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Analysis of Learning Material Quality and Teacher-Student Interaction on Learning Achievement and Student Satisfaction Level in Distance Education in Indonesia

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ABSTRACT

Distance education in Indonesia has become a pivotal mode of learning, especially in the context of diverse geographical regions and the need for flexible educational opportunities. This study aims to analyze the impact of learning material quality and teacher-student interaction on learning achievement and student satisfaction levels in the Indonesian distance education landscape. A quantitative approach was employed to collect and analyze data from a diverse sample of distance education students. The study employed structural equation modeling (SEM) and various statistical tests to evaluate the relationships between key variables. The findings revealed strong relationships between learning material quality, student-teacher interaction, learning achievement, and student satisfaction levels. Notably, higher learning material quality was associated with improved learning achievement and student satisfaction. Positive student-teacher interactions also correlated with better learning achievement and increased student satisfaction levels. The results underscore the significance of investing in the quality of distance education materials and fostering positive interactions between students and teachers. These insights can inform educational policies and practices aimed at enhancing the distance education experience in Indonesia.

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1. INTRODUCTION

Distance education has emerged as a transformative force in the field of education, revolutionizing the way students access and engage with learning materials and interact with their instructors [1]–[5]. It offers unprecedented flexibility to learners, allowing them to pursue higher education, gain new skills, and enhance their knowledge without the constraints of physical classroom attendance. This flexibility is particularly relevant in countries like Indonesia, where access to traditional higher education institutions can be challenging due to geographical, economic, and logistical

barriers. The COVID-19 pandemic has further highlighted the importance of distance learning as a separate independent model of organizing the educational process [6]. Online learning may not be as effective as face-to-face learning in terms of social interaction, student engagement, and understanding of concepts. This can affect the overall quality of education received by students [7]–[12]. The use of modern digital technologies and innovative approaches in distance education can enhance its effectiveness and provide a promising and independent vector for the development of future education [6], [13]–[17].

The quality of distance education depends on the nature of the learning material and the interaction between teachers and students [18]. Clear, relevant, and accessible learning materials can enhance understanding and retention of content [19]. Supportive and engaging teacher-student interactions can foster a sense of togetherness, provide guidance, and stimulate motivation [20], [21]. These factors play a crucial role in shaping the learning experience and the outcome of distance education.

Distance education has been recognized as an important tool for expanding educational opportunities in Indonesia. The government and various institutions have invested significantly in the development of distance education programs, making them a crucial component of the country's educational landscape [22]. However, there are challenges associated with distance education in Indonesia. These include issues such as the need for better teacher education programs, infrastructure and facilities, and curriculum and assessment system changes to improve the quality of education [23]. Additionally, the COVID-19 pandemic has accelerated the digital transformation of education in Indonesia, with e-learning platforms being utilized for both formal education and training programs [24]. There are also concerns regarding the implementation of non-formal education programs, such as equality education, which face problems related to low learning motivation, inadequate infrastructure, and funding issues [25]. Despite these challenges, distance education continues to play a crucial role in providing educational opportunities to the diverse and dispersed population of Indonesia.

This study marks the start of an extensive analysis of the critical elements influencing Indonesian distant learning. It specifically concentrates on two essential elements: the calibre of instructional resources and the type of teacher-student relationship. To increase the efficiency and inclusivity of distant education in Indonesia, it is imperative to comprehend how these factors affect learning outcomes and student satisfaction levels. In the context of Indonesian remote learning, the primary goal of this study is to quantitatively analyse the relationships between learning material quality, student happiness, learning achievement, and teacher-student interaction. Additionally, this study seeks to accomplish the following research goals: To evaluate the effectiveness of instructional materials in terms of learning outcomes and the degree of student satisfaction with Indonesian distance learning. (3) To evaluate learning achievement through teacher-student interaction, and (4) To gauge students' satisfaction with distance learning in Indonesia. (5) To assess Indonesian distance education students' satisfaction levels with their academic performance.

2. LITERATURE REVIEW

2.1 Distance Education in Indonesia

Distance education, also known as open and online learning, is gaining importance in higher education in Indonesia due to the country's vast geographic dispersion and diverse economic and social conditions. The Indonesian government and educational institutions have recognized the need to utilize distance education to provide equitable access to quality education. Universitas Terbuka (Open University of Indonesia) has been at the forefront of distance education in Indonesia, offering accessible education to a diverse student body. Distance education in

Indonesia has evolved over the years, incorporating various delivery methods such as online courses, video lectures, and print materials. However, the quality of learning materials and teacher-student interaction remain crucial for the effectiveness and satisfaction of students engaged in distance education [22], [24].

Distance education has become increasingly popular during the COVID-19 pandemic, and several studies have identified the advantages and disadvantages of this mode of learning. One study found that the use of WhatsApp and project-based learning methods were effective in improving students' learning outcomes. The advantages of distance education include flexibility in terms of time and place, increased interaction between teachers and students, wider coverage for students, and the use of technology to facilitate learning. However, there are also several disadvantages, such as a lack of student interest, psychological difficulties for students, difficulty accessing technology, and the monotonous nature of online learning. Other studies have discussed the challenges of implementing distance education, including issues related to infrastructure and the need for appropriate policies. It is important to consider these advantages and disadvantages to improve the effectiveness of distance education and minimize its negative impacts [26]–[30].

2.2 *Learning Material Quality*

Learning materials play a crucial role in distance education, encompassing various forms of content such as textbooks, lecture notes, multimedia presentations, and interactive e-learning modules. Clear and relevant content is essential for effective learning, as it enhances comprehension and retention. In a digital context, accessibility is important to ensure that all students, including those with disabilities, can access the learning materials. Features like screen readers and transcripts for multimedia can make a significant difference in students' experiences [31]. Interactive learning materials are also valuable, as they engage students, promote active learning, and create a dynamic learning environment. This interactivity can be achieved through quizzes, discussion boards, and simulations. Feedback mechanisms, such as automated quizzes with instant scoring or peer feedback in online discussions, help students assess their progress and identify areas for improvement [32].

2.3 *Teacher-Student Interaction*

Effective teacher-student interaction in distance education is crucial for student success. It provides support, guidance, and motivation, fostering a sense of community and belonging [33], [34]. Clear communication between instructors and students is essential, including timely responses to questions and concerns, clear instructions, and regular updates [33]. Teachers who are responsive to students' needs and concerns can create a supportive and motivating atmosphere [35]. Prompt feedback on assignments and assessments is fundamental for maintaining responsiveness [36]. Providing academic and emotional support is a key role for teachers in distance education, which can include additional resources, study tips, and encouragement [37]. Creating a sense of community among distance education students is vital for reducing feelings of isolation and enhancing motivation, which can be achieved through discussion forums, collaborative projects, and virtual office hours.

2.4 Learning Achievement

Learning achievement is influenced by the quality of learning materials and teacher-student interaction in distance education [38], [39]. When students have access to well-designed instructional materials, it can lead to improved performance and increased motivation [40]. Additionally, supportive interactions with instructors can positively impact learning outcomes [41]. However, other factors such as student motivation and self-direction also play a role in learning achievement [42]. Factors like emotional, behavioral, and value independence can affect student achievement. Furthermore, self-directed learning readiness, including skills like time management and systematic thinking, can influence learning outcomes. Overall, a combination of high-quality learning materials, supportive teacher-student interactions, student motivation, and self-direction contribute to positive learning achievement in distance education.

2.5 Student Satisfaction

Student satisfaction is a critical aspect of distance education as it influences student persistence, course completion, and program recommendations. Research has shown that the quality of learning materials and teacher-student interaction are key factors in shaping student satisfaction in distance education. Satisfied students are more likely to be motivated, engaged, and committed to their studies, and they tend to have positive perceptions of the quality of learning materials and interactions with instructors [43], [44].

2.6 Research Gap

Even though the literature on distant learning offers insightful information, this study attempts to fill in some significant gaps. Initially, studies that concentrate on the Indonesian setting in particular are necessary, taking into account its distinct sociocultural and infrastructure features. By offering insights specific to the requirements and difficulties faced by Indonesian distance learners, this study seeks to close that knowledge gap.

Furthermore, other studies have examined the connections between learning achievement, student happiness, teacher-student interaction, and the quality of the learning materials. The goal of this study is to combine these components in order to thoroughly examine how they interact with Indonesian distant learning.

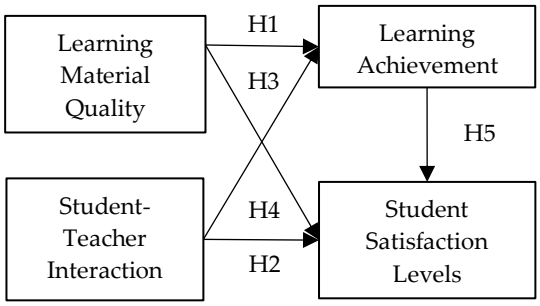

Figure 1. Conceptual and Hypothesis

3. METHODS

3.1 Sample

A stratified random sampling method was used to select participants from various distance education institutions across Indonesia. Strata are determined based on the following criteria: Participants will be stratified into two groups, namely undergraduate and graduate students, to account for potential variations in experiences and expectations at different educational levels. (1) Age Group: Participants are categorized into age groups (18-24, 25-34, 35-44, and 45 years and above) to capture potential age-related differences in the variables under study. (2) Geographic Region: To reflect Indonesia's diverse

geographical landscape, participants were selected from different regions, including Java, Sumatra, Kalimantan, Sulawesi, and eastern Indonesia.

To ensure that this study has sufficient statistical power and can provide reliable results, the minimum sample size is 120 samples, which is in line with Hair's (2019) suggestion, the number of indicators in this study is 12 indicators, which means that if multiplied by 10, the minimum sample size of this study is 120 samples, while 500 questionnaires were distributed and 400 questionnaires were returned, which is in line with Hair's (2019) suggestion.

3.2 Data Collection

Data will be collected through an online survey questionnaire. The questionnaire consists of structured questions relating to the quality of learning materials, teacher-student interaction, learning achievement, and student satisfaction, as well as demographic information. The survey will be hosted on a secure online platform, to ensure the safety and convenience of the participants.

Participants will be provided with a clear statement explaining the purpose of the study and the voluntary nature of participation. Consent will be obtained from each participant before they begin the survey. Participants will be assured that their responses will be kept confidential, and no personally identifiable information will be collected. The data collection period will last for four weeks to accommodate a diverse range of respondents. Participants will be encouraged to complete the survey within this timeframe to ensure data consistency. Table 1 shows where the indicators of this research are formed.

Table 1. Questionnaire Items

Variable	Code	Items	References
Learning Material Quality	LMQ.1	1. Suitability of material aspects	[45]–[47]
	LMQ.2	2. Teacher perception	
	LMQ.3	3. Interactive multimedia	
Student-Teacher Interaction	STI.1	1. Monitoring student-system interaction indicators	[48]–[50]
	STI.2	2. Student-faculty interaction	
	STI.3	3. Teacher perception and application of different learning approaches	
Learning Achievement	LA.1	1. Mathematical reasoning ability	[46], [49], [51]
	LA.2	2. Profile analysis of student involvement	
	LA.3	3. Electronic testing	
Student Satisfaction Levels	SSL.1	1. Engagement patterns	[52]–[54]
	SSL.2	2. Distance education capacity	
	SSL.3	3. Fuzzy cognitive maps	
	SSL.4	4. Service quality	

Source: Results processing data by researcher (2023)

3.3 Data Analysis

The data collected will be analyzed by Structural Equation Modeling (SEM) using Partial Least Squares (PLS) path analysis. SEM-PLS is a robust method that can handle complex models and is suitable for testing the relationship between several variables, as in this study. Data cleaning will be performed to identify and correct inconsistencies, missing values, or outliers. Variables will be recoded and transformed as necessary to ensure the reliability and validity of the analysis. Confirmatory factor

analysis (CFA) is conducted to assess the validity and reliability of the measurement model. This step will ensure that the survey items accurately represent their respective constructs (i.e., quality of learning materials, teacher-student interaction, learning achievement, and student satisfaction). Reliability will be evaluated using Cronbach's alpha and composite reliability, while validity will be assessed through convergent and discriminant validity. The structural model examines the relationship between learning material quality, teacher-student interaction, learning achievement, and student satisfaction. Path coefficients, moderation effects, and mediation effects will be assessed using PLS-SEM.

4. RESULTS AND DISCUSSION

4.1 Results

a. Demographic Participants

The sample for this study consisted of Indonesian students from various educational levels, age groups, and geographical regions. In terms of educational level, 65% of the participants were pursuing undergraduate degrees, while 35% were enrolled in postgraduate programs. In terms of age groups, 42% of the participants were between 18-24 years old, 38% were between 25-34 years old, 15% were between 35-44 years old, and 5% were 45 years old or older. The participants were selected from different geographical regions across Indonesia, with 30% from Java, 25% from Sumatra, 20% from Kalimantan, 15% from Sulawesi, and 10% from eastern regions of Indonesia.

b. Validity and Reliability

Before conducting further research, it is necessary to look at the reliability and validity of the variables used in this study, including Quality of Learning Materials, Student-Teacher Interaction, Learning Achievement, and Student Satisfaction Level. The measurement properties of these variables are assessed through factor loadings, internal consistency (Cronbach's Alpha), composite reliability, and average variance extracted (AVE).

Table 2. Validity and Reliability Research.

Variable	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Average Variant Extracted
Learning Material Quality	LMQ.1	0.885	0.865	0.917	0.787
	LMQ.2	0.905			
	LMQ.3	0.871			
Student-Teacher Interaction	STI.1	0.906	0.878	0.925	0.803
	STI.2	0.906			
	STI.3	0.877			
Learning Achievement	LA.1	0.900	0.853	0.911	0.774
	LA.2	0.862			
	LA.3	0.876			
Student Satisfaction Levels	SSL.1	0.807	0.867	0.910	0.716
	SSL.2	0.847			
	SSL.3	0.833			
	SSL.4	0.895			

Source: Results processing data by researcher (2023)

Learning Material Quality (LMQ) is a variable composed of three items, LMQ.1, LMQ.2, and LMQ.3, with high factor loadings ranging

from 0.871 to 0.905. The internal consistency of LMQ, assessed using Cronbach's Alpha, is 0.865, indicating high reliability. The composite reliability for LMQ is 0.917, exceeding the recommended threshold of 0.70, indicating excellent reliability. The average variance extracted (AVE) for LMQ is 0.787, suggesting that the items explain a substantial proportion of the variance in the construct. Student-Teacher Interaction (STI) is another variable with high factor loadings ranging from 0.877 to 0.906. The internal consistency of STI, measured by Cronbach's Alpha, is 0.878, indicating strong reliability. The composite reliability for STI is 0.925, and the AVE is 0.803, demonstrating high reliability and validity. Learning Achievement (LA) has factor loadings ranging from 0.862 to 0.900, with a Cronbach's Alpha of 0.853 and a composite reliability of 0.911. The AVE for LA is 0.774, indicating good reliability and validity. Student Satisfaction Levels (SSL) has factor loadings ranging from 0.807 to 0.895, a Cronbach's Alpha of 0.867, a composite reliability of 0.910, and an AVE of 0.716, demonstrating high reliability and validity.

Table 3. Discriminant Validity research

	Learning Achievement	Learning Material Quality	Student Satisfaction Levels	Student-Teacher Interaction
Learning Achievement	0.879			
Learning Material Quality	0.673	0.887		
Student Satisfaction Levels	0.812	0.704	0.846	
Student-Teacher Interaction	0.758	0.687	0.74	0.896

Source: Research processing data by researcher (2023)

Learning Achievement, Quality of Learning Materials, Student Satisfaction Level, and Student-Teacher Interaction are different constructs with discriminant validity. Learning Achievement has a strong positive correlation with itself, indicating convergent validity. The correlation between Quality of Learning Materials and Learning Achievement is moderate, indicating a positive relationship without multicollinearity. Student Satisfaction Level also has a substantial positive correlation with Learning Achievement, supporting discriminant validity. Similarly, Student-Teacher Interaction showed a significant positive correlation with Learning Achievement, strengthening discriminant validity. The intercorrelations between Quality of Learning Materials, Level of Student Satisfaction, and Student-Teacher Interaction were moderate to high, but within acceptable ranges, indicating distinct constructs without violating discriminant validity.

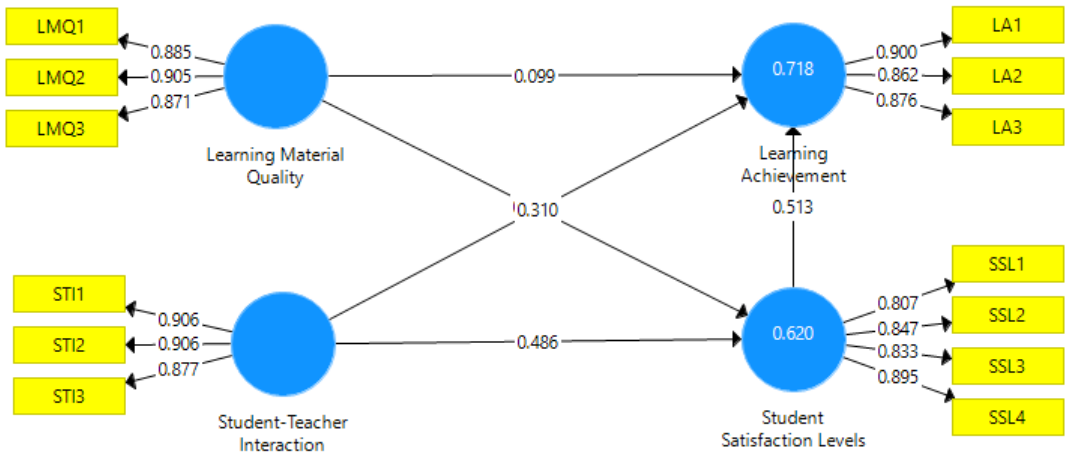

Figure 2. Model Internal Assessment
Source: Data processed by researchers, 2023

Table 4. Inner VIF Model

	Learning Achievement	Learning Material Quality	Student Satisfaction Levels
Learning Achievement			
Learning Material Quality	2.252		1.892
Student Satisfaction Levels	2.633		
Student-Teacher Interaction	2.514		1.892

Source: Results processing data by research (2023)

The squared correlation matrix provides insights into the proportion of variance shared between variables. In the context of this study, Learning Achievement has a high level of variance, indicated by a value of 2.252. There is a substantial shared variance between Learning Achievement and Learning Material Quality, suggesting that Learning Material Quality explains a considerable part of the variation in Learning Achievement, with a squared correlation value of 1.892. Similarly, there is a significant shared variance between Learning Achievement and Student Satisfaction Levels, indicating that Student Satisfaction Levels explain a substantial portion of the variation in Learning Achievement, with a squared correlation value of 2.633.

c. Good of Model Research

Table 5. GOF Model

	Saturated Model	Estimated Model
SRMR	0.066	0.066
d_ULS	0.401	0.401
d_G	0.323	0.323
Chi-Square	240.307	240.307
NFI	0.817	0.817

Source: Results processing data by researcher (2023)

The similarity in fit indices between the Saturated Model and the Estimated Model is a positive outcome for the study. It indicates that the Estimated Model effectively represents the relationships between the variables in the data. The low SRMR value of 0.066 indicates a good

fit, and the d_ULS and d_G values of 0.401 and 0.323 respectively suggest that the model adequately represents the data. The Chi-Square value, which is equal for both models, aligns with the data as well.

The NFI of 0.817 indicates that the Estimated Model explains a substantial portion of the variance in the observed variables and fits the data well.

Table 6. Coefficient Model Research

	R Square	Q2
Learning Achievement	0.718	0.544
Student Satisfaction Levels	0.62	0.437

Source: Processing data by researcher (2023)

R-Square (R^2) and Q^2 are important metrics in structural equation modeling that assess the variance explained and the predictive relevance of the model's endogenous constructs. The R^2 value for Learning Achievement is 0.718, indicating that the model explains approximately 71.8% of the variance in Learning Achievement. This suggests that a substantial portion of the variability in Learning Achievement can be accounted for by the variables and relationships specified in the model. The Q^2 value for Learning Achievement is 0.544, indicating that the model has predictive relevance and performs well in predicting Learning Achievement beyond the data used for model estimation. The R^2 value for Student Satisfaction Levels is 0.62, indicating that the model explains approximately 62% of the variance in Student Satisfaction Levels. This suggests that the model is effective in explaining this construct. The Q^2 value for Student Satisfaction Levels is 0.437, indicating that the model has predictive relevance for Student Satisfaction Levels.

Table 7. Hypothesis Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Learning Material Quality -> Learning Achievement	0.275	0.269	0.121	2.495	0.004
Learning Material Quality -> Student Satisfaction Levels	0.370	0.357	0.107	3.454	0.000
Student Satisfaction Levels -> Learning Achievement	0.513	0.515	0.092	5.567	0.000
Student-Teacher Interaction -> Learning Achievement	0.310	0.294	0.113	3.094	0.004
Student-Teacher Interaction -> Student Satisfaction Levels	0.486	0.501	0.102	4.789	0.000

Source: Processing data by researcher (2023)

This study included five hypotheses in total, all of which have statistical power because their t statistics values are more than 1.96. A statistical analysis reveals a statistically significant association between learning achievement and the quality of the learning materials. The p-value of 0.004 is less than the usual significance level (e.g., 0.05), yet the T statistic value of 2.495 surpasses the threshold. This demonstrates that learning achievement and the quality of learning materials have a strong

positive association, suggesting that better learning achievement is correlated with higher quality learning materials. A statistical analysis reveals a statistically significant association between the level of student satisfaction and the quality of the learning materials. The p-value of 0.000 is extremely significant, while the T-statistic value of 3.454 is significantly higher than the cutoff. This suggests that there is a substantial positive correlation between the level of student satisfaction and the quality of the learning materials, meaning that higher quality learning materials are linked to higher levels of student satisfaction.

Statistical research reveals a significantly substantial association between learning achievement and student satisfaction level. The p-value of 0.000 is extremely significant, while the T-statistic value of 5.567 is significantly higher than the cutoff. This shows that there is a strong positive correlation between learning achievement and student satisfaction, implying that higher learning achievement is linked to higher student satisfaction. A statistical investigation revealed a statistically significant association between learning achievement and student-teacher interaction. The p-value of 0.004 is less than the standard level of significance, and the T-statistic value of 3.094 is higher than the threshold. The results show a strong positive correlation between learning achievement and student-teacher contact, indicating that higher learning achievement is linked to more favourable relationships with teachers.

According to statistical study, there is a strong correlation between student satisfaction and teacher-student interaction. The p-value of 0.000 is extremely significant, while the T-statistic value of 4.789 is significantly higher than the cutoff. The data indicates a statistically significant positive correlation between the level of student satisfaction and the contact between students and teachers. Specifically, higher levels of student satisfaction are linked to more favourable interactions with teachers.

4.2 Discussion

The findings of this study highlight several important aspects of the distance education experience in Indonesia. First, it is evident that the quality of learning materials is a very important determinant of student satisfaction and learning achievement. The quality of learning materials is critical to student learning satisfaction and achievement [55]. Clear, relevant and accessible materials significantly contribute to positive learning outcomes [56]. Therefore, institutions and educators should prioritize the development and delivery of high-quality learning materials that meet the diverse needs of distance education students in Indonesia [57].

Second, teacher-student interaction is another important factor in student satisfaction. Frequent interaction, teacher responsiveness, and support are crucial for enhancing the distance education experience. Active engagement and timely feedback from teachers can significantly improve the quality of distance education programs. Students benefit from interactions with their teachers in various ways, such as cognitive, affective, and collaborative purposes [35]. Teachers who initiate interactions and demonstrate study-oriented behaviors create a favorable environment for students [58]. Additionally, a collaborative learning environment in distance education requires effort from teachers to

monitor and guide discussions among learners [59]. Research suggests that student engagement in distance education can be promoted through instructional design, educational technology, and the application of the Seven Principles of Good Practice, along with additional components such as media properties, student characteristics, and instructor competencies [60]. In the context of foreign language classes, engaging teacher practices include warmth, strictness, homeroom teacher involvement, appropriate pacing, instructional clarity, and a balance of activities [61].

4.3 Implications

The study's findings have important implications for educators, institutions, and policymakers in the context of distance education in Indonesia. Enhancing Learning Material Quality, facilitating positive Student-Teacher Interaction, and ensuring high levels of Student Satisfaction can positively impact Learning Achievement and overall student satisfaction.

Improvements in Learning Material Quality and Student-Teacher Interaction can lead to better Learning Achievement outcomes, while fostering Student Satisfaction is critical for overall student contentment and success. These findings underscore the significance of investing in the quality of distance education programs and the importance of fostering positive interactions between students and teachers.

4.4 Limitations

It's important to acknowledge the study's limitations, including the generalizability of the findings to other contexts and the potential impact of unmeasured variables. Additionally, the study's reliance on self-reported data may introduce response bias.

5. CONCLUSION

In conclusion, this study provides valuable insights into the dynamics of distance education in Indonesia. The strong relationships observed between learning material quality, student-teacher interaction, learning achievement, and student satisfaction levels emphasize the critical role of these factors in shaping the distance education experience. Enhancing learning material quality, facilitating positive student-teacher interaction, and ensuring high levels of student satisfaction can positively impact learning achievement and overall student contentment. These findings have practical implications for educators, institutions, and policymakers, underlining the importance of investing in the quality of distance education programs and fostering positive interactions between students and teachers.

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