, it shows that there are several problems in the online learning process, namely, the motivation of students to participate in online learning is very low. It can be seen from the lack of interaction between teachers and students or even between students. In addition, the ability of students to absorb the subject matter delivered by the teacher is less effective, so learning is disrupted. Certain subjects, such as biology subjects, make teachers unable to do online learning because there must be in-person meetings such as practicum, for example. It requires direct monitoring and delivery by the teacher to students. Not all facilities, such as laboratory equipment, are owned by students to support online learning. There are even some students who do not have other supporting tools such as mobile phones and computers. It resulted in many students who could not follow the learning process. Likewise, the internet network facilities in various student residences in Ambon city have not functioned optimally and adequately. Furthermore, based on other observations, there are several problems related to online learning, such as low motivation, less enthusiasm, interest in following the lesson, do not pay attention to the explanation by the teacher, and a lack of activity in a student regarding the learning material. In addition, students lack master the internet and computers, so problems sometimes occur in the learning process. Besides, online learning also makes teachers give assignments to students more than usual. Lessons make students lazy and ineffective and focus on following the learning process. It is because the learning process can be done while eating, lying down, or even participating in other activities. Online learning is an alternative solution to continue learning activities during the COVID-19 pandemic, as a student's right to obtain an education. However, in essence, a student is less effective in doing this online learning, especially in biology subjects both theoretically and practically, because some teachers have not been able to master the proper tutorials or techniques in online learning so that changes in learning behavior are less noticed. The teacher provides virtual and module subject matter and is continued with assignments within a specified time which tends to measure the cognitive aspects of students only. In contrast, developments in effective and psychomotor aspects are difficult for teachers to know [6][7].

The purpose of learning does not only focus on the academic aspect, but more than that namely changes in attitudes and character [8]. In this case, the learning process is not just transferring knowledge from a teacher to students. However, learning is a process of constructing knowledge following constructivism in education [9][10]. In addition, online learning is also not suitable for all students because each student has a different learning style. Student learning styles generally consist of visual, auditory, and kinesthetic learning styles [11]. Students who tend to learn visually easily accept lessons by seeing or observing first before learning new things. Students whose learning style is auditory, then he must listen to the explanation first to easily understand the lesson. Meanwhile, students whose learning style is kinesthetic want always to move and are more interested in looking for themselves without always having to read [12]. In addition, there are still teachers and students who have inadequate digital knowledge and skills on online learning technology devices and are unfamiliar with their use. Of course, it becomes hampered, so learning objectives cannot be achieved [13]. Based on the background described above, the researchers are interested in researching the Analysis of Online Biology Learning during the Covid-19 pandemic on student learning patterns. One method often used regarding regression analysis is the ordinary least squares method or the Ordinary Least Square (OLS) method. It is a proposition that reveals that the best straight line that can represent the relationship point of the predictor variable (independent variable) and the response variable (dependent variable) is a straight line that meets the criteria for the number of squares the difference between the observation point and the point on the line is the minimum [14]. The least-squares method will produce an unbiased, linear estimator with a minimum variance of the Best Linear Unbiased Estimator (BLUE). This method is used to estimate the parameters of each equation in this system if the equations are not related to one another [15].

2. Research Methods

This research was a quantitative descriptive study. The data obtained from this study were primary data taken directly from the research object. The place of this research was in Public Senior High School 11 Ambon. The research and data processing was carried out for 3months, from April to June 2020. The variables used in this study consisted of two independent variables, namely learning motivation (X_1) and the role of the teacher (X_2), while the dependent variable is student learning outcomes (Y).

3. Results And Discussion

3.1. Descriptive Analysis of Research Variables

a. Student Learning Outcome Variables

Data analysis of student learning outcomes was measured based on student learning outcomes in basic biology subjects. The detailed description of Student Learning Outcomes based on the absolute criteria that have been set can be seen in Table 1, below.

Table 1. Conversion of Student Learning Outcomes (Y)

No	Interval	Frequency	Percentage	Criteria
1.	85-100	5	25%	Very High
2.	70-84	6	26%	High
3.	55-79	6	2%	Moderate
4.	40-54	10	13%	Low
5.	<39	8	33%	Very Low
Total		Total 35	100%	

Based on Table 1, it can be seen that the number of respondents who perceive student learning outcomes in very high category as many as 5 respondents (25%), 6 respondents (26%) in a high category, 6 respondents (2%) in a moderate category, 10 respondents (13%) in a low category and the rest 8 respondents (33%) in a very low category. In addition, the mean or average score of 53.7 is obtained, which lies in the 40-54 interval with low qualifications. Therefore, it can be concluded that student learning outcomes at Public Senior High School 11 Ambon generally have qualifications or are in the low category.

b. Learning Motivation Variable (X_1)

Data analysis of learning motivation variables with research instruments was as many as 29 questions with 5 choices, so that the item scores can be determined as follows:

Highest score 5 x 29 = 145
Lowest score 1 x 29 = 29
Range = 116

The detailed description of the motivation to learn at Public Senior High School 11 Ambon based on the absolute criteria that have been set can be seen in Table 2 below.

Table 2. Conversion of Learning Motivation Value (X_1)

No	Interval	Frequency	Percentage	Criteria
1.	131-145	6	46%	Very High
2.	116-130	6	9%	High
3.	102-115	7	22%	Moderate
4.	87-101	9	14%	Low
5.	< 87	7	9%	Very Low
Total		35	100%	

Based on Table 2, it can be seen that the number of respondents who perceive learning motivation in a very high category are 6 respondents (46%), 6 respondents (9%) in the high category, and 7 respondents (22%) in a moderate category. The rest are in a low category as many as 9 respondents (14%), and the very low category as many as 7 respondents (9%). In addition, the mean value or average score is 108.3, located in the 102-115 interval with the high category. Therefore, it can be concluded that learning motivation at Public Senior High School 11 Ambon, in general, has moderate qualifications.

c. Teacher's Role Variable (X₂)

Data analysis of the teacher's role with research instruments were as many as 10 questions with 5 choices so that the item scores can be determined as follows.

Highest score 5 x 10 = 50
Lowest score 1 x 10 = 10
Range = 40

The detailed description of the teacher's role based on the absolute criteria that have been set can be seen in Table 3, below:

Table 3. Conversion of Teacher Role Values (X_2)

No	Interval	Frequency	Percentage	Criteria
1.	45-50	7	29%	Sangat Tinggi
2.	40-44	7	10%	Tinggi
3.	35-49	10	23%	Sedang
4.	30-34	5	25%	Rendah
5.	<30	6	13%	Sangat Rendah
	Total	35	100%	

Based on Table 3, it can be seen that the number of respondents who perceive the role of teachers in a very high category is 7 respondents (29%), 7 respondents (10 %) in a high category, 10 respondents (23%) in a moderate category, 5 respondents (25%) are in a low category and the very low category as many as 6 respondents (13%). In addition, the mean or average score is 37.3, located in the 35-49 interval with qualifications or in the moderate category. Therefore, it can be concluded that the role of teachers at Public Senior High School 11 Ambon generally has moderate qualifications.

3.2. Assumption Test

a. Normality test

The normality test of data is an absolute assumption that must be fulfilled in regression analysis, especially when using parametric statistics. If the assumption of normality is not met, then the conclusion from the test results is not efficient. The normal distribution of data can be determined by using the Kolmogorov-Smirnov test. The results of data processing from the Kolmogorov-Smirnov test can be seen in Table 4, below:

Table 4. One-Sample Kolmogorov-Smirnov Test

		Student learning outcomes	Learning Motivation	Teacher's Role
N		35	35	35
Normal Parameters[a,b]	Mean	126.9045	120.1146	36.9236
	Std. Deviation	31.99795	23.20946	8.47360
Most Extreme Differences	Absolute	.194	.181	.125
	Positive	.194	.142	.125
	Negative	-.166	-.181	-.123
Test Statistic		.194	.181	.125
Asymp. Sig. (2-tailed)		.110[c]	.220[c]	.215[c]

In Table 4, it can be seen that the significance values show whether the data is normally distributed. Therefore, the guideline for decision-making is that if the significance value < 0.05, the data is not normal, and vice versa, if the significance value is > 0.05, the data is normal.

Based on Table 4, it can be seen that the significance value for the four variables shows a value of more than 0.05. It is concluded that the data is normally distributed.

b. Linearity Test

The linearity test is intended to determine whether there is a linear relationship between the independent variables of learning motivation and the role of the teacher and student learning outcomes calculation results obtained from the following model:

$$\hat{Y} = 107,42 + 0,162X_1 \text{ and } \hat{Y} = 136,972 + 0,273X_2$$

Furthermore, the linearity test of the equation obtained the following results.

Table 5. Linearity Test Results of Learning Motivation (X_1) on Student Learning Outcomes (Y)

			Sum of Squares	df	Mean Square	F	Sig.
Student Learning Outcomes * Learning motivation	Between Groups	(Combined)	42789.13	51	839.0	.753	.869
		Linearity	2209.34	1	2209	1.984	.162
		Deviation from Linearity	40579.75	50	811.5	.729	.893
	Within Groups		116934.4	105	1113		
	Total		159723.5	156			

Based on Table 5, the significance value is obtained at deviation from linearity = 0.893 > 0.05. It means that H_0 is accepted, or it is concluded that learning motivation (X_1) with Student Learning Outcomes in School (Y) has a linear relationship.

Meanwhile, the results of the linearity test based on the values of F_{count} and F_{table} were found after we first look for df_1 dan df_2.

df_1 = k-1 = 2-1 = 1 , df_2 = n-k = 35-2 = 33 and F_{table} = 3,90.

Based on the calculation results, it is known that the value of F_{count} from *deviation from liniearity* is 0,729 and the value of F_{table} is 3,90 or in other words, the value F_{count} (0,729) < F_{table} (3,90). It is concluded that learning motivation (X_1) with Student Learning Outcomes (Y) has a linear relationship.

Table 6. The Result of Teacher's Role Linearity Test (X_2) on Student Learning Outcomes (Y)

			Sum of Squares	Df	Mean Square	F	Sig.
Student Learning Outcomes * Teacher's Role	Between Groups	(Combined)	35479.780	33	1075.14	1.064	.390
		Linearity	832.760	1	832.760	.824	.366
		Deviation from Linearity	34647.020	32	1082.71	1.072	.381
	Within Groups		2215.432	124243.7	123	1010.1	
	Total		6744.675	159723.5	156		

Based on Table 6, the significance value is obtained at deviation from linearity = 0.381 > 0.05. It means that H_0 is accepted. It can be concluded that the role of the teacher (X_2) with Student Learning Outcomes (Y) has a linear relationship. Meanwhile, the results of the linearity test based on the value of F_{count} and F_{table} first reach the value df_1 and df_2.

df_1 = k-1 = 2-1 = 1

df_2 = n-k = 35-2 = 33 and F_{table} = 3,90.

Based on the calculation results, it is known that the value of F_{count} of deviation from linearity is 1.072 and the value of F_{table} is 3,90 or in other words the value of F_{count} (1,072) < F_{table} (3,90). It is concluded that the role of the teacher (X_2) with Student Learning Outcomes in School (Y) has a linear relationship.

c. Multicollinearity Test

A multicollinearity test was conducted to detect that the regression model did not contain a linear relationship between the predictor variables. If a model has a strong correlation between the predictor variables, then the model has a multicollinearity problem. Forming a good regression model should avoid these problems. The Tolerance (Tol) or Variance Inflation Factor (VIF) value for each predictor variable can be used to detect the presence of multicollinearity in the model.

Table 7. Multicollinearity Test Results for Learning Motivation Variables (X_1),
Teacher's Role (X_2) on Student Learning Outcomes (Y)

	Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	117.42	17.59		6.675	.000		
	Motivation to learn	.161	.110	.117	1.460	.146	1.000	1.000
	Teacher's Role	-.266	.301	-.070	-.883	.379	1.000	1.000

Based on Table 7, it can be seen that the values of the Tolerance of Learning Motivation Variables (X_1) and the Role of the Teacher (X_2), that is, 1,000 is greater than 0.10. Meanwhile, the VIF Value of Learning Motivation Variables (X_1) and the Role of the Teacher (X_2), that is, 1,000 is less than 10.00. Therefore, it can be concluded that there is no indication of multicollinearity problems in the predictor variable.

3.3. Research Hypothesis Test

Hypothesis testing in this study aimed to test the three hypotheses. The first test was to test whether there is a positive influence between learning motivation (X_1) on Student Learning Outcomes (Y). The second test was to test whether there is a positive influence between the teacher's role (X_2) on Student Learning Outcomes (Y). Furthermore, the third test was to test whether there is a positive influence on learning motivation (X_1) and the Role of the Teacher (X_2) together on Student Learning Outcomes (Y). Simple linear regression analysis and multiple linear regression were used to test the three hypotheses.

Multiple linear regression analysis is intended to test how much positive influence learning motivation and teacher's role on student learning outcomes at Public Senior High School 11 Ambon. Furthermore, it is written in the following hypothesis:

$H_0 : \mu_i = 0$; i=1,2   (X_1 and X_2 has no effect on Y)

$H_0 : \mu_i \neq 0$ (X_1 and X_2 has effect on Y)

Furthermore, the results of the multiple linear regression method are obtained in Table 8, below.

Table 8. Results of Testing Multiple Linear Coefficients of Work Motivation Variable (X_1) and the Role of the Teacher (X_2) on Student Learning Outcomes (Y)

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	117.428	17.592		6.675	.000
	Learning Motivation	.161	.110	.117	1.460	.014
	Teacher's Role	.266	.301	-.070	.883	.037

Based on Table 8, the multiple linear regression equation model is obtained as follows:

$$\hat{Y} = 117{,}428 + 0{,}161X_1 + 0{,}266X_2$$

Furthermore, the coefficients b1 and b2 are called the regression direction coefficients and state the change in the average variable of Student Learning Outcomes (Y) for each change in learning motivation (X_1) and the teacher's role (X_2). Each of which is one unit so that the equation can be translated:

1. The constant of 117.428 states that if there is no value for learning motivation (X_1) and the Role of the Teacher (X_2) then the value of Student Learning Outcomes is 117.428.
2. Regression coefficient X_1 of 0.161 states that for every addition of 1 value of learning motivation, the value of student learning outcomes increases by 0.161.
3. Regression coefficient X_2 as much as 0.266 states that for every additional 1 value of the Teacher's Role, the value of Student Learning Outcomes increases by 0.266.
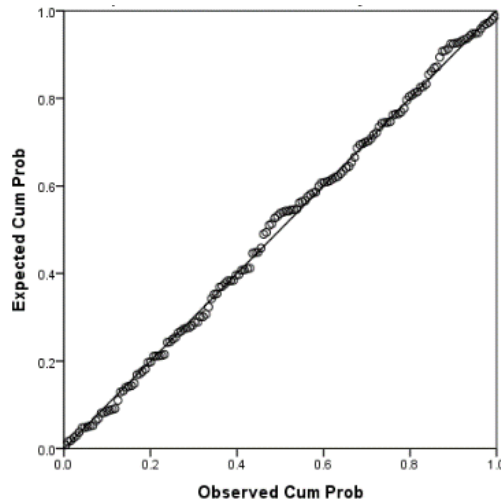
Figure 1. Hypothesis Equation

Furthermore, to test the significance of the multiple linear regression coefficients, the t-test was carried out. The value of t_{count} for regression coefficient X_1 is 0,161 with value $sig = 0,014$ and value t_{count} for regression coefficient X_2 is 0,266 with value $sig = 0,037$. When compared with $\alpha = 0.05$, both sig values are smaller than α. It shows that the variables of learning motivation and teacher's role affect student learning outcomes at Public Senior High School 11 Ambon. Furthermore, the influence of learning motivation and the role of the Teachers on Student Learning Outcomes at Public Senior High School 11 Ambon can be seen in Table 4.9 below:

Table 9. Results of Analysis of Multiple Linear Regression Variable Motivation Work (X_1) and the Role of the Teacher (X_2) on Student Learning Outcomes (Y)

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3002.654	2	1501.327	11.475	.023[b]
	Residual	156720.913	154	1017.668		
	Total	159723.567	156			

Based on Table 9, the value of $f_{count} = 11,475$. To get value F_{table}, it is calculated by formula $df_1 = k-1 = 3-1 = 2$, whereas $df_2 = n-k = 35-3 = 154$ then we get the value $F_{table} = 3,90$. The interpretation of the Table 4.17 stated that it turned out $F_{count} = 11,475 > F_{table} = 3,90$. Furthermore, for significance, it is obtained the value $sig = 0,023 < \alpha = 0,05$ then H_0 is rejected and H_1 is accepted. This means that learning motivation (X_1) and the Role of the Teacher (X_2) have an influence on student learning outcomes (Y) at Public Senior High School 11 Ambon.

The amount of the effect of perceptions of learning motivation and teacher's role simultaneously on student learning outcomes at Public Senior High School 11 Ambon can be known based on the coefficient of determination (R^2) as follows:

Table 10. Coefficient of Determination of Work Motivation Variables (X_1) and Teacher Role Variables (X_2) on Student Learning Outcomes (Y)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.537[a]	.619	.406	31.90091

Based on Table 10, the correlation value (R) = 0.537, which means that the relationship between the variables of learning motivation and the teacher's role has a sufficient relationship. The amount of the influence of the independent variables (Learning Motivation and Teacher's Role) on the dependent variable (Student Learning Outcomes) can be seen from the value of the coefficient of determination (R^2), which is 0.619. Thus, it can be concluded that the magnitude of the influence of learning motivation and the role of teachers on student learning outcomes at Public Senior High School 11 Ambon is 61.9%, while other variables outside the study influence the remaining 38.1%.

4. Conclusions

Based on the results and discussion, several conclusions were obtained as follows:

1. Student Learning Outcomes at Public Senior High School 11 Ambon were in the very high category with as many as 5 respondents (25%), 6 respondents (26%) in a high category, 6 respondents (2%) in a moderate category, 10 respondents (13%) in a low category, and 8 respondents (33%) in a very low category. In addition, the mean or average score of 53.7 is obtained, which lies in the 40-54 interval with low qualifications. Therefore, it can be concluded that student learning outcomes at Public Senior High School 11 Ambon generally have qualifications or are in a low category.

2. Student Learning Motivation at Public Senior High School 11 Ambon was in the very high category with as many as 6 respondents (46%), 6 respondents (9%) in a high category, 7 respondents (22%) in a moderate category, and the rest are 9 respondents (14%) in a low category and 7 respondents (9%) in a very low category. In addition, the mean value or average score is 108.3, located in the 102-115 interval with qualifications or in the high category. Therefore, it can be concluded that learning motivation at Public Senior High School 11 Ambon generally has moderate qualifications.

3. The role of teachers in Public Senior High School 11 Ambon is in a very high category with as many as 7 respondents (29%), 7 respondents (10%) in a high category, 10 respondents (23%) in a moderate category, 5 respondents (25%) a low category and the rest in the very low category as many as 6 respondents (13%). In addition, the mean or average score is 37.3, located in the 35-49 interval with the moderate category. Therefore, it can be concluded that the role of teachers at Public Senior High School 11 Ambon generally has moderate qualifications.

The variables of learning motivation and the role of teachers have a positive effect on student learning outcomes at Public Senior High School 11 Ambon. It can be seen from the multiple linear regression model $Y = 117.428 + 0.161X_1 + 0.266X_2$ with a correlation strength (R) of 0.537. The contribution amount of the influence of Learning Motivation and Teacher's Role on Student Learning Outcomes at Public Senior High School 11 Ambon is expressed by the coefficient of determination (R^2) of 61.9%. It means that the higher the learning motivation and the teacher's role, the higher the student learning outcomes at Public Senior High School 11 Ambon. Meanwhile, the remaining 38.1% is influenced by other factors outside the study

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