Pegem Journal of Education and Instruction, Vol. 14, No. 4 , 2024 (pp. 92-101)

RESEARCH ARTICLE WWW.PEGEGOG.NET

Factor Analysis of Student Satisfaction Levels with Online Learning in Higher Education during Pandemic COVID-19

Dwi Maryono[1*], Dewi Tjahyaningtyas Setiowati[2], Febri Liantoni[3]

[1-3]Faculty of Teacher Training and Education, Universitas Sebelas Maret Surakarta

Abstract

This study aims to determine student satisfaction with online learning in higher education, the factors that influence it, and the most dominant factors. This research used a quantitative approach with a survey research design. Data were collected via survey method by distributing questionnaires and analyzing the responses using factor analysis. Factor analysis is a useful technique for looking for factors that can explain the relationship between various independent indicators observed. It is also useful for identifying a small number of factors that can be used to explain a large number of interrelated variables. The respondents of this research were 43 students of the Informatics and Computer Education Study Program at Sebelas Maret University, Indonesia. The results showed an average score for student satisfaction with online learning of 3.78 out of 5. Five variables consisting of 12 indicators were used to measure student satisfaction with online learning. Following the factor analysis process, these 12 indicators were reduced to two factors that affect the level of student satisfaction, namely professional and competent teaching staff, and the technical factor. The most dominant factor was professional and competent teaching staff. The three most dominant indicators of which were good communication, personal attention, and understanding of students.

Keywords: online learning, student satisfaction, factor analysis

Introduction

The Covid-19 pandemic first emerged at the end of December 2019 before spreading almost worldwide, severely curtailing economic, social, and educational activities (Wang et al., 2020). In education, the pandemic impacted learning activities, including in universities, which were prohibited by the government from holding face-to-face lectures and thus switched to online learning (Kasih, 2020). Online learning centers on an internet network with accessibility, connectivity, flexibility, and the ability to engage in various types of interactions in learning (Moore & Kearsley, 2011). It includes lecture delivery, audiovisual aids, PowerPoint slides, and video recordings of lessons (Baber, 2020). Online learning is conducted to maintain students' rights in universities and to ensure they can learn from their respective places (Indarti et al., 2021).

The COVID-19 pandemic has forced higher education institutions to expand the use of online learning, which may not have been widely considered before. This indicates that online learning will become an increasingly important part of the future of higher education. Therefore, it is crucial for more selective higher education institutions to carefully consider the implementation of online learning to ensure the satisfaction of students is maintained (Wright et al., 2023). The implementation of online learning requires preparedness by various parties, including universities, office holders, lecturers, and the students themselves. Universities, now more than ever, should invest in the professional development of their teaching faculty, to ensure they remain fully abreast of current effective pedagogical methods both with and without the use of online technologies (Rapanta et al., 2020).

Undergraduate students demonstrate a high level of readiness in using technology and the internet for online learning. Despite the high level of readiness, there are differences in the perception of motivation for online learning after a certain stage in the learning process. Some constraints faced by students during the online learning process include issues related to motivation and attention (NAYCİ, 2021).

Corresponding Author e-mail: dwimaryono@staff.uns.ac.id

https://orcid.org/0000-0002-8059-2311

How to cite this article: Maryono D*, Setiowati DT, Liantoni F (2024). Factor Analysis of Student Satisfaction Levels with Online Learning in Higher Education during Pandemic COVID-19 Pegem Journal of Education and Instruction, Vol. 14, No. 4, 2024, 92-101

Source of support: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest: None

DOI: 10.47750/pegegog.14.04.10

Received: 11.01.2024

Accepted: 17.05.2024 **Publised :** 01.09.2024

Various obstacles undoubtedly exist in the switch from face-to-face to online learning; an evaluation of user satisfaction is thus required. Satisfaction is an individual's feeling of happiness or disappointment that arises after comparing the performance of the product they are considering against the performance they expect. If the former falls well below the latter, then the customer will not be satisfied. Conversely, if the performance aligns with the expectation, the customer is satisfied, while if it exceeds the expectation, they are very satisfied or happy (Kotler, 2006). In this context, the customers are college students. Student satisfaction with the online learning process must therefore be evaluated and is an essential factor in higher education in the provision of educational services for students (Lala & Marhalim, 2019).

Student satisfaction with online learning can be measured using the Servqual method, which encompasses five dimensions of satisfaction: tangibles, reliability, responsiveness, assurance, and empathy (Sukmanasa et al., 2017). The results of measuring student satisfaction help in determining the factors that significantly influence it and can thus also be used as an evaluation tool to improve the quality of online learning in the future. A previous study identified four factors that affected student satisfaction with online learning: internet facilities, the platforms used by students, student–student interaction, and student–lecturer interaction (Yuriko & Sany, 2021). Two of these were found to positively influence online learning: internet facilities and student–lecturer interaction. Another study analyzed the determinants of student satisfaction with online learning during the pandemic, namely lecturer professionalism, critical thinking, and student character attitudes (Nahariani et al., 2022). Elsewhere, research identified four factors that affect online learning satisfaction: online learner, online instructor, online platform, and online instructional design (Nahariani et al., 2022). Other research shows several factors that influence the effectiveness of online learning in the COVID-19 pandemic era such as lecturer's information technology capabilities, the availability of assessment guidelines, semester learning plan guidelines, academic position, type of lecturer publication, lecturer certification, and workload (Haryani et al., 2023). Other factors that can be used to determine student satisfaction in online learning include peers, content design, interaction and flexibility, assessment, technology, lecturers, and the learning process (Bismala & Manurung, 2021).

While those studies successfully identified factors that influenced student satisfaction with online learning, only a limited number of factors have been explored, with no indication as to the most dominant. As such, in this study, we employ factor analysis techniques to analyze the indicators that affect the level of student satisfaction with online learning using the Servqual model which consists of five dimensions of satisfaction: tangibles, reliability, responsiveness, assurance, and empathy (Lim et al., 1999). Apart from identifying indicators that influence the level of satisfaction with online learning, with factor analysis we can find out which indicators are most dominant in the level of satisfaction with online learning. With factor analysis we can also group these indicators into several new factor components which may be different from the initial reference, the Servqual model. This is a novel aspect in this research, namely formulating new factors that influence satisfaction in online learning.

Method

Research Design

This research used a quantitative approach with a survey research design. The survey was carried out in the form of distributing questionnaires to analyze the factors that influence the level of student satisfaction with online learning. We used factor analysis because it is a useful technique for looking for factors that can explain the relationship or correlation between various independent indicators that are observed. Factor analysis is also useful for identifying a small number of factors that can be used to explain a large number of interrelated variables.

Population and Sample/ Study Group/ Participants

The population in this research was all students of the Informatics and Computer Engineering Education study program at Sebelas Maret University, Indonesia, classes of the years 2019, 2020 and 2021. The sample was determined using random sampling, which provides equal opportunities for each element or member of the population being included in samples. The samples obtained can be seen in Table 1.

Data Collection Tools

Data was collected by using a questionnaire. The questionnaire was used to measure student satisfaction with online learning. We developed this questionnaire ourselves by deriving 5 variables from the dimensions of the Servqual satisfaction model, namely tangibles, reliability, responsiveness, assurance, and empathy. From these variables, we created 12

Table 1: Distribution of Samples by Class Year

Class year	*Number of samples*	*Percentage*
2019	16	37.2%
2020	13	30.2%
2021	14	32.6%

indicators and 36 statements for the respondents to answer. The responses were measured using a Likert scale (1–5) to indicate the degree of agreement, from disagreement to strong agreement. Table 2 displays the variables and indicator items. Before the instrument is used, we carry out a content validity test by an expert, followed by a validity test and a reliability test.

The content validation conducted by experts concluded that the instrument is deemed appropriate for gathering student satisfaction data in online learning.

Data Collection

Instrument validity was tested using Pearson Product-Moment Correlation and a reliability test was conducted using Cronbach's alpha. The validity and reliability of the questionnaire were analyzed using SPSS 25 software. An instrument is said to be valid if the value of the sig. (2-tailed)<0.05, and reliable if the value of Cronbach's alpha>0.6 (Priyatno, 2013). The questionnaire validity and reliability test results showed that the 36 items were valid and reliable instruments. The results of the instrument validity and reliability test are shown in Table 3.

Table 2: Variables and Indicators of Student Satisfaction with Online Learning

Variables	*Indicators*
Tangibles	Facilities and infrastructure Use of the e-learning system Lecturer appearance
Reliability	Teaching ability Lecturer responsibility
Responsiveness	Willingness to help Accuracy and availability of time
Assurance	Lecturer competence Fairness
Empathy	Personal attention Understanding of students Good communication

Table 3: Result of Validity and Reliability Test of the Questionnaire

Indicator	*Items*	*Item-test Correlation*	*A*
Facilities and infrastructure	TAN_1.1	.813	.627
	TAN_1.2	.903	
The use of an e-learning system	TAN_2.1	.889	.821
	TAN_2.2	.792	
	TAN_2.3	.893	
Lecturer appearance	TAN_3.1	.856	.828
	TAN_3.2	.932	
	TAN_3.3	.799	
Teaching ability	REL_1.1	.879	.910
	REL_1.2	.817	
	REL_1.3	.941	
	REL_1.4	.915	
Lecturer responsibility	REL_2.1	.905	.890
	REL_2.2	.939	
	REL_2.3	.871	
Willingness to help	RES_1.1	.937	.932
	RES_1.2	.939	
	RES_1.3	.941	
Accuracy and availability of time	RES_2.1	.928	.908
	RES_2.2	.931	
	RES_2.3	.903	
Lecturer competence	ASS_1.1	.930	.911
	ASS_1.2	.932	
	ASS_1.3	.905	
Fairness	ASS_2.1	.925	.931
	ASS_2.2	.953	
	ASS_2.3	.948	
Personal attention	EMP_1.1	.849	.877
	EMP_1.2	.927	
	EMP_1.3	.911	
Understanding of students	EMP_2.1	.917	.910
	EMP_2.2	.926	
	EMP_2.3	.927	
Good communication	EMP_3.1	.938	.933
	EMP_3.2	.958	
	EMP_3.3	.924	

The questionnaire data result from all respondents can be seen in the form of statistical summaries, as presented in Table 4.

Table 4: Statistical Summary of Average Questionnaire Scores

Mean	3,779069767
Median	4
Mode	4,166666667
Standard Deviation	0,767672292
Sample Variance	0,589320748
Kurtosis	1,34090667
Skewness	-1,320173258
Range	3,416666667
Minimum	1,472222222
Maximum	4,888888889

Data Analysis

The data were analyzed using factor analysis. Factor analysis is a statistical method used to identify patterns or structures in data by reducing the dimensions of several interrelated variables to a smaller number of factors. The main goal of factor analysis is to simplify the complexity of the data by identifying latent (hidden) factors that can explain the variation in the observed data.

Factor analysis aims to reduce the dimensions and groupings of variables. It helps overcome the "dimensional curse" problem, in which the greater the number of variables in an analysis, the more complex and complicated the interpretation. By combining related variables into factors, data dimensions can be reduced with no loss of important information. Factor analysis is also used to group variables by helping to identify groups of interrelated variables. This assists in developing a better understanding of the data under study and how the variables relate to one another. With factor analysis, the information becomes more concise; with fewer variables, the information can be presented in such a way that renders it easier to understand and interpret. As such, variables that do not contribute much to variation can be identified and potentially omitted for further simplification. Factor analysis can help test a theory or hypothesis about the relationship between variables by considering the extent to which the resulting factors follow the existing conceptual framework.

The main principle of factor analysis is correlation; as such, the assumptions related to the correlation statistical method must be fulfilled. The magnitude of the correlation or partial correlation between the independent variables must be sufficiently strong. The magnitude of the partial correlation is the correlation between two variables by assuming the other variables remain. The adequacy of the correlation matrix is measured using Bartlett's Test of Sphericity or by the Measure of Sampling Adequacy (MSA). If the assumption test has been satisfied, the next step is to run the factor analysis process.

The following factor analysis steps were performed in this study.

a. Testing of the assumptions using Bartlett's Test of Sphericity and MSA.
b. Factoring; deriving one or more factors from the variables that pass the assumption test.
c. Conducting factor rotation for the resulting factors. The goal is to define the variables involved in each factor.
d. Interpret the factors that have been formed, which are considered to represent the member variables of those factors.

SPSS software was used to conduct the factor analysis in this study.

Findings

The results of the questionnaire survey show that the level of student satisfaction with online learning in the Computer Education study program is 3.78 out of 5 or 75.6 out of 100. Furthermore, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity were performed to determine the feasibility of a variable and whether it could be processed further using factor analysis techniques.

Table 5 indicates a KMO value of 0.883, while the significance value of Barlett's Test of Sphericity is 0.000. Therefore, the units observed based on the KMO test are suitable for factor analysis. Furthermore, Barlett's Test of Sphericity obtained a significance value of less than 0.05 (0.00<0.05), meaning the relationship between the variables was high and the factor analysis in this study could be continued.

Alongside the results of the KMO and Barlett's tests, at this initial stage, MSA testing must also be carried out. The MSA test is performed to identify the indicators suitable for inclusion in the factor analysis.

Table 6 shows that one indicator has an MSA score of less than 0.5, namely facilities and infrastructure. It therefore cannot proceed to the next stage and must be removed from the matrix, and the test should be repeated. Table 7 shows the results obtained from rerunning the KMO and Bartlett's test.

Table 5: KMO and Barlett's Test

KMO and Bartlett's Test		
Kaiser–Meyer–Olkin MSA		.883
Bartlett's Test of Sphericity	Approx. Chi-Square	511.929
	Df	66
	Sig.	.000

Table 6: MSA (Measure of Sampling Adequacy)

Indicator	*MSA value*
Facilities and infrastructure	0.013
Use of the e-learning system	0.785
Lecturer appearance	0.796
Teaching ability	0.930
Lecturer responsibility	0.865
Willingness to help	0.902
Accuracy and availability of time	0.907
Lecturer competence	0.843
Fairness	0.925
Personal attention	0.912
Understanding of students	0.903
Good communication	0.931

Table 7: KMO and Bartlett's Retest

KMO and Bartlett's Test		
Kaiser–Meyer–Olkin MSA		.897
Bartlett's Test of Sphericity	Approx. Chi-Square	498.685
	Df	55
	Sig.	.000

The retesting results showed a KMO value of 0.897, while Barlett's Test of Sphericity maintained a significance value of 0.000. Based on the KMO retesting, it can be said that the observation unit is suitable for factor analysis. Furthermore, according to Barlett's Test of Sphericity, the significance value is below 0.05 (0.00<0.05), meaning that the linkage between the variables is high and factor analysis can be continued.

After removing the indicators that failed to meet the criteria, the calculation results were obtained, which showed that all variables had an MSA value of above 0.5, as seen in Table 8.

Based on this result, we can proceed to the factor analysis process. Analysis of communalities shows whether the value of the indicator under study is capable of explaining the factor or not. The criterion for the value of communalities is that each indicator must have an extraction value greater than 0.5. That is, each factor can explain more than 50% of the variance of each variable. The results of the communalities analysis of the remaining 11 indicators are shown in Table 9. From here, it is evident that all indicators have extraction values≥0.5, which means they meet the requirements.

Table 8: MSA (Measure of Sampling Adequacy) Retest

Indicator	*MSA value*
Use of the e-learning system	0.752
Lecturer appearance	0.820
Teaching ability	0.935
Lecturer responsibility	0.867
Willingness to help	0.936
Accuracy and availability of time	0.903
Lecturer competence	0.858
Fairness	0.925
Personal attention	0.918
Understanding of students	0.913
Good communication	0.927

Table 9 : Communalities Indicators

Communalities		
	Initial	*Extraction*
Use of the e-learning system	1.000	.810
Lecturer appearance	1.000	.773
Teaching ability	1.000	.793
Lecturer responsibility	1.000	.810
Willingness to help	1.000	.831
Accuracy and availability of time	1.000	.818
Lecturer competence	1.000	.599
Fairness	1.000	.766
Personal attention	1.000	.880
Understanding of students	1.000	.868
Good communication	1.000	.890
Extraction Method: Principal Component Analysis		

The total variance explained is used to determine how many factors will form by checking whether the eigenvalue value is greater than 1. Table 10 shows that two initial eigenvalues ≥ 1, meaning two factors are formed. The first factor can explain 71.147% of the total variance, while the second factor can explain 9.203% of the total variance. Therefore, the sum of the two factors can explain 80.350% of the total diversity of the research items.

Table 11 shows the correlation values of each indicator with the factors formed. From here, it can be seen that the use of the e-learning system indicator has a correlation value of 0.528 with factor 1 and 0.729 with factor 2. Furthermore, the rotated component matrix was analyzed to determine which indicator enters into which factor. The factor that an indicator represents is established by identifying the one that has the more significant value.

Table 10: Total Variance Explained

Total Variance Explained						
	Initial Eigenvalues			*Extraction Sums of Squared Loadings*		
Compo-nent	*Total*	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	7.826	71.147	71.147	7.826	71.147	71.147
2	1.012	9.203	80.350	1.012	9.203	80.350
3	.671	6.098	86.448			
4	.423	3.844	90.292			
5	.306	2.783	93.075			
6	.219	1.990	95.065			
7	.164	1.489	96.554			
8	.136	1.233	97.787			
9	.105	.953	98.740			
10	.074	.669	99.409			
11	.065	.591	100.000			

Table 11: Component Matrix

Component Matrix[a]

	Components	
	1	*2*
Use of the e-learning system	.528	.729
Lecturer appearance	.716	.510
Teaching ability	.877	.154
Lecturer responsibility	.899	.037
Willingness to help	.902	-.133
Accuracy and availability of time	.900	-.087
Lecturer competence	.771	-.068
Fairness	.874	-.037
Personal attention	.907	-.239
Understanding of students	.908	-.206
Good communication	.909	-.254

Extraction Method: Principal Component Analysis.

[a.] 2 components extracted.

Table 12 Rotated Component Matrix

Rotated Component Matrix[a]

	Components	
	1	2
Use of the e-learning system	.138	**.890**
Lecturer appearance	.405	**.780**
Teaching ability	**.711**	.537
Lecturer responsibility	**.784**	.442
Willingness to help	**.863**	.293
Accuracy and availability of time	**.841**	.332
Lecturer competence	**.718**	.290
Fairness	**.795**	.365
Personal attention	**.917**	.200
Understanding of students	**.903**	.230
Good communication	**.925**	.188

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

[a.] Rotation converged in 3 iterations.

In this analysis, varimax rotation was used. To facilitate the identification of the dominant item, this method brings the item correlations close to the absolute values of 1 and 0 for each factor, thus simplifying the task of determining whether an indicator is entered into factor 1 or factor 2. Table 12 shows the results of the rotated component matrix.

Table 12 shows the spread of indicators that fall into factor 1 and factor 2, from which it is possible to determine which value is more significant. There are correlation values greater than 0.5 for both components 1 and 2. It is possible to conclude that the formed factors can summarize 11 of the analyzed indicators. Thus, these 11 indicators can assess student satisfaction with online learning.

After conducting the factoring and rotation, the next step was to interpret the factors that had been formed. This was carried out to represent the variables of the members of the factor. The naming and concept of each factor depend on the general meaning of the variables involved.

From the study results, two factors were formed. The first factor consisted of the following indicators: teaching

ability, lecturer responsibility, willingness to help, accuracy and availability of time, lecturer competence, fairness, personal attention, understanding of students, and good communication. This first factor can thus be named the factor of professional and competent teaching staff, which is evident from how all of its indicators relate to the ability of lecturers to teach and provide treatment to students during online learning.

The second factor comprises only two indicators: use of the e-learning system and lecturer appearance. From this, we can name it the technical factor, where a technical factor is derived from supporting equipment or media. Factor two is thus technical because its two indicators relate to technical aspects and problems in online learning. Examples include the use of the e-learning system, whether it can be used properly and smoothly, the appearance of lecturers when conducting online learning through the e-learning platform, and whether the video quality is good and the voice can be heard clearly. The complete division of indicators into the formed factors is shown in Table 13.

Table 13 shows that factor 1 can explain 71.147% of the variance in the dataset and factor 2 can explain 9.203% of the variance in the dataset. Therefore, both factors can explain 80% of the variance in the data. According to these results, Factor 1, correlated with nine indicators, has the most significant impact on student satisfaction with online learning. It can thus be concluded that the most dominant factor influencing student satisfaction with online learning in the Computer Education study program is factor 1, namely professional and competent teaching staff. The loading factor values in Table 13 show that the three most dominant indicators influencing student satisfaction with online learning are good communication, personal attention, and understanding of students.

Discussion

Based on the questionnaire results, the average score for student satisfaction with online learning is 3.78 out of 5 or 75.6 out of 100. It can thus be concluded that the respondents in the Computer Education study program were satisfied with online learning.

According to the analysis of the 12 indicators, 11 of them affect the level of student satisfaction with online learning in the Computer Education study program, Universitas Sebelas Maret. Those indicators are use of the e-learning system, lecturer appearance, teaching ability, lecturer responsibility, willingness to help, accuracy and availability of time, lecturer competence, fairness, personal attention, understanding of students, and good communication. This can be seen from the MSA value of each indicator. The KMO value is also high, at 0.897, thus demonstrating that the overall indicators are significant. However, the facilities and infrastructure indicator was not found to affect student satisfaction. This finding is contrary to another study, which reported that facilities and infrastructure are essential in implementing online learning (Irmawati & Kaltsum, 2022), including internet connection (Basuony et al., 2021). This may be attributable to the fact that most of the samples already had access to adequate infrastructure for online learning, and there were no technological gaps between them.

Table 13: Distribution of Factors Formed

Factor	*Indicator*	*Loading Factor*	*% Variance*	*% Cumulative*
Professional and competent teaching staff	Good communication	0.925	71.147	71.147
	Personal attention	0.917		
	Understanding of students	0.903		
	Willingness to help	0.863		
	Accuracy and availability of time	0.841		
	Fairness	0.795		
	Lecturer responsibility	0.784		
	Lecturer competence	0.718		
	Teaching ability	0.711		
Technical	Use of the e-learning system	0.890	9.203	80.350
	Lecturer appearance	0.780		

The results of the factor analysis show that the level of student satisfaction with online learning is influenced by two factors, namely professional and competent teaching staff and technical factors. Professional and competent teaching staff includes the aspects of teaching ability, lecturer responsibility, willingness to help, accuracy and availability of time, lecturer competence, fairness, personal attention, understanding of students, and good communication. This is in line with other research which indicates instructor variables are the most important factor when it comes to student satisfaction in the online environment (Bolliger & Martindale, 2004). Meanwhile, the technical factors comprise the use of the e-learning system and the appearance of lecturers. These results align with those of other studies, which found that technical constraints in the form of unstable networks hindered students from conducting online learning (Klara & Ristiono, 2021). Other research states that the use of online learning platforms also influences satisfaction with online learning (Basuony et al., 2021).

The most dominant factor in terms of influencing student satisfaction with online learning is that of professional and competent teaching staff. This is in line with another study, which identified one of the factors affecting the learning satisfaction of health students in online learning as the professionalism of teachers (Nahariani et al., 2022). Another study reported that the competence and skills of educators must be enriched in carrying out online learning (Wahyono & Husamah, 2020). Professional and competent teaching staff are needed when conducting online learning. The teaching staff referred to in this case are lecturers, who are the key to all online learning activities. Meanwhile, the three most dominant indicators affecting student satisfaction with online learning in the Computer Education study program at Universitas Sebelas Maret are good communication, personal attention, and understanding of students.

When implementing online learning, good communication is revealed as the most crucial factor to ensure that learning can take place directly. According to Enshanty and Umrotun (2021), effective communication ensures teachers are aware of students' learning development at home. The delivery of effective online learning requires the development of lecturers' teaching ability. This is a unique ability that teachers, lecturers, and instructors must possess to perform teaching tasks effectively, efficiently, and professionally (Gilcman, 1991). Lecturers must be willing to assist students who experience difficulties during online learning and provide practical solutions to overcome them. They must also have accuracy and time available for students who need it. Furthermore, lecturer competence also has an important influence on the level of student satisfaction.

As mentioned earlier, it was stated that students initially exhibit high readiness in using technology and the internet for online learning. However, after reaching a certain stage in the learning process, there is a decline in motivation and attention (NAYCİ, 2021). This is where the importance of good communication, personal attention, and understanding of students by a lecturer comes into play to address issues of motivation and student attention.

Student satisfaction with online learning in the Computer Education study program was also affected by the technical factor. It is impossible to separate online learning from the use of technology. This technical factor manifests in the availability of technological facilities to support the implementation of online learning using e-learning systems. It is important for higher education institutions to be more selective and cautious in considering the implementation of online learning to ensure the satisfaction of students is maintained (Wright et al., 2023). The ease of using the e-learning system to find online learning materials and the stable and smooth operation of the e-learning system contribute to determining student satisfaction when performing online learning. Previous research has reported that the perceived benefits and ease of use influence student engagement in online learning due to the ability to post comments on discussion boards, which ultimately impacts satisfaction (Goh & Wen, 2020). Other research states that learning content and course design in online learning systems are the main factors in online learning satisfaction (Barbera & Linder-vanberschot, 2013). The appearance of lecturers when engaged in online learning, from how they dress, the clarity of their voice, and the quality of their videos, also affected the level of student satisfaction with online learning in the Computer Education study program.

Conclusion

Based on the analysis above, it can be concluded that students were satisfied with the online learning that took place in the Computer Education study program. Two factors were identified that affected student satisfaction with online learning. First, professional and competent teaching staff, which comprised the indicators of teaching ability, lecturer responsibility, willingness to help, accuracy and availability of time, lecturer competence, fairness, personal attention, understanding of students, and good communication. The second factor was termed the technical factor and consisted of the use of the e-learning system and lecturer appearance. Furthermore, professional and competent teaching staff was the dominant factor influencing student satisfaction with online learning. The three most dominant indicators

affecting student satisfaction with online learning were good communication, personal attention, and understanding of students. The results obtained in this study can thus be used to improve the online learning process in the future.

Recommendations for further research could involve a more in-depth exploration of the factors influencing student satisfaction in online learning, such as conducting an analysis of regression on student satisfaction in online learning based on the already identified factors. Additionally, the study can utilize the above-mentioned indicators to measure student satisfaction with other types of learning, thereby conducting educational research associated with other educational variables. Furthermore, the research findings can serve as an evaluation instrument for universities to both assess and enhance student satisfaction in online learning and the overall quality of online learning.

References

Baber, H. (2020). Determinants of Students' Perceived Learning Outcome and Satisfaction in Online Learning During the Pandemic of COVID19. *Journal of Education and E-Learning Research*, *7*(3), 285–292. https://doi.org/10.20448/JOURNAL.509.2020.73.285.292

Barbera, E., & Linder-vanberschot, J. A. (2013). *Factors Influencing Student Satisfaction and Perceived Learning in Online Courses*. *10*(3), 226–235. https://doi.org/10.2304/elea.2013.10.3.226

Basuony, M. A. K., Emadeldeen, R., & Farghaly, M. (2021). The factors a ff ecting student satisfaction with online education during the COVID-19 pandemic : an empirical study of an emerging Muslim country. *Journal of Islamic Marketing*, *12*(3), 631–648. https://doi.org/10.1108/JIMA-09-2020-0301

Bismala, L., & Manurung, Y. H. (2021). Student satisfaction in e-learning along the COVID-19 pandemic with importance performance analysis. *International Journal of Evaluation and Research in Education (IJERE)*, *10*(3), 753–759. https://doi.org/10.11591/ijere.v10i3.21467

Bolliger, D. U., & Martindale, T. (2004). Key Factors for Determining Student Satisfaction in. *International Journal on E-Learning*, *January-Ma*, 61–67.

Enshanty, Y., & Umrotun. (2021). *Komunikasi Efektif dalam Pembelajaran Daring [Effective Communication in Online Learning]*. Pasundan Ekspres.

Gilcman, A. (1991). *Keterampilan Dasar Mengajar Guru [Basic Teaching Skills for Teachers]*. Rineka Cipta.

Goh, E., & Wen, J. (2020). Applying the Technology Acceptance Model to Understand Hospitality Management Students' Intentions to Use Electronic Discussion Boards as a Learning Tool. *Journal of Teaching in Travel and Tourism*.

Haryani, F. F., Sarwanto, & Maryono, D. (2023). *Online learning in Indonesian higher education : New indicators during the COVID-19 pandemic*. *12*(3), 1262–1270. https://doi.org/10.11591/ijere.v12i3.24086

Indarti, I., Wahyuningsih, U., Yulistiana, Y., Suhartini, R., & Prihatina, Y. I. (2021). Faktor-faktor yang Mempengaruhi Kepuasan Belajar Jarak Jauh Mahasiswa Vokasi di Masa Pandemi Covid-19 [Factors that Influence Vocational Students' Distance Learning Satisfaction during the Covid-19 Pandemic]. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *18*(2), 226. https://doi.org/10.23887/jptk-undiksha.v18i2.31147

Irmawati, I., & Kaltsum, H. U. (2022). Sarana dan Prasarana Pembelajaran Daring pada Masa Pandemi Covid-19 di sekolah Dasar [Online Learning Facilities and Infrastructure during the Covid-19 Pandemic in Elementary Schools]. *Jurnal Basicedu*, *6*(3), 3918–3930. https://doi.org/10.31004/basicedu.v6i3.1629

Kasih, A. P. (2020). *Minister of Education and Culture: Higher Education in All Zones Prohibited Face-to-Face Lecture*. Kompas. https://www.kompas.com/edu/read/2020/06/16/103917571/mendikbud-perguruan-tinggi-di-semua-zona-dilarang-kuliah-tatap-muka

Klara, F., & Ristiono, R. (2021). Identifikasi Faktor Penyebab Kesulitan Belajar Peserta Didik yang Pembelajarannya dalam Jaringan (Daring) kelas XI [Identification of Factors that Cause Learning Difficulties for Students Who Learn Online in Class XI]. *Journal for Lesson and Learning Studies*, *4*(3), 350–356.

Kotler, P. (2006). *Manajemen Pemasaran [Marketing Management]* (11th ed.). PT. Indeks Gramedia.

Lala, A., & Marhalim, M. (2019). Aplikasi Tingkat Kepuasan Mahasiswa terhadap Layanan Administrasi Fakultas Teknik Universitas Muhammadiyah Bengkulu [Application of Student Satisfaction Levels with Administrative Services of the Faculty of Engineering, Muhammadiyah University of Bengkulu. *Pseudocode*, *6*(2), 172–180. https://doi.org/10.33369/pseudocode.6.2.172-180

Lim, P. C., Tang, N. K. H., & Jackson, P. M. (1999). An innovative framework for health care performance measurement. *Managing Service Quality*, *9*(6), 423–433.

Moore, M. G., & Kearsley, G. (2011). *Distance Education: A Systems View of Online Learning*. Cengage Learning.

Nahariani, P., Retno, S., Andayani, D., Rosmaharani, S., & Noviana, I. (2022). Analisis Faktor yang Mempengaruhi Tingkat Kepuasan Belajar Mahasiswa Kesehatan dalam Pembelajaran Daring [Analysis of Factors that Influence the Level of Learning Satisfaction of Health Students in Online Learning]. *Jurnal Ilmiah Keperawatan*, *8*(1), 252–255.

NAYCİ, Ö. (2021). Online learning readiness of associate degree students and their experiences reg. *International Journal of Eurasian Education and Culture*, *6*(12), 235–285. https://doi.org/10.35826/ijoecc.324

Priyatno, D. (2013). Independent Learning Data Analysis with SPSS. In *Mediakom*. MediaKom.

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity. *Postdigital Science and Education*, *2*(3), 923–945. https://doi.org/10.1007/s42438-020-00155-y

Sukmanasa, E., Novita, L., & Siti, F. (2017). Analisis Kepuasan Mahasiswa terhadap Kinerja Dosen Program Studi Pendidikan Guru Sekolah Dasar Universitas Pakuan [Analysis of Student Satisfaction with the Performance of Lecturers in the Pakuan University Primary School Teacher Education Study Program]. *Pedagonal : Jurnal Ilmiah Pendidikan*, *1*(2), 91–99. https://doi.org/10.33751/pedagog.v1i2.390

Wahyono, P., & Husamah, H. (2020). Guru Profesional di Masa Pandemi COVID-19: Review Implementasi, Tantangan, dan Solusi Pembelajaran Daring [Professional Teachers during the COVID-19 Pandemic: Review of Online Learning Implementation, Challenges and Solutions]. *Jurnal Pendidikan Profesi Guru*, *1*(1), 51–65.

Wang, C., Horby, P. W., Hayden, F. G., & Gao, G. F. (2020). A Novel Coronavirus Outbreak of Global Health Concern. *The Lancet*, *395*(10223), 470–473.

Wright, G., Volodarsky, S., Hecht, S., & Saxe, L. (2023). Student Satisfaction and the Future of Online Learning in Higher Education : Lessons from a Natural Experiment. *Online Learning*, *27*(1), 336–355. https://doi.org/10.24059/olj.v27i1.3224

Yuriko, O., & Sany, S. (2021). Faktor yang Mempengaruhi Kepuasan Pembelajaran Mahasiswa Selama Masa Pandemi Covid-19 pada Mahasiswa Jurusan Akuntansi di Universitas Kristen Petra [Factors that Influence Student Learning Satisfaction During the Covid-19 Pandemic in Accounting Department. *Business Accounting Review*, *9*(1).