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The role of instructional quality on online learning intentions of university students: The technology acceptance model of Zoom

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ABSTRACT

E-learning technology has a vital role to play in supporting the realization of learning goals during the COVID-19 pandemic. One that is often used is video conferencing technology from Zoom. Many studies have discussed the important role of e-learning technology, but there are still limited studies that examine how the role of Zoom technology in increasing student engagement in online learning. Thus, this study focuses to reveal the impact of online instructional quality using Zoom video conferencing technology on increasing students' online learning intentions. We use the technology acceptance model (TAM) approach to answer the objectives of this study. This study randomly involved 190 students at Universitas Negeri Jakarta, Indonesia through an online questionnaire. We used structural equation modeling (SEM) analysis to examine the effect on each variable. In addition, we also use a bootstrap confidence interval estimate to investigate the role of mediation. The study results reveal that students' online learning intentions are influenced by perceived usefulness and ease of using Zoom. Also, perceived usefulness and ease of use are proven to mediate the effect of instructional quality on students' online learning intentions using Zoom video conferencing technology. The results of this study provide important implications for education practitioners to develop engaging online learning for students.

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1. INTRODUCTION

The emergence of technology has had a major influence on human life systems, including in the context of learning and teaching [1], [2] and school management [3]. The role of technology in the field of education is very important to improve learning interactions between students and lecturers [4]. Even now many schools have combined technology and education which is eventually known as e-learning. Currently, the use of technology in education is nothing new, especially during the COVID-19 pandemic, all educational institutions are forced to be familiar with the technology. The impact of the COVID-19 pandemic has forced all schools and universities not to carry out offline learning activities. Alternatively, all learning activities must be conducted online to avoid the spread of COVID-19 [5]–[7]. In a pandemic crisis like this, it has shown how valuable technology is to continue the learning process during a pandemic. Students and lecturers must adapt to the new habit of doing distance learning online.

Restrictions on learning activities during COVID-19 have also prompted major changes in the learning behavior of students and teachers. The sudden application of this technology also has an impact on

the readiness of teachers' skills to use the technology. Developing quality teaching online is a new challenge for teachers during this COVID-19 pandemic. The biggest challenge for teachers is how to understand students' learning needs through online mode. On the other hand, major changes to the use of online/virtual technology are placing unprecedented pressure on Internet infrastructure [8]. Now, many educational institutions use various e-learning platforms for their learning activities, such as Zoom. Many studies prove that e-learning is helpful to support improving student learning outcomes [9]–[11]. However, e-learning can also hurt lecturers and students. The use of e-learning that is carried out continuously without direct interaction will encourage boredom and stress for students [12]–[14]. Learning using e-learning during COVID-19 makes students often isolated and isolated because of their hesitation to participate in online learning. The interaction of teachers and students is also very limited because facial and body expressions cannot be clearly understood by both teachers and students. Teachers also feel that preparing for online learning is more complex than traditional (face-to-face) learning [15].

Although the development of internet-based technology in education is very rapid, students' enthusiasm for using technology in learning is decreasing [16], [17]. Another challenge is that the emergence of technology provides the potential for internet addiction and other negative impacts that can disrupt the learning process [18], [19]. Currently, internet technology has become an essential aspect of supporting human life, including in the context of education. The internet as a learning medium offers various conveniences such as flexibility and creativity, unlike traditional learning [20]; but until now, internet use as a learning medium is still not optimal. Empirically, students in China spend a lot of time online, but a minimal portion is spent studying [21]. Another study also stated that the use of internet technology for learning is still limited in universities [22]. This means that the use of internet technology for learning activities is still not maximally accepted by students and teachers.

One of the most frequently used online learning platforms during COVID-19 is Zoom. This platform provides an alternative to video conferencing technology (VCT) technology that can be used by students to learn virtually. It has been almost two years since we studied at vocational colleges using the online mode with the Zoom platform. However, until now studies evaluating how the quality of online teaching using Zoom by lecturers affects the online learning intentions of vocational students are still limited. The ability of lecturers to teach through online mode using Zoom will significantly affect student assessments of the usefulness and ease of use of Zoom in online learning. It will ultimately affect the increase in students' intention to engage in online learning. How the quality of learning can increase students' interest in participating in online learning is still an interesting discussion. This problem must be studied to find out how far the quality of teaching by lecturers using online mode. In addition, it is also necessary to know how students perceive the ease and usefulness of using the Zoom platform during the online learning process. Information about the quality of online teaching by lecturers and perceptions of the usefulness and convenience of Zoom technology is very important because this information has a long-term impact on the success of online learning during COVID-19. Therefore, this study aims to determine the effect of lecturers' online teaching quality on students' online learning intentions using Zoom. In addition, we use the technology acceptance model (TAM) to answer the objectives of this study.

2. LITERATURE REVIEW

2.1. The effect of instructional quality on students' intention to learn online

In the context of education, teaching quality plays an important role in improving student learning outcomes [23], [24]. There are many studies that discuss the quality of teaching, but there are still variations in the use of different terms. For example, there are several studies that use teacher quality, teaching effectiveness, teaching quality. Teacher quality refers to the characteristics of teachers which include personality, knowledge, and skills of teachers to teach [25], [26]. Meanwhile, teaching effectiveness refers to the teacher's impact on student learning outcomes [27]. Another study states that teaching quality is defined as teachers' ability in teaching activities which include students' cognitive activation, support for student learning, and good classroom management [28], [29]. Essential aspects of teaching quality include classroom management, teacher supervision of students, clarity of teaching, learning climate, and completeness of instruction [30], [31].

An understanding of the quality of teaching cannot be separated from the skills of the teacher. In online learning, instructors must have more skills, especially in applying technology in classroom learning [32]. Lecturers must have mastery of the use of information and communications technology (ICT) because these skills help them develop ICT-based teaching competencies. The concept of e-learning has changed the role of lecturers from being material experts to facilitators [33]. Also, online-based instructor competencies have the following criteria: i) Have knowledge of online systems; ii) Communication skills; iii) Content proficiency; iv) Technical competence; and v) Personal features [34]. In addition, instructional quality has an

important role in fostering student achievement intentions [35]. Another study also revealed that instructional quality affects student learning outcomes [36]. Previous studies have stated that optimizing the use of e-learning in learning will encourage the achievement of better learning outcomes [37]. The interaction between teachers and students is essential because it can foster student learning motivation in the classroom [38]. Lecturers' skills in using e-learning will significantly affect students' perceptions of the usefulness and ease of using e-learning via Zoom.

In the TAM model, the two main TAM factors (perceived usefulness and ease of use) are influenced by external factors. Therefore, external factors play an essential role in influencing technology adoption behavior. As we discussed earlier, the external factor in this study is instructional quality. This study narrows the meaning of instructional quality in the context of online teaching. So, the selection of indicators must describe the quality of online teaching. Referring to previous study [39], instructional quality includes understandableness, structure, motivation, student involvement, and classroom management. After we evaluated previous studies, there are several indicators that can explain the quality of online teaching which include understandableness, structure, motivation, and student involvement. The classroom management indicator is considered unsuitable for evaluating the quality of teaching in the context of online learning. Thus, the hypotheses are: i) Instructional quality has a positive effect on students' perceptions of perceived ease of use online learning (H1); and ii) Instructional quality has a positive effect on students' perceptions of perceived usefulness online learning (H2).

2.2. Technology acceptance model

Davis introduced the theory of the TAM [40]. TAM theory explains the importance of the influence of external factors in shaping beliefs about technology use. This model is the most popular model for building a test of how individuals accept new technology. The TAM theory proposes that perceived usefulness and ease of use are the most influential factors on attitude towards use and will subsequently influence behavioral intentions. Perception of ease of use describes the individual's perception that using a new system or technology will facilitate his work [40]. Perceived ease of use can build perceptions of acceptance and adoption of e-learning [41]. Previous studies have proven that perceived usefulness is influenced by perceived ease of use and ultimately affects behavioral intentions to accept new technological systems [42]. Many studies prove that the intention to adopt e-learning is influenced by perceptions of the ease of using technology [43]–[47]. Meanwhile, perceived benefits describe the individual's perception of his belief that using a new system or technology can improve his performance [40]. Previous studies revealed that the perceived usefulness of e-learning technology was found to be an important and critical predictor of intention to use e-learning [48]. Thus, the hypotheses are: i) Perceived ease of use has a positive effect on students' online learning intentions (H3); ii) Perceived ease of use has a positive effect on students' perceived usefulness (H4); iii) Perceived usefulness has a positive effect on students' online learning intentions (H5); iv) Perceived ease of use significantly mediates the effect of instructional quality on the online learning intention (H6); v) Perceived usefulness significantly mediates the effect of instructional quality on the online learning intention (H7).

Referring to the theory and previous studies, the conceptual model of this study can be set as in Figure 1. Overall, this study examines the intention of students to learn online using Zoom by involving three antecedent factors consisting of instructional quality, perceived ease of use, and perceived usefulness. The antecedent factors of this study were tested using the TAM model theory to see how students' intentions were to be involved in online learning using Zoom.

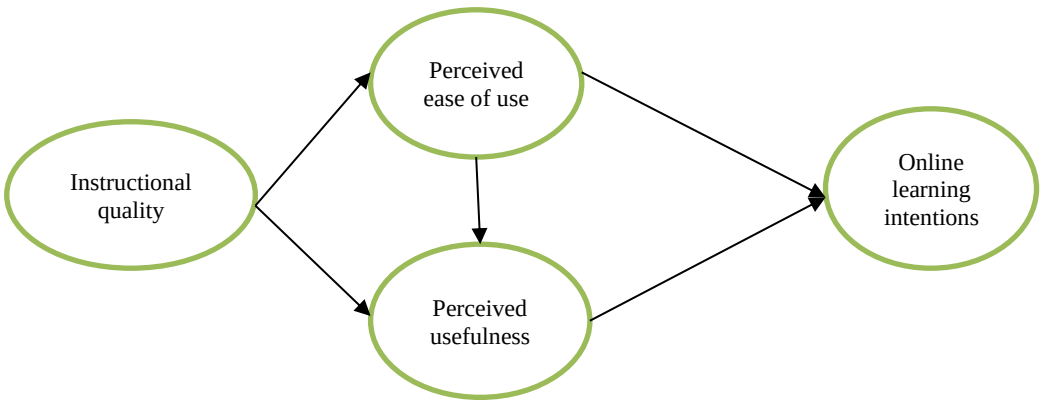


Figure 1. The conceptual framework

3. RESEARCH METHOD

This study involved students from the faculty of engineering at Universitas Negeri Jakarta, Indonesia. The number of students was 190 students consisting of 50 male students and 140 female students. The details of the students involved are shown in Table 1. In this study, students provide information related to instructional quality, perceived ease of use, perceived usefulness, and online learning intentions using Zoom's video conferencing technology. The collection of information for this study used an online survey using a Google Form.

Table 1. Background of participants (N-190)

Attribute	Categories	N	%
Gender	Male	50	26
	Female	140	74
Degree	1st grade	5	2.6
	2nd grade	66	34.7
	3th grade	105	55.3
	4th grade	14	7.4
Study program	Building Engineering Education	95	50
	Family Welfare Education	95	50

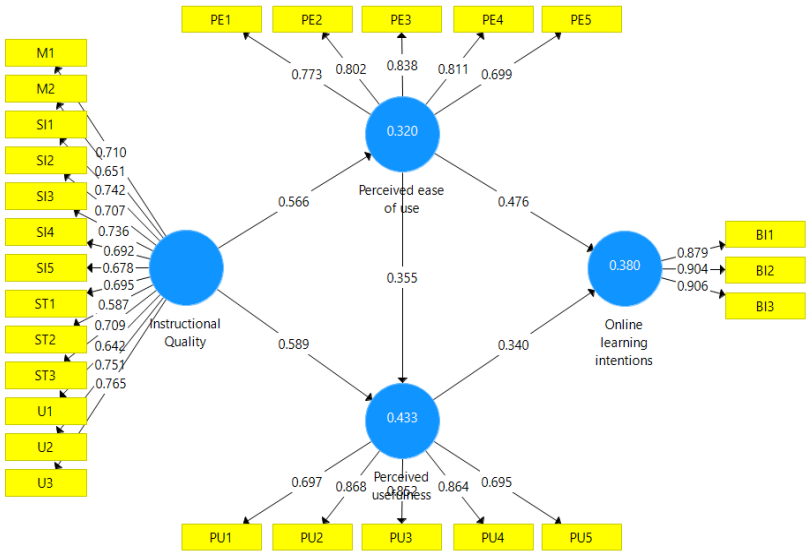
This study uses the reference of previous studies to develop a questionnaire of instructional quality, perceived usefulness, perceived ease of use, and online learning intentions. A questionnaire on the instructional quality of online learning was developed and adapted from Wagner *et al*. [39]. The online learning instructional quality questionnaire consists of four indicators, namely motivation (two items), understandableness (four items), student involvement (five items), and structure (three items). Furthermore, students' perceptions of perceived ease of use, perceived usefulness, and online learning intentions were collected using a questionnaire developed from previous studies [42]. Each TAM questionnaire consists of 6 items for perceived ease of use, 5 items for measuring perceived usefulness, and 3 items for online learning intentions. All questionnaires use a 5 Likert scale which includes strongly agree=5, agree=4, neutral=3, disagree=2, and strongly disagree=1.

Furthermore, structural equation modeling (SEM) analysis based on partial least squares (PLS) is used in this study. PLS is very well used for multivariate data analysis in the area of management and strategy [49]. The advantages of using PLS are that the data does not have to be normally distributed, can be used for analysis on variables with reflective and formative indicators, and can be used to analyze the relationship between variables with small samples [50], [51]. This analysis uses the SmartPLS 3.0 software. PLS is a variant-based structural equation modeling (SEM) approach that tests both the measurement and structural models at the same time [52]. The normed fit index (NFI) and standardized root mean square residual (SRMR) scores are used to determine the goodness of fit criteria in this study. A model is declared a good fit if it has an NFI value above 0.8 and an SRMR below 0.08 [50], [53]. The outer model (measurement model) in the PLS-SEM analysis explains the role of indicators in the formation of latent variables. The loading factor parameter and the average variance extracted (AVE) value are used to test the measurement model. The loading factor parameter value must be greater than 0.7, and the AVE value must be greater than 0.5 [54]. Furthermore, hypothesis testing using the bootstrapping method on smart PLS 3.2.9 tests the direct or indirect effect. This research relies on 500 bootstrap samples with a 95% confidence level.

4. RESULTS AND DISCUSSION

4.1. Validities and reliabilities questionnaire

The validity and reliability of each questionnaire are examined as the first phase in this study's analysis. This test uses SmartPLS to perform confirmatory factor analysis on the outer SEM model (v.3.2.9). Figure 2 shows the results of the first running model. The findings of the SmartPLS analysis of the outer SEM model suggest that there are still items on the questionnaire with a loading factor of less than 0.7, specifically the instructional quality and perceived usefulness items. In the instructional quality questionnaire, there are six items that have a loading factor below 0.7 (M2, SI4, SI5, ST1, ST2, U1). In the perceived usefulness questionnaire, there are two items that have a loading factor below 0.7, namely PU1 and PU5. In addition, one of the items on the perceived ease of use questionnaire is incorrect (PE5). Following that, all of these elements are deleted from the model. Figure 3 shows the improved model after invalid elements have been removed.



Note:
M1-M2=items of motivation;
SI1-SI5=items of student involvement;
ST1-ST3=items of structure;
U1-U3=items of understandableness;
PE1-PE5=items of perceived ease of use;
PU1-PU5=items of perceived usefulness;
BI1-BI3=items of online learning intentions

Figure 2. First SEM model

Figure 3 demonstrates the acquisition of validity and reliability test scores for the instructional quality questionnaire, perceived ease of use, perceived usefulness, and online learning intention using the loading factor test. The results of the outer model analysis on all variables showed valid (.705~.928) and reliable (.831~.905) results. Testing the validity of each item has a loading factor value above 0.70. In addition, reliability testing also shows an AVE value above 0.50 a show in Table 2. This finding means that the questionnaire used in this study is accurate for measuring student perceptions of instructional quality, perceived ease of use, perceived usefulness, and online learning intention to use Zoom.

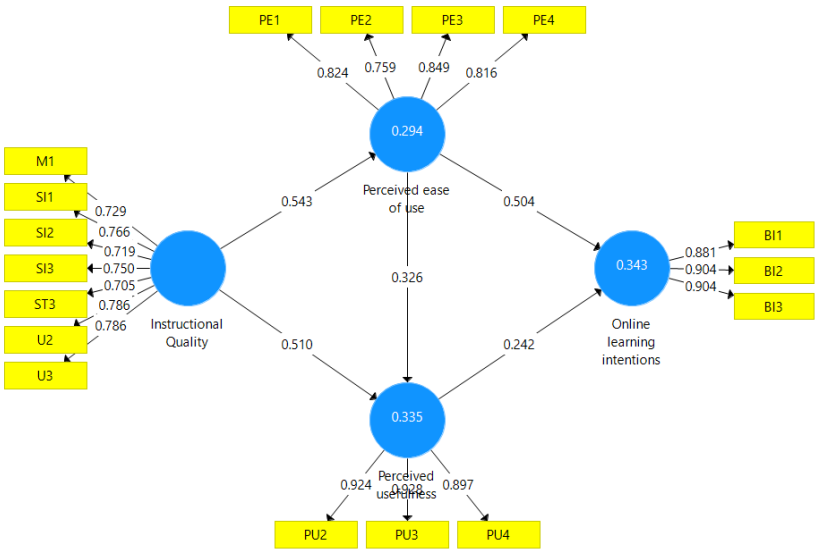


Figure 3. Modification of SEM model

Table 2. Validity and reliability

Variables (N)	Validity	Cronbach's alpha	Composite reliability	AVE
Instructional quality	.705~.786	.870	.900	.804
Perceived ease of use	.759~.849	.831	.886	.661
Perceived usefulness	.897~.928	.905	.940	.840
Online learning intention	.881~.904	.878	.925	.804

4.2. Hypothesis testing using SEM analysis

Before using the path coefficient test to test the hypothesis, we must first determine whether the model meets the goodness of fit criteria. The NFI and SRMR scores are obtained using the goodness of fit criterion test. The model is said to be fit if it has an NFI value above 0.8 and an SRMR below 0.08 [50], [53]. NFI and SRMR values that match the criteria as indicated in Table 3 are derived based on the results of the model fit test via SmartPLS-SEM.

Table 3. Criteria for goodness of fit model

Criteria	Saturated model	Estimated model
NFI	0.821	0.819
SRMR	0.074	0.079

The final step, testing the hypothesis on each path is analyzed through the bootstrapping method on SmartPLS 3.2.9. Bootstrapping method is a new sampling method repeatedly using original data [55]. In addition, the bootstrapping method in this study was used to test the significance of the mediating role in the research model [56]. This research relies on 500 bootstrap samples with a 95% confidence level. Table 4 shows the outcomes of this study's hypothesis testing.

Referring to Table 4, it can be seen that the overall research hypothesis on the regression path is accepted. The decision is rescinded if the P-Values obtained are less than 0.05 (P-values 0.05). The study's findings show that instructional quality has a beneficial impact on the perceived ease of use of online learning with Zoom (P=0.000), which confirms the first hypothesis. Furthermore, instructional quality has a substantial beneficial influence on the perceived usefulness of online learning using Zoom (P=0.000), proving the second prediction. In order to evaluate the third hypothesis, students' online learning intentions are positively influenced by perceived ease of use. The hypothesis test yielded a significance value of 0.000, indicating that this outcome confirms the third hypothesis, namely that perceived ease of use has a favorable impact on students' desire to study online using Zoom.

Testing the fourth hypothesis yielded a p-value of 0.000, indicating that this data confirms the fourth hypothesis, namely that perceived ease of use has a substantial impact on the perceived usefulness of Zoom's video conferencing technology. The same results are seen when the fifth hypothesis is tested, which looks at the impact of perceived usefulness on students' intentions to study online. The hypothesis test yielded a significant value (p-value) of 0.001, which is less than 0.05, and this finding supports the fifth hypothesis, which asserts that perceived usefulness has a favorable influence on students' plans to utilize Zoom for online learning.

Furthermore, test the role of mediation in this study to test the role of simple mediation. Simple mediation in this study is shown in the path of the influence of instructional quality on online learning intentions through the perceived ease of use of students using video conferencing technology from Zoom. The results of this hypothesis test indicate the acquisition of p-values of 0.000 and support the sixth hypothesis. This research suggests that perceived ease of use might help students' online learning intentions by mediating the impact of instructional quality. In addition, simple mediation is also shown on the path of the influence of instructional quality on online learning intentions through the perceived usefulness of students using Zoom. Perceived usefulness is proven to mediate the effect of instructional quality on online learning intentions of students using Zoom (p-values=0.010, this finding supports the seventh hypothesis).

Table 4. Hypothesis testing results

Hypothesis	Original sample	P-Values
Instructional quality -> Perceived ease of use	0.543	0.000
Instructional quality -> Perceived usefulness	0.333	0.000
Perceived ease of use -> Online learning intentions	0.425	0.000
Perceived ease of use -> Perceived usefulness	0.326	0.000
Perceived usefulness -> Online learning intentions	0.242	0.001
Instructional quality -> Perceived ease of use -> Online learning intentions	0.231	0.000
Instructional quality -> Perceived usefulness -> Online learning intentions	0.080	0.010

5. DISCUSSION

Due to the COVID-19 epidemic, all educational institutions have implemented a policy of limiting offline learning activities, which has resulted in a variety of changes in learning behavior and learning technology innovation. One of the widely used learning technologies is video conferencing technology from

Zoom. There are many studies that discuss the effectiveness of using Zoom in online learning activities, but there are still limited that relate how the quality of instruction using Zoom affects students' online learning intentions. As a result, the goal of this research is to see how online instructional quality, as measured using Zoom video conferencing technology, affects students' online learning intentions.

The first hypothesis was tested to see if instructional quality had a favorable impact on students' opinions of online learning's perceived ease of use. The outcomes of the study show that instructional quality has an impact on students' inclinations to learn online. The ability of lecturers to teach online by paying attention to aspects of motivating students, the ability to transfer knowledge (understandableness), the ability to involve students (student involvement), and the ability to manage to learn (structure). According to Lee and Bailey [38], building interactions between teachers and students is very important to influence student motivation and intentions. The strategy of building active interactions during online learning is the biggest challenge for lecturers. The limitations of direct observation and interaction in online learning led to lower student learning participation than offline learning. Lecturers must be able to build interesting interactions so that students are fully involved in learning activities in class, especially how to convince students to learn through online mode which is no less interesting than offline learning mode.

In addition, the second hypothesis test demonstrated that instructional quality had an impact on students' perceptions of Zoom's utility in online learning. This study suggests that a lecturer's ability to use Zoom in online learning leads students to believe that utilizing Zoom can help them improve their productivity and learning effectiveness. The role of lecturers in online learning has changed from being material experts to facilitators [33]. In online learning, teachers are not only sufficient to master the learning material, but also must understand how to use Zoom optimally in learning activities. According to previous research, online instructor qualifications include online system expertise, technical skills, communication skills, subject competency, and personal characteristics [34]. The ability to create a conducive learning atmosphere will encourage students to understand the importance of using Zoom technology for their learning outcomes. Basically, the presence of technology should provide convenience and benefits for its users. Thus, it is hoped that the new technology will encourage increased performance in learning activities.

Furthermore, this research shows that students' intents to learn online are positively influenced by the perceived ease of use of Zoom technology. This means that the ease of features offered by Zoom in using video conferencing technology is considered by students to be easy to use so that it encourages students' intention to be involved in online learning. According to previous research, perceived ease of use can influence attitudes toward e-learning acceptance and uptake [41]. The results of the same study were also expressed by the several scholars [43], [47]. In theory, the ease of use of technology by end-users, in this case, students, is a crucial factor to consider while building technology. Unlike the case, difficult and complicated technology will encourage users not to be involved in using it because it will make it difficult. Thus, the skills of lecturers using Zoom technology through the various features offered by Zoom are the main key to building student engagement in online learning.

Another finding of this study is that perceived ease of use influences students' perceptions of video conferencing technology's effectiveness in online learning. These findings back with prior research that shown that perceived ease of use influences perceived usefulness, and that both factors impact behavioral intentions to embrace technology systems [42]. This finding means that the ease of use of Zoom technology encourages students' perceptions of the convenience that can increase the effectiveness and productivity of their learning. Therefore, it is very important how teachers improve their mastery of Zoom technology for teaching in order to create a conducive learning atmosphere. Students using Zoom can make it easier for them to complete study assignments and increase their understanding of teaching materials. Furthermore, students' evaluations of the advantages resulting from Zoom's ease of use motivate them to participate in online learning with Zoom. According to Kimathi and Zhang [48], the perceived usefulness of e-learning technology is one of the determinants of e-learning intention. This conclusion makes sense since a person's decision to use or not utilize technology will be based on their knowledge of the benefits derived from utilizing technology. So far, the findings of this study support the TAM theory of technology acceptance, which contends that perceived ease of use and perceived usefulness influence the desire to use technology.

The function of perceived ease of use and perceived usefulness in mediating the impact of instructional quality on students' intentions to engage in online learning is also investigated in this study. According to the findings, perceived ease of use significantly moderates the influence of instructional quality on students' intentions to participate in online learning with Zoom. The instructional quality of lecturers in online teaching has a hierarchical effect on perceived ease of use, which in turn enhances students' desire to utilize Zoom in online learning. Therefore, in online teaching, lecturers must strive to develop teaching strategies that can build student perceptions regarding the ease of learning using Zoom video conferencing technology. This perception will be formed if the lecturer demonstrates the ability to operate several Zoom features that support online learning.

Finally, this study investigates the impact of perceived usefulness in mediating the influence of instructional quality on students' intentions to learn online. The results of the study show that instructional quality affects students' online learning intentions through the perceived usefulness of Zoom's video conferencing technology. The higher the students feel that the use of Zoom technology will make it easier for them to complete their learning activities, the higher the instructional quality will have an influence on students' online learning intentions. According to TAM theory, external influences influence perceived ease of use and perceived usefulness [40]. In the context of this study, the external factor is instructional quality. The development of learning technology in educational institutions is inseparable from the quality of the teaching of a teacher. So, it makes sense if the instructional quality factor is involved in the development of the TAM model, especially in the context of online learning (e-learning).

6. CONCLUSION

The use of Zoom video conferencing technology in online learning during COVID-19 has been widely used. However, studies that address how instructional quality is involved in the TAM model are limited. The findings of this study show how important it is to build instructional quality in the TAM model in order to influence students' online learning goals. Through perceived ease of use and usefulness, instructional quality has an indirect impact on students' online learning goals. Using Zoom video conferencing technology, it was discovered that perceived ease of use and perceived usefulness mitigate the influence of instructional quality on students' online learning intentions. It is critical for instructors to emphasize the ease and advantages that students gain from learning online via Zoom.

This study has limitations related to the focus on using Zoom technology and has not discussed in depth how interactions occur between lecturers and students when learning to use Zoom. In addition, other online-based learning technologies have not been discussed in this paper. As a result, we believe that future research should focus on examining the impact of various e-learning platforms on the establishment of various student learning habits, as well as the quality of instructor teaching. In addition, study into how lecturers and students engage in online learning. This study has significance for educators who want to improve the quality of online teaching in order to boost students' online learning intentions, and in the end, students' active participation will affect their learning results.

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