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Implementation of cyberlearning in elementary schools: case study in Indonesia

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ABSTRACT

Many studies have focused on online learning in terms of it is structure and practice, but only some have sampled elementary school teachers. This article explains factor analysis of the relevance of online learning in Indonesia. They are taking teachers from 25 elementary schools with public, private, and Islamic school clusters. Data analysis found two groups of factors that determine online learning in elementary schools in Indonesia; the first is related to system quality and information quality, while the second is related to technology mastery, teacher characteristics, and student characteristics. Attention is focused on the readiness to transition from face-to-face learning to cyberlearning, which we wrote about in the learning recommendations. Overall, these two factors are related to implementing enjoyable online learning.

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1. INTRODUCTION

Cyberlearning is something that has been introduced previously in education. Although it is unknown when cyberlearning started, online-based learning began in the 1980s [1]. Cyberlearning is defined as fast learning without face-to-face contact using technology platforms as the right solution for modern learning [2]. Online learning has been widely developed as an alternative to face-to-face learning [3], [4]. Many models can be applied to online learning, including interactive multimedia [5] and website-based learning [6]–[8]. Using gadgets in everyday life should be part of transitioning from face-to-face to online-based learning.

Since the COVID-19 pandemic hit Indonesia for the first time on March 2, 2020, the Minister of Education and Culture has taken a firm stance to change learning to online-based cyber learning. Unpreparedness due to nervousness and inability due to technological illiteracy are complicated situations teachers and students face, especially for teachers and students who never use technology during face-to-face learning. At the beginning of 2020, Indonesia was a country with almost 64% of the population using the internet and spending around 8 hours a day interacting with their gadgets [9], [10]. It takes a long time to learn to use the internet. Another must-have readiness is the ability of teachers and students to operate gadgets in learning-online-based learning with the internet or multimedia benefits schools and other education providers.

Cyberlearning provides excellent benefits for schools as education providers. First, cyberlearning can balance school finances because learning emphasizes physical distancing and reducing excessive use of

infrastructure [11]. Second, cyberlearning can prepare the school environment to compete globally [12] as a fast step in opening up digital information [13]–[15]. Cyberlearning for students is not a limitation of the learning method obtained. Students can learn anywhere, anytime, with the desired source [16], allowing them to learn with anyone. Cyberlearning can regulate students' learning rhythm [17] and as an alternative to conventional learning [18].

Reflecting on cyberlearning in China, student absence in the classroom becomes a pedagogical challenge [19] due to the need for feedback on learning [20]. In Singapore, however, cyberlearning emphasizes using technology in home-based learning [21]. The readiness of teachers and students to switch to online learning is a challenge for cyberlearning in Indonesia [22]. How is cyberlearning practiced in Indonesia, especially in elementary schools? Therefore, the problem of cyberlearning during the advancement of digital technology is essential to analyze, so teachers and students must prepare good digital skills. The research was conducted to provide an overview of cyberlearning learning patterns in Indonesia, teacher readiness, influencing factors, and recommendations for ideal learning to be carried out.

2. METHOD

This research applied multivariate analysis with factor analysis. The purpose of factor analysis is to explain the structure of relationships between many variables in the form of formed variables. The factors formed are random quantities that previously could not be observed, measured, or determined directly [23]. The population is elementary school teachers who apply cyberlearning in Central Java. The sampling technique used was random, with 25 schools consisting of three groups: state schools, private schools, and schools based on Islamic education in Central Java. Data collection applied in this research used an online questionnaire distributed randomly to a network of elementary schools. The data collection technique is a questionnaire link filled in by the teacher, and then the data is reduced for analysis. The five aspects that are the points of the questionnaire given are shown in Table 1. Factor analysis is a data analysis used in this research. It operates with SPSS. Factor analysis determines the relationship between the variables studied to obtain factor variable data. It recognises or identifies underlying dimensions or factors that explain the correlation between variables [23], [24].

Table 1. Aspects of research questionnaires

Aspect	Description	Explanation
Mastery of Technology	Knowledge, skills, and attitudes toward operating technology [25]	Knowledge and skills in operating a computer or smartphone used in online learning.
Student Characteristics	Activeness and mastery of the material provided by the teacher [26], [27]	Student activity and participation during online learning are carried out.
Teacher Characteristics	Age, attitude, and moral reasoning [28], [29]	Age level, teacher attitudes, and morals
Information quality	Contextual, representative, and easily accessible [30], [31]	Material context and suitability of the material provided by the teacher.
System quality	Easy to access, stable connection, and easy to use [32]	The application used is easy to access and has a stable network

3. RESULTS AND DISCUSSION

3.1. Results of analysis factors

The initial part of the research results shows the average time elementary school teachers spent on online learning during the COVID-19 pandemic in Indonesia, as seen in Figure 1. This is surprising because 58% of elementary school teachers in Indonesia use online learning for only 1-2 hours out of the 8 hours of lessons that should be done in class. Another fact obtained is that teachers use social media networks to communicate with students, not using online learning platforms provided by schools or the government.

Several sequences must be followed to obtain the factor analysis results in this research. The SPSS Kaiser Meyer Olkin Measure (KMO) of Sampling and Bartlett output tables in Table 2 show the first results. The KMO and Bartlett's tables determine whether factor analysis can occur. The conditions that must be met are if the KMO measure of sampling adequacy (MSA) value is >0.50 and Sig <0.05, it can be continued at the next stage. In the KMO and Bartlett's Test table, this research shows that the KMO MSA value is 0.700>0.50 and the Sig. The first condition is met at 0.008<0.05; then, factor analysis can be continued.

The second SPSS output table obtained is the anti-image matrices table. Table 3 is used to determine variables suitable for use in factor analysis. Let's look at the following SPSS output anti-image matrices table. The anti-image matrix table, shown in Table 4, has a sign with the letter code [a], which means the MSA sign. The MSA value of each variable is known as follows.

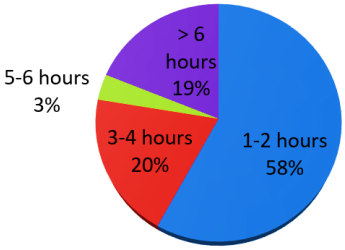

Figure 1. Average online learning hours

Table 2. KMO and Bartlett's test

Component		Value
KMO MSA		.700
Bartlett's test of sphericity	Approx. Chi-Square	21.476
	df	10
	Sig.	.008

Table 3. Anti-image matrices

	Aspect	Technology mastery	Student characteristics	Teacher characteristics	Information quality	System quality
Anti-image covariance	Technology mastery	.716	-.244	-.156	-.043	-.088
	Student characteristics	-.244	.674	-.105	-.159	-.051
	Teacher characteristics	-.156	-.105	.909	.028	.012
	Information quality	-.043	-.159	.028	.614	-.308
	System quality	-.088	-.051	.012	-.308	.650
Anti-image correlation	Technology mastery	.732[a]	-.351	-.193	-.064	-.129
	Student characteristics	-.351	.734[a]	-.135	-.248	-.077
	Teacher characteristics	-.193	-.135	.712[a]	.038	.015
	Information quality	-.064	-.248	.038	.665[a]	-.488
	System quality	-.129	-.077	.015	-.488	.677[a]

a. Measures of sampling adequacy (MSA)

Table 4. MSA value for each variable

Aspect	MSA value
Technology mastery	0.732
Student characteristics	0.734
Teacher characteristics	0.712
Information quality	0.665
System quality	0.677

The following output data is the community table in Table 5. The community Table 5 shows the value of each variable as a determinant of whether or not the variable is appropriate to explain the factor. The following is the SPSS output on the communalities table. Based on the Table 5, the extraction value for all variables is >0.50. The condition that must be met to get a good commonalities value is if the extraction value is >0.50. So, all research variables can be used to explain factor analysis.

Table 5. Communalities

Aspect	Initial	Extraction
Technology mastery	1.000	.595
Student characteristics	1.000	.597
Teacher characteristics	1.000	.742
Information quality	1.000	.734
System quality	1.000	.702

Extraction method: principal component analysis

The SPSS output in Table 6 is a total variant explained in the Table 6, which shows the value of each variable studied. This research has five variables, meaning five components must be analyzed. The condition for it to be a factor in factor analysis is that the Eigenvalues must be greater than 1. The eigenvalues for the factor one component are 2.303, so it becomes factor 1 and can explain 46.051% of the

variation. Meanwhile, the eigenvalues of the factor two component are 1.068, so it becomes factor 2 and can explain 21.362% of the variation. This means that this research has two components factor analysis.

The two-component analysis factor of this research can also be displayed in the SPSS output scree plot image, as shown in Figure 2. At the eigenvalues point, two components exceed number 1, namely the one-factor and the two-factor components. Both components contribute significantly to the total variance of the data. The sharp decrease in eigenvalues after the second component indicates that only two principal components are relevant for further analysis. Thus, these two components represent the main data structure and will be used in the next step of the analysis.

Table 6. Total variance explained

	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.303	46.051	46.051	2.303	46.051	46.051	1.906	38.117	38.117
2	1.068	21.362	67.414	1.068	21.362	67.414	1.465	29.296	67.414
3	.690	13.796	81.210						
4	.530	10.594	91.803						
5	.410	8.197	100.000						

Extraction method: principal component analysis.

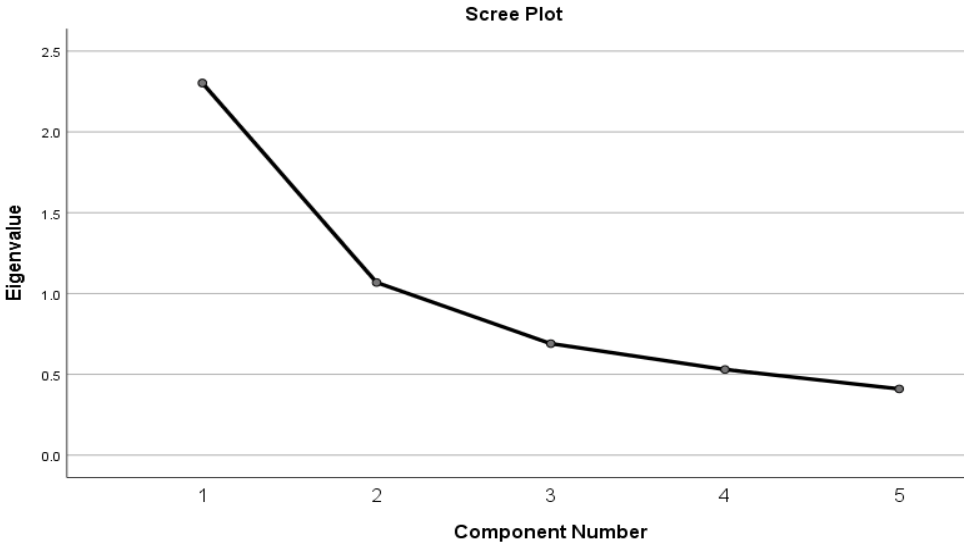

Figure 2. Scree plot

The next stage of SPSS output is a component matrix is shown in Table 7. The component matrix shows the relationship of variables to the factors formed. The technology mastery variable from the component matrix table correlates with factors 1 of 0.709 and 2 of 0.305. Likewise, for component matrix calculations on other variables.

The most significant correlation value between the variables and the component factors formed can be used to determine which variables are included in factor one or two. To ensure that a variable is included in factor one or two groups in this research, you can pay attention to the rotated component matrix value. Table 8 shows that the variables of technology mastery, student characteristics, and teacher characteristics are included in the second-factor analysis component. Meanwhile, factor analysis component one consists of the information quality and system quality variables. The final SPSS table output is a component transformation matrix, namely the magnitude of the component values for each variable.

Table 7. Component matrix

Aspect	Component	
	1	2
Technology mastery	.709	.305
Student characteristics	.759	.147
Teacher characteristics	.372	.777
Information quality	.752	-.410
System quality	.721	-.428

Extraction method: principal component analysis.
a. 2 components extracted.

Table 8. Rotated component matrix[a]

Aspect	Component	
	1	2
Technology mastery	.411	.653
Student characteristics	.542	.551
Teacher characteristics	-.133	.851
Information quality	.852	.089
System quality	.836	.056

Extraction method: principal component analysis.
Rotation method: varimax with kaiser normalization.
a. Rotation converged in 3 iterations.

Table 9 shows that component one has a correlation value of 0.824>0.50, and component two has a correlation value of 0.824>0.50, so the two factors formed can summarise the five variables analyzed. The high correlation between these two components indicates that each element strongly relates to the variables studied. This result strengthens the validity of the principal component analysis model in summarizing data into two main factors that represent all variables.

Table 9. Component transformation matrix

Component	1	2
1	.824	.567
2	-.567	.824

Extraction method: principal component analysis.
Rotation method: varimax with kaiser normalization.

3.2. Discussion

The research details two factors that influence and are interconnected in cyberlearning in elementary school education in Indonesia. The first factor consists of information quality and system quality. Meanwhile, the second group of factors is technology mastery, student characteristics, and teacher characteristics.

3.2.1. Information quality and system quality

The diverse characteristics of students challenge teachers and schools to create innovations in cyber learning. The target group taken leads to student activity [33] and students' critical abilities in learning [34]. The student's ability to respond to the material provided by the teacher is also a consideration of the suitability of the student's age and learning style [35].

Understanding students' complete characteristics is the teacher's responsibility. Teachers need help remembering the learning environment students require in various learning models. Making it fun for students in face-to-face learning must also be present in online learning. Preparing an online learning atmosphere appropriate to the student's learning environment is used to avoid pedagogical mismatches [36]. Student profiles will be found before online learning is conducted [37], [38].

When viewed from student satisfaction, online learning is equivalent to face-to-face learning in class. Student characteristics and the teacher's ability to convey material appropriately increase students' flexibility and accessibility. However, it becomes a concern about the teacher's learning approach to packaging the material to make it very interesting for students.

3.2.2. Technology mastery, student characteristics, and teacher characteristics

The problem in Indonesia is that cyberlearning is rarely implemented at the elementary school level. Many of the obstacles experienced by teachers and students are computer control and unstable internet networks. Teachers' and students' understanding of computer technology's benefits still needs to be improved. Apart from the many benefits of cyberlearning, obstacles are often experienced in impersonal assessments, giving the impression of learning to isolate oneself [39]. Even in the same district, Indonesia, primary school education has unequal access between schools. There are many underlying causes, but at least two are essential: teachers' ability to use technology and students' characteristics in learning.

The characteristics formed in online and active classroom learning are very different. Measures of system quality and information quality determine the success of online learning. The research showed that many elementary school teachers use social media platforms as learning media in Indonesia. System quality is ignored while other learning platforms can be used.

The relationship emerges that information and system quality are part of fulfilling online learning infrastructure. When online learning continues to develop, even though it is not a pandemic and learning from home, what must be strengthened is meeting online learning needs and infrastructure. However, face-to-face learning is always the right choice when implementing learning [40]. Readiness for online learning constructs is critical.

The main environmental differences between online and face-to-face learning require the development of online teaching with different competencies. Communication, managing technology, and conveying information is essential in intensive online learning. Another thing that must be learned is the readiness to adapt to new media and new learning sources. Monitoring student knowledge and problem-solving is essential for teachers, minimising the possibility of students dropping out of online learning groups.

3.2.3. Ideal online learning practices

We provide several recommendations regarding online learning in terms of structure and practice. First, changing the mindset related to teacher and student characteristics means that online education can be done anywhere, anytime, effectively, and enjoyable. Technological developments are speedy, making it possible that in the next 20 to 30 years, learning will be carried out entirely through online learning. Face-to-face learning is only effective for essential competencies; students must develop their abilities independently [41].

Online learning mode with virtual classes makes it easier for students to log in and join courses. The ability to access and intensity of access to virtual classes will make it easier for students to find the learning problems they face. So what is the teacher's job like? Become a moderator and case solver for every learning problem faced by students.

Second, clear regulations for online learning must be prepared. Determine the learning platform used, the assessment applied, and the form of information control provided by the teacher. Even empirical data from research shows that the completion rate for online classes with full student participation still needs to be higher because the online learning platform uses social media.

As we know, regulations are straightforward to change in Indonesia. Whoever is in charge has the freedom to change rules. This means that the regulations made for online learning adapt to the needs of global market demands regarding education. They are flexible but firm to implement. Regulations also regulate online-based learning media platforms, not social media.

Third, good learning time management. If research shows that teachers only spend 1-2 hours teaching online, then what about the remaining 8 hours of lessons that should be done? Making the most of learning time to develop students' advanced competencies is a step that can be taken. Students must obtain a second literacy and opinion from their studied material. Time management is also inseparable from the communication teachers carry out with students. Provide intense guidance to each student by overcoming their learning problems. Ideally, if there are 8 hours of face-to-face learning time, 4 hours of online learning can be applied.

4. CONCLUSION

This article describes the factors that influence cyberlearning in elementary schools in Indonesia. Two groups of technology mastery factors, student and teacher characteristics, implement factors in cyberlearning. Emphasising the mastery of technology possessed by teachers and students must also be balanced with their adaptability to the use of technology. Technological infrastructure is the basis for strengthening cyberlearning capabilities in elementary schools. Changing face-to-face learning styles to virtual classes is a challenge for education administrators. The second factor is related to information and system quality. Let's differentiate between cyberlearning platforms and social media. Because of the systems developed, social media's information capabilities are similar to those of cyberlearning platforms. The choice of a cyberlearning platform is balanced with the teacher's pedagogy and student characteristics in learning. The environment provides support, but system and information quality are the determinants.

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