Statistical Analysis in Determining the UIN Kiai Haji Achmad Siddiq (UIN KHAS) Jember Students' Readiness Toward the Internet-Based Learning System

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Abstract: This research focuses on finding out how far the readiness of UIN KHAS Jember students in facing this e-learning learning system is, so research is carried out in the form of a survey. From the survey results, it is hoped that data can be obtained regarding what factors influence the e-Learning-based learning system to be applied to UIN KHAS Jember students. The variables used are Study Habits and Technology Habits. The data analysis method used in this research is the 1 sample proportion test and the Chi-Square test. Respondents used were UIN KHAS Jember students Class of 2015, 2016, 2017, and 2018. From a series of data collection to the analysis stage, several conclusions can be drawn, namely the number of UIN KHAS Jember students ready to face the e-learning learning system by 60% (or more than 50% of students). The variables that affect student readiness in dealing with e-learning learning systems are study habits and technology habits. From each of these variables, it turns out that only the attitude factor towards the learning system and the length of time on the internet are very significant or affect student readiness.

Abstrak: Fokus penelitian ini untuk mengetahui sejauh mana kesiapan mahasiswa UIN KHAS Jember dalam menghadapi sistem pembelajaran e-learning ini, maka dilakukan penelitian berupa survey. Dari hasil survey ini, diharapkan bisa dipereleh data mengenai faktor-faktor apa saja yang berpengaruh terhadap sistem pembelajaran berbasis e-Learning untuk diterapkan pada mahasiswa UIN KHAS Jember. Variabel yang digunakan yaitu Kebiasaan Belajar dan Kebiasaan Berteknologi. Metode Analisis Data yang digunakan dalam penelitian ini yaitu Uji proporsi 1 sampel dan uji Chi-Square. Responden yang digunakan yaitu mahasiswa UIN KHAS Jember Angkatan 2015, 2016, 2017 dan 2018. Dari serangkaian pengambilan data sampai tahap analisis, dapat diambil beberapa kesimpulan yaitu Banyaknya mahasiswa UIN KHAS Jember yang siap menghadapi sistem pembelajaran e-learning sebesar 60% (atau lebih dari 50% mahasiswa). Variabel-variabel yang berpengaruh terhadap kesiapan mahasiswa dalam menghadapi sistem pembelajaran e-learning adalah variabel kebiasaan belajar dan variabel kebiasaan berteknologi. Dari masing-masing variabel tersebut ternyata hanya faktor sikap terhadap sistem pembelajaran dan lamanya berintemet sangat signifikan atau berpengaruh terhadap kesiapan mahasiswa.
INTRODUCTION

Electronic learning or E-Learning is a form of distance education that uses electronic media based on web technology to deliver material and communication between lecturers and students. E-learning is currently being developed in developed and developing countries as one of the learning media that can overcome the problem of limited time, place, and facilities. The purpose of this e-learning teaching method is to achieve the proper teaching method so that it can increase the percentage of student graduation, and it is hoped that the highest failure rate is around 10%.

Previous research on the use of e-learning in distance learning during the Covid-19 pandemic is a qualitative descriptive study on the use of e-learning in distance learning during the pandemic, which results in a level of understanding of the material on learning using e-learning. The E-Learning learning model in improving the quality of learning, which in this study discusses the literature review regarding learning and teaching models using e-learning, produces a breakthrough in the field of education. Another research on the use of e-learning for teachers and lecturers in the digitalization era 4.0 resulted in a statement that students and educators are required to be technology literate, or master technology and must have specific technical skills to learn and teach creatively. On the contrary, this study was conducted to prove the readiness of students to conduct e-learning using a proportional survey method in taking respondents, and their readiness numbers were proven quantitatively (numeric based on numbers) using statistical analysis methods.

Using the e-learning method, expect to increase time efficiency considering the amount of material that must be given is temporarily limited. This method is also expected to make it easier for students to understand the lectures as one of the technology campuses that have used the internet network in each faculty at UIN KHAS Jember. This campus tries to promote this system as the latest learning system because it is considered that the process will be straightforward.

To find out how far the readiness of UIN KHAS Jember students in facing this e-learning learning system, a survey was conducted. From the results of this survey, it is hoped that data can be obtained regarding what factors affect the e-Learning-based learning system to be applied to students of UIN KHAS Jember.

In this study, several issues were raised as study material, including:
1. How are the students of UIN KHAS Jember ready to face the e-learning system?
2. How do determine the variables that affect the readiness of UIN KHAS Jember students in facing the e-learning learning system?
3. How are these variables related to the readiness of UIN KHAS Jember students to face the e-learning learning system?
The objectives of this research are as follows:
1. To find out how readiness UIN KHAS Jember students are to face the e-learning learning system
2. To find out the variables that affect the readiness of UIN KHAS Jember students in facing the e-learning learning system
3. To find out the relationship between these variables on the readiness of UIN KHAS Jember students to face the e-learning learning system.

LITERATURE REVIEW

E-Learning

Electronic learning or E-learning is a learning process system that utilizes information technology in the form of computers equipped with telecommunication facilities, such as the internet, intranet, extranet, and multimedia such as graphics, audio, and video. Both are the primary media in delivering material and interaction between teacher or lecturer and learners or students.  

Information and communication technology-based learning models using e-learning result in changes in learning culture in the context of learning. There are at least four essential components in building a learning culture using the e-learning model:
1. Learners are required to be independent in learning with various appropriate approaches so that students can direct, motivate, and regulate themselves in learning
2. Teachers can develop knowledge and skills, facilitate learning, understand learning and the things needed in learning
3. Availability of adequate infrastructure
4. Creative administrators and infrastructure preparation in facilitating learning.

The steps in the management of e-learning program management are:
1. Determine a clear strategy regarding the target audience, learning, audience location, availability of infrastructure, budget, and return on investment that is not only in the form of cash
2. Determine equipment such as host vs. installed LMS and Commercial or OS-LMS
3. There is a relationship with companies that develop research related to the developed e-learning program
4. Preparing materials needed are specific proposals that can be implemented and prepare a short response time.

Determining the quality of learning using the e-learning model has been developed by the Qualitative Standards Scholarship Assessed: An Evaluation of the Professoriate developed by Glassick, Huber, and Maeroff in 2005 with instrument indicators that have been developed including clarity of learning objectives, preparation of materials sufficient learning, preparation of appropriate learning methods, producing significant positive learning outcomes, effectiveness in presenting lesson materials and critical feedback from students.

There are two models of online learning material development. In the

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3Indah Purnama Sari, ‘Implementasi Pembelajaran Berbasis E-Learning Menggunakan Claroline’, Research and Development Journal Of Education, 4.1 (2017) <https://swa.co.id/swa/listed-articles/innen-e-learning-bung>.

4Sari, ‘Implementasi Pembelajaran Berbasis E-Learning Menggunakan Claroline’, (2017).
first model, the lecturer builds a material with parts of the material using a computer. Each section can be read and studied offline by downloading it from the internet or a shared CD.\(^5\)

In the second model, the lecturer builds learning materials with online material development facilities. Lecture material is entered into the system piece by piece, which is assembled as a whole in the system. Students can only attend lectures in full through the same system online. With this model, offline distribution can only be done after the development of lecture material is complete or chapter by chapter.

Cara-cara Perbandingan Proporsi

Response variables that have two categories are called binary. Several groups on the response variable Y are often compared. If there are 1 group, the results can be displayed in the 1 X 2 contingency table, where the columns are Y levels.\(^6\)

1 Sample Proportion Test

The following hypothesis is used to determine 1 sample proportion of the population:

\[
H_0 : p = p_0
\]

\[
H_1 : p \neq p_0
\]

where \(p = \) population proportion and \(p_0 = \) early estimate/proportion hypothesis

Reject condition \(H_0\) if \(Iz\)-count \(> z\)-table \(p\)-value < alpha (0.05). Proportion test approach with standard normal distribution \((N(0,1))\) using the \(z\) test statistic with formula:

\[
z = \frac{p - p_0}{\sqrt{\frac{p_0(1 - p_0)}{n}}}
\]

where \(p\) is the proportion obtained from the sample to estimate the population proportion.\(^7\)

Proportion Difference

For the first line subject, \(i=1,2,\ldots, I\), \(\pi_{i1}\) is response 1 probability, and \((\pi_{i1}, \pi_{i2}) = (\pi_{i1}, 1 - \pi_{i1})\) is conditional distribution from binary response. However, if comparing two lines, for example, \(h\) and \(i\), then use a proportion comparison, \(\pi_{ih} - \pi_{ii}\).

The comparison in response 2 is equivalent to the comparison in response 1.\(^8\)

\[
\pi_{2h} - \pi_{2i} = (1 - \pi_{1h}) - (1 - \pi_{1i}) = \pi_{1i} - \pi_{1h}
\]

\(^{6}\)Alan Agresti, *An Introduction to Categorical Data Analysis Second Edition.*

\(^{7}\)Charlett, *Introduction to Survival Analysis* (HPA Colindale Statistics Unit, 2003).

\(^{8}\)D Collet, *Modelling Survival Data In Medical Research* (London: Chapman and Hall, 1994).
Relative Risk

Figure 2X2, relative risk is a ratio \( \frac{\pi_{11}}{\pi_{12}} \). The ratio is a non-negative real number. Relative Risk is worth 1, indicating the relationship is mutually independent. Comparison in the second response used a different relative risk:\(^9\)

\[
\frac{\pi_{21}}{\pi_{22}} = \frac{(1 - \pi_{11})}{(1 - \pi_{12})}
\]

Odds Ratio

At figure 2X2, odds corrspondencein line 1 is \( \Omega_1 = \frac{\pi_{11}}{\pi_{21}} \), and odds corrspondencein line 2is \( \Omega_2 = \frac{\pi_{12}}{\pi_{22}} \).

For combined distribution, each \( \Omega_i \) non-negativewith a value of more than 1 if the response 1 is more than the response 2. Rasio of odds \( \Omega_1 \) and \( \Omega_2 \) called Odds Ratio. So,

\[
\theta = \frac{\Omega_1}{\Omega_2}
\]

\[
\theta = \frac{\pi_{11}}{\pi_{12}} \frac{\pi_{11}}{\pi_{22}} = \frac{\pi_{11} \pi_{22}}{\pi_{12} \pi_{21}}
\]

Yule

Yule was introduced and called Q in Honor of The Belgian statistician Quetelet, now known as Q Yule’s. This is related to odds ratio \( \theta=(\pi_{11} \pi_{22})/(\pi_{12} \pi_{21}) \) by \( Q=(\theta - 1)/(\theta + 1) \).

\[
Q = \frac{\pi_{11} \pi_{22} - \pi_{12} \pi_{21}}{\pi_{11} \pi_{22} + \pi_{12} \pi_{21}}
\]

Independence Test

Pearson Chi-Squared Test

The expected frequency, namely \( \hat{m}_{ij} = np_i \cdot p_j \). So, the statistic test of \( \chi^2 \) is,

\[
\chi^2 = \sum \sum \left( \frac{n_{ij} - \hat{m}_{ij}}{\hat{m}_{ij}} \right)^2
\]

Pearson (1900,1922) states that replacement \( \hat{m}_{ij} \) by approximation \( \hat{\pi}_{ij} \) will not affect the distribution of \( \chi^2 \). Since there N=I] categories for cross grouping, he argues that there will be a Chi-square distribution asymptote with df=ij-1.\(^{10}\)

Likelihood Ratio Chi-Squared

The Likelihood Ratio test is a common way to test \( H_0 \) toward \( H_1 \). In this test, the likelihood is maximized under \( H_0 \) under the general condition that \( H_0 \) or \( H_1 \) is correct. Likelihood Ratio test mengikuti Wilks’s statistic and is denoted by \( G^2 \), that is

\[
G^2 = 2 \sum \sum n_{ij} \log \left( \frac{n_{ij}/m_{ij}}{\hat{m}_{ij}} \right)
\]

Where \( \hat{m}_{ij} = n_i \cdot n_j / n \) is an estimate of the expected frequency under independent assumptions.\(^{11}\)

\(^9\)Cox, Analysis of Survival Data (London: Chapman and Hall, 1984).

\(^{10}\)E. J Hinkley, D. V., Reid, N., dan Snell, Statistical Theory And Modelling (In Honour Of Sir David Cox, FRS) (London: Chapman and Hall, 1991).

\(^{11}\)Chap T Le, Applied Survival Analysis (Canada: John Willey and Sons, 1997).
Three variables are mutually independent if \( \pi_{ijk} = \pi_{i+j} \pi_{i+k} \pi_{+j+k} \) for all \( i, j, \) and \( k. \) While conditionally independent eg \( X \) and \( Y \) are conditionally independent at each level \( Z, \) then \( \pi_{ijk} = \pi_{i+k} \pi_{j+k} / \pi_{+j+k} \) for all \( i, j, \) and \( k. \)

**METODE**

The research procedure used in this study can be seen in the following chart.

![Research Procedure Flowchart](image)

The object of research or respondents' targets in this research are all students from various batches and study programs, both undergraduate and postgraduate.

The sampling technique used was proportional random sampling adjusted to the number of students at UIN KHAS Jember in each batch and not according to the study program. The number of samples describes as follows:

- \( n_3 \leq n_4 < n_5 < n_6 \)

where
- \( n_3 = \) the number of samples in the 2015 academic year
- \( n_4 = \) the number of samples in the 2016 academic year
- \( n_5 = \) the number of samples in the 2017 academic year
- \( n_6 = \) the number of samples in the 2018 academic year.

The variables used as materials for making questionnaires and further analyzed in this study were divided into three, namely:

1. Response Variable (Students readiness) \( \rightarrow Y \)
2. Predictor Variable

   a. Variable 1 (Learning Habits) \( \rightarrow X_1 \)
      - Learning Duration \( \rightarrow X_{11} \)
      - Learning System \( \rightarrow X_{12} \)
      - Activating \( \rightarrow X_{13} \)
      - Subject Type \( \rightarrow X_{14} \)
      - Learning Attitude \( \rightarrow X_{15} \)
      - AttitudetowardAssignment \( \rightarrow X_{16} \)
      - Lecturer Type \( \rightarrow X_{17} \)
      - AttitudetowardLearning System \( \rightarrow X_{18} \)

   b. Variable 2 (Habit of using Technology) \( \rightarrow X_2 \)
      - Using Internet Duration \( \rightarrow X_{21} \)
      - Using Internet Location \( \rightarrow X_{22} \)
      - Using Internet Activity \( \rightarrow X_{23} \)
      - Sites \( \rightarrow X_{24} \)

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**Figure 3. Research Procedure Flowchart**

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\(^{12}\text{Agresti.}\)

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\(^{13}\text{Sugiyono, Metode Penelitian Kuantitatif, Kualitatif, Dan R&D (Bandung: Alfabeta, 2009).}\)
RESULT AND DISCUSSION

Before further discussing this research, it is necessary to know how the objectives and general description of the respondents are the objects of research.

Respondents Descriptive Statistics

As previously explained, the target of this research was UIN KHAS Jember students from both undergraduate or strata 1 and postgraduate strata 2 levels from various generations, 2015, 2016, 2017, and 2018 academic years. This survey was conducted using proportional simple random sampling. Undergraduate and postgraduate students use the online method via WhatsApp Application assisted by the google form application due to the pandemic period of students studying at home. The respondents who were successfully surveyed can be described as follows:

Chart 1. Summary of Respondents

| Aspect     | Item      | Freq | Total |
|------------|-----------|------|-------|
| Sex        | M         | 35   |       |
|            | F         | 69   |       |
|            | M/F       | 8    |       |
| Level      | Strata 1  | 78   |       |
|            | Strata 2  | 34   |       |
|            | 2015      | 11   |       |
| Academic Year | 2016     | 30   |       |
|            | 2017      | 40   |       |
|            | 2018      | 31   |       |
| Readiness  | Ready     | 64   |       |
|            | Not Ready | 15   |       |
|            | Abstain   | 33   |       |

The number of respondent questionnaires used as material for analysis is 99 respondents. This number has a sufficient proportion because it can be seen from the number of students of UIN KHAS Jember, the majority of whom are women, and many are from Strata S1.

The class selection is based on the number of students who are still in college and the length of time they have been in college. It is described in more detail as follows:

Chart 2. Completely valid summary of the respondent’s questionnaire

| Aspek   | Item     | Frek | Total |
|---------|----------|------|-------|
| Sex     | M        | 33   |       |
|         | F        | 59   |       |
|         | M/F      | 7    |       |
| Level   | Strata 1 | 69   |       |
|         | Strata 2 | 30   |       |
|         | 2015     | 10   |       |
| Academic Year | 2016    | 28   |       |
|         | 2017     | 36   |       |
|         | 2018     | 25   |       |
| Readiness | Ready   | 59   |       |
|         | Not Ready| 13   |       |
|         | Abstain  | 27   |       |

The number of responding questionnaires used as material for analysis is 99 respondents. This number has a sufficient proportion because it can be seen from the number of students of UIN KHAS Jember, the majority of whom are women, and many are from Strata S1. The class selection is based on the number of students who are still in college and the length of time they have been in college. It is described in more detail as follows:
It can be seen that after validating the less valid questionnaires, the results of graphs and descriptive statistics are not much different from expectations. The questionnaire determines validity by the presence of the information needed for analysis and the steps to deal with this problem by adding respondents and, if possible, returning the questionnaire that is considered less valid.

Visually, previous charts and graphs show the readiness of UIN KHAS Jember students for the e-learning learning system, and it can be stated that 60% of students answered ready, and 13% of students answered not ready. The remaining 27% answered they did not know/were doubtful. We have to prove this statement not only with graphs or descriptive statistics but need to be analyzed further to make sure that UIN KHAS Jember students are ready to implement an e-learning learning system and know what factors influence it.

To ensure that 60% of UIN KHAS Jember students are ready to face the e-learning learning system, a 1 sample proportion test is carried out as follows:

The hypothesis used:

\[ H_0 : p = p_0 \]
\[ H_1 : p \neq p_0 \text{ or } p > p_0 \text{ or } p < p_0 \]

where \( p \) = the value of the proportion of observations (sample) and \( p_0 \) = the estimated value of the proportion of a population. Reject \( H_0 \) if \( p \)-value < alpha (0.05)

Based on the proportion test analysis series of 1 sample, \( p \)-values are obtained, which can be seen in Table 3.1 below:

| \( p_0 \) | \( p < p_0 \) | \( p \neq p_0 \) | \( p > p_0 \) |
|----------|---------------|----------------|---------------|
| 0.9      | 0.000         | 0.000          | 1.000         |
| 0.75     | 0.001         | 0.001          | 1.000         |
| 0.5      | 0.978         | 0.070          | 0.035         |
| 0.6      | 0.505         | 1.000          | 0.576         |

Based on the \( p \)-value above, it can be seen that the \( p \)-value will be more than 0.05 when the \( p_0 \) value is equal to 0.6. So, the percentage of UIN KHAS Jember students ready to face the e-learning learning system is 60% or more than 50%.

**Relationships between Variables Detection**

Previously identified two variables affecting student readiness for e-learning learning systems, study and technology habits. The measurement of the influence of these variables is reviewed from several aspects, for example, learning duration, learning system, duration of stay in front of a computer, and software that is mastered.

The relationship between each variable and student readiness was detected. To detect this relation, the researcher carried out individual chi-square tests. The steps are almost the same when analyzing each of the variables. In this case, one example will be given for the analysis of the Student Readiness variable (Y) on the Study duration variable (\( X_{11} \)).
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Hipotesis:
H₀ : The learning duration does not affect student readiness.
H₁ : The learning duration affects student readiness.

Statistical Test:
\[ \chi^2 = \sum \frac{(n_{ij} - \hat{m}_{ij})^2}{\hat{m}_{ij}} \]

Reject area:
Reject H₀ if \( I \times \chi^2 - \text{count} I > \chi^2 - \text{chartor} \)

p-value < alpha (0.05)

In the example, the p-value is 0.156 > alpha (0.05), and the Chi-square count is 6,647, which is smaller than the table value of 9,488. So, accepting H₀ or length of study does not affect student readiness, and the full results can be shown in the following table:

| Learning Habit Variable | Table 4. Chi-Square test results for each learning habit variable |
|-------------------------|---------------------------------------------------------------|
| Variable | Chi-Square | db | Table | P-value |
| X11 | 6,647 | 4 | 9,488 | 0.156 |
| X12 | 7,371 | 6 | 12,592 | 0.028 |
| X13 | 1,976 | 2 | 5,991 | 0.372 |
| X14 | 6,834 | 6 | 12,592 | 0.036 |
| X15 | 11,711 | 6 | 12,592 | 0.069 |
| X16 | 5,403 | 6 | 12,592 | 0.493 |
| X17 | 12,401 | 6 | 12,592 | 0.054 |
| X18 | 12,492 | 4 | 9,488 | 0.014 |

It can be seen that the X18 variable has a relationship with student readiness because it has a chi-square count that is greater than the chi-square table (p-value less than 0.05). The X18 variable indicates that the X17 and X15 variables have an influence but are less significant. A variable like this is analyzed individually because the possibility of a joint bond with other variables exists.

The next step is to increase the table’s dimensions into a 3-dimensional table by including two variables study habits to student readiness. Not all combinations are tested because it is seen whether they have a mutual relationship between the two or not. As a result, four possibilities will be tried and can be seen in the following table.

| Variable | Code | Chi-Square | db | Table | P-value |
|----------|------|------------|----|-------|---------|
| X11 vs X14 | A | 3,729 | 6 | 12,592 | 0.713 |
| X12 vs X17 | D | 2,902 | 4 | 9,488 | 0.574 |
| X13 vs X18 | H | 14,059 | 4 | 9,488 | 0.007 |
| X15 vs X16 | J | 7,794 | 6 | 12,592 | 0.254 |
| X15 vs X16 | K | 7,894 | 6 | 12,592 | 0.246 |
| X15 vs X16 | L | 2,418 | 6 | 12,592 | 0.878 |
| X15 vs X16 | M | 4,440 | 4 | 9,488 | 0.350 |

It turns out that after testing the relationship simultaneously with other variables that may have an effect, the results are not so significant. Only the variable X13 (student activity) with the variable X18 (attitude towards new learning) interact can affect the readiness of UIN KHAS Jember students to face the e-learning learning system.

This finding is indicated by the p-value, which is less than 0.05 (alpha), so that if the two variables interact, it will affect student readiness. Meanwhile, the interaction of the other variables has no effect. Moreover, there are still many possible interactions between variables that may affect but have not been discussed in this study.
Technological Habit Variables

It can be seen that the variable X21 (internet surfing duration) has a relationship with student readiness because it has a chi-square count that is greater than the chi-square table (p-value less than 0.05). X21 variable is possible that there are indications such as the X22 variable that has an influence but are less significant. Both variables should be analyzed in unison because there may be dependencies with other variables.

The next step is to increase the table's dimensions into a 3-dimensional table by including two variables from technology habits to student readiness. Not all combinations are tested because it is seen whether they have a mutual relationship between the two or not. As a result, three possibilities will be tried and can be seen in the following table.

Table 7. Chi-square Test using Cross-tabulation on Technology Habit Variables

It turns out that after testing the relationship simultaneously with other variables that may have an effect, the results are not so significant. Only the variable X21 (internet length) with the variable X22 (internet location) that interact with each other can affect the readiness of UIN KHAS Jember students in facing the e-learning learning system.

This is indicated by the p-value, which is less than 0.05 (alpha) so that if the two variables interact, it will affect student readiness. Meanwhile, the interaction of the other variables has no effect. Furthermore, there are still many possible interactions between variables that may affect but have not been discussed in this study.

CONCLUSION

From data series collection to the analysis stage, the following conclusions show:

1. The number of UIN KHAS Jember students ready to face the e-learning system is 60% or more than 50% of students.
2. The variables that affect student readiness in facing the e-learning learning system are study habits and technology habits.
3. From each of these variables, it turns out that only the attitude factor towards the learning system and the length of time on the internet are very significant or affect student readiness.
The implications of this research theoretically, with statistical methods, can be used to determine how big the percentage value of UIN KHAS JEMBER students face internet-based learning (e-learning). Identify the variables that affect student readiness in welcoming e-learning-assisted learning. Practically, it can provide input and advice in policymaking. The quantitative results based on the questionnaire distribution survey show that UIN KHAS JEMBER students are ready to carry out an internet-based learning system.

As for what can be considered or suggestions for future research, it is carried out using multiple-answer questionnaires so that it can be known in more detail about what factors are influential. In addition, a more in-depth study of crosstab analysis with larger dimensions is needed. So we hope to help UIN KHAS Jember make decisions in implementing an e-learning learning system that can be more convincing with solid data support.

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