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**FACTORS THAT INFLUENCE STUDENTS' READINESS IN FACE-TO-FACE LEARNING SETTING
IN POST COVID-19 PANDEMIC THROUGH ORDINAL LOGISTIC ROUGH REGRESSION**

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Abstract. Due to declining trends in Covid-19 in Indonesia, the government of Indonesia is now considering the option of face-to-face learning in educational sector. Based on the current situation, the purpose of this study is to identify the influencing factor of students' readiness in face-to-face learning post Covid-19 pandemic. Proposed in this study through ordinal logistic rough regression method, the variables that affect the level of students' readiness in preparing face-to-face learning are: (1) Education Unit Activity Plan and Budget (RKAS) related in funding from socialization activities to the provision of health and hygiene facilities and infrastructure (X1), (2) Supporting facilities to support face-to-face learning in Covid-19 period (X2), (3) Agreement between the school and the school committee (X3), (4) Vaccinations for the entire academic community (X4), (5) Organizing of the Covid-19 task force (X5), (6) Regulation to close cafeteria and to forbid any extracurricular activities (X6), and (7) Guidelines in dividing classroom into small groups, room layout with a minimum distance of 1.5 meters, and one-way traffic direction in hallways/corridors and stairs (X7). The results of the analysis obtained the strength value or association as well as the coefficient of determination in the regression, the Cox and Snell value of 0.843 (84.3%), Nagelkerke's value of 0.766 (76.6%) and Mc Fadden's value of 0.748 (74.8%).

Keywords: Student Readiness, Face-to-face Learning Setting, Ordinal Logistics Rough Regression

A. INTRODUCTION

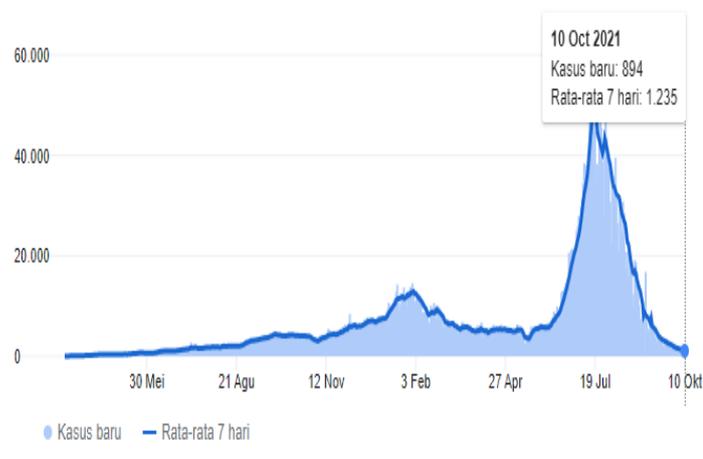
The Covid-19 world pandemic has given huge impact in Indonesia with challenges that were never imagined before. The Covid-19 pandemic that occurred in Indonesia escalated and became a multisector problem. As a muslim, we should view this Covid-19 problem from the Islamic perspective, it has been written in the Qur'an, one of which is contained in QS. Al Baqarah 920: 155-157[1].

"And We will surely test you with something of fear and hunger and a loss of wealth and lives and fruits, but give good tidings to the patient. Who, when disaster strikes them, say, "Indeed we belong to Allah, and indeed to Him we will return." Those are the ones upon whom are blessings from their Lord and mercy. And it is those who are the [rightly] guided.

Referring to these verses, with the covid-19 virus is one of the test for humans. All elements of society were being alarmed by the virus. Therefore, we should realize that the virus is a part of God creation, submissive and obedient to the command of Allah Subhanahu wa ta'ala. Thus, man must return to his own identity, that there is an Almighty God upon all the events on earth. The next attitude is to pray, as people with faith we must be sure that all happen to us is Allah's willing. Hence, be protected and kept away from the spread of disease due to the corona virus becomes something that we should request from Allah Subhanahu wa ta'ala.

Since the first case of Covid-19 confirmed in Indonesia in March 2020, covid-19 has infected more than 1.3 million people and at least 35,000 people have died. However, efforts to reduce the rate of spread of the covid-19 virus have had such a huge impact in various fields. The economic and social welfare areas of the community show significant gap as a result of the Covid-19 pandemic. We see that with Covid-19 making the poverty rate in Indonesia increase strikingly, the negative impact of the pandemic on the socioeconomic field will be much worse without government funding. In addition to socio-economic fields, the education field also has a significant negative impact on the teaching and learning process due to pandemic. It has been more than a year Indonesian government implementing distance learning or e-learning to minimize the spread of pandemic covid-19.

The Indonesian government establish Covid-19 Task Force to overcome Covid-19 problem by multifaceted research-based policies and strategies to suppress Covid-19 impact. One of the strategies that has been implemented is vaccination in whole country. According to Health Minister Budi Gunadi Sadikin in [3], Indonesia is ranked 5th in the world out of the number of people who have been vaccinated. The ranking was achieved after the Indonesian Government successfully delivered the vaccine to more than 90 million people until October 2021. Reporting from Our World in Data data as of October 7, 2021, the following are the 10 countries with the highest number of people who have received the covid-19 vaccine: China (1.10 M), India (670.86 M), the United States (216.27 million), Brazil (153.36 million), Indonesia (99.3 million), Japan (92.17 million), Mexico (65.88 million), Pakistan (63.05), Germany (56.91 million), and Turkey (54.35 million) [4]. Now, Indonesian people have begun to feel the benefits of vaccination acceleration policy. Based on Covid-19 Task Force information in [5] there was a decrease in Covid-19 cases at 11 consecutive weeks. The decrease in cases can be seen from the collapse of the curve of new cases active covid-19 in Indonesia below



Source: Covid19.go.id

The decline in active cases and the rapid distribution of covid-19 vaccination in Indonesia led the government to prepare face-to-face learning setting for educational sector. The guidance of face-to-face learning setting post Covid-19 Pandemic confirmed by 4 Ministers Joint Decree. After approximately two years of online learning, students should prepare themselves to welcome face-to-face learning (offline learning) in accordance with government policy. Based on current circumstances, researchers are interested in identifying factors that affect student readiness in face-to-face learning post covid-19 pandemic.

Logistic ordinal regression method is a very suitable method to model factors that affect student's readiness in face-to-face learning post covid-19 where in the student readiness variable as a response variable is categorical data type. In regression, if the response variable uses a nominal or ordinal scale then the analysis can be done with logistic regression, while, based on the type of data scale the logistic regression response variable is divided into three, they are: (1) Binary logistic regression, (2) Multinomial logistic regression, and (3) Ordinal logistic regression.

In addition, one of the appropriate regression methods used for ordinal-scale response variables is ordinal logistic regression. Many studies use logistic ordinal regression methods by linking ordinal response variables with predictor variables in the form of categorical data. [6]

Similar research has been conducted by Istanti, H. (2020) who examined about the factors that affect the readiness of learning the practice of new students of fashion in era 4.0. The research was conducted using a qualitative approach and provided results that the factors that affect learning include: the effectiveness of computers / internet, self-learning, participant control (attendance, student semester level), practical facilities and infrastructure, learning motivation, effectiveness of online communication, knowledge of e-learning and students' perception of e-learning. Another study conducted by Paramita & Subroto (2021) on Critical Factors of E-learning Readiness Drivers of High School Students' Economic Learning during the Covid-19 Pandemic. The study used multiple linear regression methods to analyze the results of questionnaire data. The results showed that there are four factors of e-learning readiness, namely self-competency, perceived usefulness, self-directed learning and financial factors. Another study was conducted by Muhammad Dedi Saputra (2019) who examined the analysis of factors that affect teacher readiness in using Moodle-based E-learning using Technology Acceptance Model (TAM) theory. Analysis of the data on the research uses multiple linear regression analysis and shows the results that variables that affect the perception of teacher readiness in using Moodle-based e-learning include the use of technology, ease of use of technology and interest in using technology.

Based on the previous research above, there is an urgency in researching using the ordinal logistic rough regression method to identify influencing factors of students' readiness among State Islamic Universities in preparing face-to-face learning. Therefore, research related to face-to-face learning during the covid-19 pandemic is chosen. This study occurs as government's policy on face-to-face learning conducted in universities.

B. METHOD

1. Ordinal Logistic Regression

Logistic regression method is applied in a study which has dependent/response variable (Y) as classification-type data. The major differentiation between linear regression and logistic regression is if linear regression is a method used to analyze the relationship between response variables and predictors, while logistic regression is a method used to analyze response variables to obtain relationships between predictor variables and the probability of an event as a result of the presence of predictor variables. In general, response variables are used in ordinal or nominal logistic regression. In logit models, the ordinality based on the Y response variable interpreted with cumulative probability such that *cumulative logit models* are obtained by comparing cumulative probability from probability less than or equal to the j^{th} response category into p predictor variables that can be expressed in vector X . $P(Y \leq j|X)$. While the probability greater than the j^{th} category is $P(Y > j|X)$ [10]. Cumulative probability can be defined as $P(Y \leq j|X)$ bellow.

$$P(Y \leq j|X) = \frac{\exp(\theta_j + \sum_{k=1}^p \beta_k x_k)}{1 + \exp(\theta_j + \sum_{k=1}^p \beta_k x_k)} \quad (1)$$

where $j = 1, 2, \dots, J$ is a category of response variables [9].

Furthermore, parameter estimation on ordinal logistic regression is performed using the Maximum Likelihood Estimation (MLE) method. The MLE method was chosen because it has several advantages compared to some other methods. MLE can be used for non-linear models such as logistic regression and the assessment results are unbiased (Hosmer,et al., 2013).

2. Simultaneous Test

The hypotheses used in simultaneous testing are as follows.

$$H_0 : \beta_1 = \beta_2 = \dots = \beta_p = 0$$

$$H_1 : \text{at least one } \beta_k \neq 0, k = 1, 2, \dots, p$$

Statistics test used in this study are G^2 or Likelihood Ratio Test with the formula as below. G^2

$$G^2 = -2 \ln \frac{l_0}{l_1} = -2(L_0 - L_1) \quad (2)$$

Where l_0 is maximized value from likelihood function H_0 below. l_1 is the value maximized as a whole ($H_0 \cup H_1$) function. (Hosmer, et al., 2013).

Areas of rejection:

H_0 is rejected if the value of $G^2 > \chi^2_{(\alpha, p)}$ where p is the degree of freedom in the chi-square distribution table.

3. Partial Test

$$H_0: \beta_k = 0$$

$$H_1: \beta_k \neq 0, k = 1, 2, \dots, p$$

The statistics test used are statistics by Wald [10]:

$$W_k^2 = \left(\frac{\hat{\beta}_k}{SE(\hat{\beta}_k)} \right)^2 \quad (3)$$

Areas of rejection:

H_0 is rejected if $W_k^2 > \chi^2_{(\alpha, 1)}$ or p-value is less than α

4. Model Conformity Test

After parameters testing for both simultaneously and partially, then the next test is goodness of the ordinal logistic regression model that has been formed. The hypothesis used is as follows.

H_0 : The model is suitable

H_1 : The model is not suitable

$\alpha = 5\%$

The test statistics used are as follow. [10]

$$\chi^2 = \sum_{j=1}^J \frac{(y_j - m_j \phi_j)^2}{m_j \phi_j (1 - \phi_j)} \quad (4)$$

where $j = 1, 2, 3 \dots J$. where y_j states the j response variable, m_j states the number of observations that have values ϕ_j , and ϕ_j expresses cumulative odds.

Areas of rejection:

H_0 is rejected if the value $\chi^2 > \chi^2_{(J-2)}$ or p-value is less than α (alpha).

5. The Power of Association

There are several R^2 power in research to see the goodness model achieved, while the R^2 types used are as follows (Hosmer, et al., 2013).

1. Cox and Snell R^2 with the following formula.

$$R_{CS}^2 = 1 - \left(\frac{L(\mathbf{B}^{(0)})}{L(\hat{\mathbf{B}})} \right)^{\frac{2}{n}} \quad (5)$$

2. Nagelkerke's R^2 with the following formula.

$$R_N^2 = \frac{R_{CS}^2}{1 - L(\mathbf{B}^{(0)})^{\frac{2}{n}}} \quad (6)$$

3. McFadden's R^2 with the following formula.

$$R_{CS}^2 = 1 - \left(\frac{L(\hat{\mathbf{B}})}{L(\mathbf{B}^{(0)})} \right) \quad (7)$$

where:

$L(\hat{\mathbf{B}})$: log-likelihood function model with parameter estimation
 $L(\mathbf{B}^{(0)})$: log-likelihood function by only consist of thresholds
n: The number of cases

6. Research Methodology

The data used in this study is primarily taken with questionnaire methods. The questionnaire was distributed to 100 students of UIN Maulana Malik Ibrahim Malang across several faculties. The approach and type of research used is quantitative method that focus on studies to model factors that affect students' readiness in preparing face-to-face learning post covid-19 pandemic.

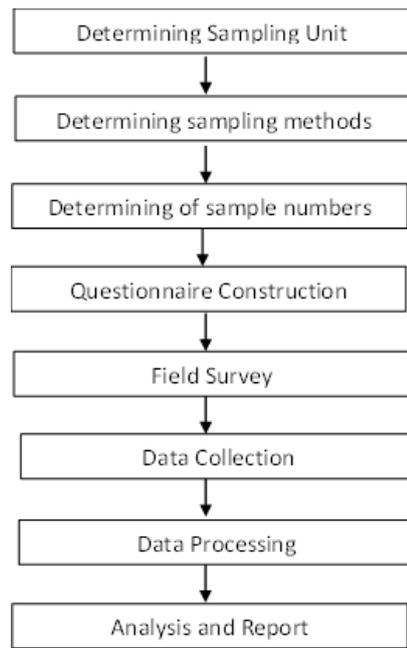
The conditions that must be met in order to carry out face-to-face learning refer to 4 Ministers Joint Decree, they are:

1. The location of the school/university is in Restrictions on Community Activities area level 1-3.
2. Have verified and evaluated readiness in implementing face-to-face learning based on DAPODIK or EMIS checklist.
3. Create an Activity Plan and Budget of the Education Unit (RKAS) related to the funding of socialization activities to the procurement of health and hygiene facilities and infrastructure.
4. Providing facilities to support for face-to-face learning in the COVID-19 period, including:
 - a. Body temperature checker device
 - b. Well-circulated classroom
 - c. Sterilization facilities
 - d. Teaching facilities
 - e. Set up a changing room for students who took public transport
5. There is an agreement between the school/University and the school committee/senates.
6. Full-vaccinated teacher and employee.
7. Establishment of COVID-19 Task Force in schools/university.
8. Cafeteria are closed, sports and extracurricular activities are not allowed.
9. Dividing classroom into small groups, room layout with a minimum distance of 1.5 meters, and one-way traffic direction in hallways/corridors and stairs.

Based on 4 Ministers Joint Decree on the requirement condition in order to carry out face-to-face learning, we identified the variables used in the study as follows.

- Y : The level of students' readiness in facing face-to-face learning.
 X_1 : Education Unit Activity Plan and Budget (RKAS) related in funding from socialization activities to the provision of health and hygiene facilities and infrastructure
 X_2 : Supporting facilities to support face-to-face learning in Covid-19 period
 X_3 : Agreement between the school and the school committee
 X_4 : Vaccinations for the entire academic community
 X_5 : Organizing of the Covid-19 task force
 X_6 : Regulation to close cafeteria and to forbid any extracurricular activities
 X_7 : Guidelines in dividing classroom into small groups, room layout with a minimum distance of 1.5 meters, and one-way traffic direction in hallways/corridors and stairs.

The steps taken in this study are illustrated through the following flowcharts



C. RESULTS AND DISCUSSIONS

1. Model Conformity Test

The following table presenting the results of data analysis with SPSS.

Table1. Goodness of Fit

	Chi-Square	Df	Sig.
Pearson	512.201	99	.100
Deviance	224.309	99	1.000

Link function: Logit.

Table 1. Goodness of Fit demonstrates the model's conformity test with the data. Pearson value of 512,201 with significance of 0.1 (> 0.05) and Deviance of 224,309 with significance of 1,000 (> 0.05). This means that the model corresponds to empirical data or the model is suitable.

2. Test Parameters Simultaneously

After we know that the logistic regression model is appropriate and worthy of further analysis, then we do simultaneous parameter testing as presented in Table 2 bellow.

Table 2 Model Fitting Information

Type	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	417.785			
Final	243.368	129.417	30	.000

Link function:Logit.

Table 2 above shows the results of the model fitting test used to compare models without predictor variables. Based on the test results above, it shows that the results of -2 log likelihood model B (with predictor variables) have 417,785 of score and the result of -2 log likelihood model A (with predictor variable) have 243,368 of score. Furthermore, it is shown that the G test statistical value was 129,417. Furthermore, the testing criteria is done by taking the margin of error $\alpha = 0.05$ from the chi-square distribution table we obtain $\chi^2 (0.05;30) = 7.81$. Because the statistical value G (129,417) obtained in the test is greater than the table value, or mathematically can be written the statistical value $G (129,417) > \chi^2 (0.05;30) = 7.81$ then the decision to reject H_0 and accept H_1 . The conclusion is that at least there is one $\beta_p \neq 0$. Based on the results of these tests, to see which variables have a significant influence can be shown in subsequent analysis.

3. Partially Parameter Test

After simultaneous parameter testing is obtained the result that there is at least one significant parameter, then the test can be continued partially to see which variables have a significant effect. Here are the results of partial parameter testing.

Table3. Parameter Estimate

Predictor	Coefficient	SE Coefficient	Wald Value	Sig.	Odds Ratio
Constant (1)	-8,071	0,881	112,231	0,000	
Constant (2)	-3,043	0,345	72,412	0,000	
Constant (3)	0,646	0,420	23,082	0,000	
X ₁	-3,664	1,249	21,292	0,000	15,6
X ₂	3,091	1,096	19,990	0,002	12,3
X ₃	-2,452	1,097	61,754	0,000	10,5
X ₄	2,198	1,353	10,005	0,042	13,3
X ₅	-3,132	1,634	6,007	0,003	14,7
X ₆	-2,731	0,703	11,079	0,000	14,5
X ₇	-5,738	0,643	31,315	0,001	17,1

In the test results of Table 3, pay attention to the Wald value and the significance value. All predictor variables used in the study (X₁-X₇) is proven to have an effect on the level of students' readiness in facing face-to-face learning post Covid-19 pandemic. Since the response variables used consist of four categories, there are three (4-1=3) logit models using all the following predictor variables.

$$\begin{aligned} \text{Logit} (\beta_1) &= \log\left(\frac{\beta_1}{1 - \beta_1}\right) \\ &= -8,071 - 3,664x_1 + 3,091x_2 - 2,452 x_3 + 2,198 x_4 - 3,132 x_5 - 2,731 x_6 \\ &\quad - 5,738 x_7 \\ \text{Logit} (\beta_2) &= \log\left(\frac{\beta_2}{1 - \beta_2}\right) \\ &= -3,043 - 3,664x_1 + 3,091x_2 - 2,452 x_3 + 2,198 x_4 - 3,132 x_5 - 2,731 x_6 \\ &\quad - 5,738 x_7 \\ \text{Logit} (\beta_3) &= \log\left(\frac{\beta_3}{1 - \beta_3}\right) \\ &= 0,646 - 3,664x_1 + 3,091x_2 - 2,452 x_3 + 2,198 x_4 - 3,132 x_5 - 2,731 x_6 \\ &\quad - 5,738 x_7 \end{aligned}$$

The logit model formed above is interpreted by using the odds-ratio obtained from β . Based on the table above, the odds-ratio value for variables of the Activity Plan and Budget of the Education Unit (RKAS) related to the funding of socialization activities to the procurement of health and hygiene facilities and infrastructure (X₁) scores 15.6. It shows that the variable will

contribute to the level of students' readiness in preparing face-to-face learning as 15.6 point. Analogously for other variables.

4. The Power of Association

To see the goodness of the model that is proposed, it can be seen based on the criteria of the value of R-square (R^2) as Table 4 below.

Table 4. Pseudo R-Square

Cox and Snell	.843
Nagelkerke	.766
McFadden	.748

Link function: Logit.

Table 4. Pseudo R-Square shows that how much free variables were able to explain independent variables (the level students' readiness to confront face-to-face learning post covid-19 pandemic). This value is like the coefficient of determination in regression. Cox and Snell method scores 0.843 (84.3%), Nagelkerke method scores 0.766 (76.6%) and Mc Fadden Method scores 0.748 (74.8%).

D. CONCLUSION

Based on the results analysis that has been done before, it can be concluded some of the following points. First, the variables that have a significant effect on the level of students' readiness in preparing face-to-face learning post Covid-19 pandemic are: (1) Education Unit Activity Plan and Budget (RKAS) related in funding from socialization activities to the provision of health and hygiene facilities and infrastructure; (2) Supporting facilities to support face-to-face learning in Covid-19 period; (3) Agreement between the school and the school committee; (4) Vaccinations for the entire academic community; (5) Organizing of the Covid-19 task force; (6) Regulation to close cafeteria and to forbid any extracurricular activities; and (7) Guidelines in dividing classroom into small groups, room layout with a minimum distance of 1.5 meters, and one-way traffic direction in hallways/corridors and stairs. Meanwhile, logit models of the seven variables that are thought to affect student stress levels can be obtained.

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