



Determinants of University Student Engagement and Satisfaction in Live Online Learning: Evidence from Vietnam

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Abstract

Research purpose:

This study adopted the structural equation modeling approach to address a knowledge gap in the distance and e-learning literature on the relationships between online instructor quality, online student readiness, engagement, and satisfaction in live online learning.

Research motivation:

In the context of a digitalized world during these recent years, live online learning has been adopted around the world by universities to respond to the challenges of the transforming higher education system, particularly during COVID-19 pandemic. Some studies highlighted the role of online instructors in promoting online learner engagement and satisfaction. However, a few studies focused on the relationships between online instructor quality, online student readiness, and online student engagement and satisfaction. It is unclear in the existing literature how online instructors and online student readiness promote online student engagement and satisfaction in live online learning. It is also questionable if there is a relationship between instructors' strategies and online student readiness and how they contribute to online student engagement and satisfaction.

Research design, approach, and method:

Data was collected at a leading multi-disciplinary university in Vietnam. Our sample includes 427 students from various training majors, including social and humanities, natural sciences, and technology, who have participated in live online learning for three consecutive semesters during the COVID-19 pandemic in Vietnam.

Main findings:

Our results showed that online material quality impacts student digital readiness and self-directed learning, which positively affects live online learning engagement and satisfaction. Meanwhile, online teaching quality only impacts digital readiness but does not influence self-directed learning.

Practical/managerial implications:

Research findings suggest implications for improving online student readiness, engagement, and satisfaction in live online learning at universities.

Keywords: Digital Readiness, Live Online Learning, Online Learning Engagement, Online Learning Satisfaction, Self-Directed Learning, Structural Equation Modelling (SEM), Vietnam.

1. INTRODUCTION

According to Crawford et al. (2020) and Sobaih et al. (2020) live online learning has been adopted around the world by universities to respond to the COVID-19 pandemic. Tang et al. (2021) defined live online learning is an education system in which teaching and learning are conducted through synchronous and asynchronous communication channels to achieve the learning outcome. Research has shown that live online learning is challenging to implement. Thus, Almazova et al. (2020), Karkmaz and Toraman (2020), and Warfving et al. (2022) mention that universities adopting live online learning

need to promote online learner engagement to increase student achievement and satisfaction.

Some academic research previous of Wang et al. (2021), Rokhman et al. (2022) and Nikolopoulou and Kousloglou (2022), the literature on distance and online education has indicated many internal and external success factors promoting students to engage in and satisfy with live online education. On the otherhand Kim et al. (2019) and Chau et al. (2021) confirmed the importance of online student readiness factors. Chakraborty and Song (2019), Chen et al. (2021) highlighted the role of online instructors in promoting online learner engagement and satisfaction.

However, a few studies focused on the relationships between online instructor quality, online student readiness, and online student engagement and satisfaction. It is unclear in the existing literature how online instructors and online student readiness promote online student engagement and satisfaction in live online learning. It is also questionable if there is a relationship between instructors' strategies and online student readiness and how they contribute to online student engagement and satisfaction.

This study contributes to the literature on online learning and distance education in higher education by identifying key factors influencing online student engagement and satisfaction in live online learning structural equation modeling approach, it clarifies a model which guides universities in facilitating online student engagement and satisfaction in live online learning. The paper begins by developing a theoretical framework through intensive literature review and hypothesis development. It follows survey research using equation modeling methods to verify the framework.

The analysis results are then presented and discussed before the conclusion is drawn.

2. THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1 Live online learning

Tang et al. (2021) defined live online learning refers to an education system in which teaching and learning activities are conducted online in real time and through synchronous communication channels such as video conferencing, Microsoft Teams, Zoom, Google meet, and WebEx. Simamora (2020) mentions that teaching materials and assignments might be posted in learning management systems, emails and social media platforms for students to study at home. Crawford et al. (2020) and Sobaih et al. (2020) have the same opinion that live online learning has become a common distance education approach around the world since the outbreak of covid 19 in early 2020. Because according to Simamora (2020), Sim et al. (2021) and Lemay et al. (2021) students were forced to use live online learning, they did not prefer this type of education and felt stress at the outset of the pandemic. Angelova (2020) reported that students found difficult to work in teams and to interact with instructors and other students Adnan, and Anwar (2020), and Meyer (2014). However, Sobaih et al. (2020) and Chakraborty and Song (2019) showed that there are increasing evidence that students have been recognising the usefulness and felt more confidence with live online learning as a result of proper progressive supports. Meyer (2014) and Rokhman et al. (2022) defined live online learning can be an effective education approach for adult learning used by universities in the post covid 19 period, providing students convenience and economic education service if well-managed.

2.2 Live online student engagement and satisfaction

Online learning engagement of university students is argued as a success factor in live online learning Soffer and Cohen (2019) and Dixson (2019). Meanwhile Kim et al. (2019) and Alqurashi, E. (2022) facilitates online student learning, achievement and satisfaction.

According to Gunuc and Kuzu (2015) and Kim et al. (2019) online student engagement generally refers to the state of student psychological, cognitive, emotional and behavioural responses to achieve learning outcomes. Dixson (2019) includes emotional, cognitive and behavioural engagement. When students engage in online learning they will put time, energy, thought, efforts, and, to some extent, feelings into their learning both within and outside of the online classes.

Dixson (2019) found that in live online learning, student engagement can be recognized through their responses with the contents, classmates, and instructors to achieve their learning outcomes. Behavioral engagement refers to observable actions, such as attendance, activeness, and levels of participation. Emotional engagement is intangible feelings, interest, and emotions and cognitive engagement is a measure of student effort. Wei and Chou (2020) determined a high degree of engagement will lead to online learning satisfaction toward instructional style, learning contents and course structures, instructors and teaching assistants, discussion forum, the group projects/examinations, and the overall online course.

2.3 Live online student readiness and engagement

Wei and Chou (2020), Kim et al. (2019), and Hong and Kim (2018) identified distance education literature indicates online learning readiness as an important factor influencing online learning engagement and satisfaction of university students. Warner et al. (1998), Hung et al. (2010) and Tang et al. (2021) determine online learning readiness refers to the student characteristics that contribute to the success of online students in a specific online learning context. Martin et al.

(2020) Tang et al. (2021) identified by students' perception on their self-efficacy and confidence in using online learning system. In live online learning where synchronous online learning is dominant, online student readiness is significant different from other types of online learning such as asynchronous online learning. Chau et al. (2021) distinguish a few key aspects of readiness that influence live online learning engagement and satisfaction of university students.

Hong and Kim (2018) and Kim et al. (2019) found that digital readiness is regarded as an important determinant to live online learning engagement and satisfaction at universities. Digital readiness for university students refers to technology-related knowledge, skills, attitude and competences necessity for effective live online learning (Hong and Kim, 2018). In order to be digitally ready, Tang et al. (2021), Hong and Kim (2018), and Hung et al. (2010) discovered that students must be confident in using technologies and computers, information science, media, and communication. Tang et al. (2021), Wei and Chou (2020), Martin et al. (2020), and Meletioui-Mavrotheris (2022) concluded that live online learning and digital readiness can be measured in terms of students' perception of technology, online communication self-efficacy, learner control, and online learning motivation.

Self-directed learning is a multifaceted concept that should not be approached through one perspective (Loeng, 2020). Loeng (2020) defined that self-directed learning entails individuals taking initiative and responsibility for their own learning. As defined by Garrison (1992), self-directed learning is not necessarily fully autonomous learning because it is a matter of degree. Chau et al. (2021) and Meletioui-Mavrotheris (2022) determined that self-directed learning is another critical factor influencing live online learning engagement and satisfaction of university students. In fact, self-directed learning is important because online students are expected to be more autonomous which includes self-monitoring and awareness of learning responsibilities in their online studying process. Self-directed learning facilitates students to engage in live online learning proactively Chau et al. (2021). Brockett and Hiemstra (1991), Hung et al. (2010), and Tang et al. (2021) explain that self-directed learning can be measured by examining the student behaviors of planning, implementing, and evaluating personal online learning. It reflects the student responses to external instructional process Brockett and Hiemstra (1991) and demonstrates student internal characteristics of self-discipline, self-regulation, and learning management Linkous (2021).

2.4 Live online instructor quality, online student readiness and online student engagement and satisfaction

Student engagement is the time and energy students devote to educationally sound activities (Kuh, 2003). Five clusters of activities indicate student engagement, including the level of academic challenge, a supportive campus environment, enriching educational experiences, student-faculty interaction, and active and collaborative learning (Robison & Hullinger, 2008).

Student satisfaction is an indicator of whether they are satisfied with their learning experience (Li et al., 2016). According to Elliot and Healy (2001), student satisfaction is a short-term behavior and a result of students' experiences with their educational services provided by their institution.

Recent research of Tang et al. (2021) and Chuang et al. (2021) has increasingly indicated that live online instructors, among other factors such as live online learning platforms, university and peer supports, are the most critical factor in promoting live online student engagement and satisfaction. Online instructors directly deliver instruction, communication of course topics and time frame, feedback, facilitation and encouragement for students in live online learning determine that online teaching and material design strategies influences online student learning and engagement online teaching and material design strategies influences online student learning and engagement. The quality of their online teaching and material is therefore the key determinants to students engagement and satisfaction in live online learning Muir et al. (2019).

Muir et al. (2019), and Wang et al. (2021) point out online teaching quality refers to the teaching capabilities perceived as essential and effective for online student learning. Research has indicated key online teaching quality aspects such as consistent delivery of organised and clear instructions, flexible and timely communication, feedback and supports. Muir et al. (2019) innovative educational strategies in using technologies to create supportive environment for instructor-student, student-student, and student-content interactions. According to Wang et al. (2021) and Chuang et al. (2021), online teaching quality therefore not just promotes student learning and engagement in live online classes, but also positively impact online student perception on the quality of live online system and their loyalty with live online learning in the future.

According to Muir et al. (2019), online material quality refers to the effective material designs that effectively promote online student learning and engagement. For example, clear and timely study guides facilitate online engagement. Furthermore, there is evidence that material presentation techniques with technology can enhance online student learning and engagement. Therefore, online material quality is critical to student interest and engagement in live online learning classes.

Past research has indicated that both online student readiness and online instructor quality promote online student engagement and satisfaction in live online learning. However, it is unclear in the literature how these two factors simultaneously impact online student engagement and satisfaction. A few studies indicated a relationship between online

instructor quality and online student readiness that leads to online student engagement and satisfaction. However, Wei and Chou (2020) considered this relationship in a broader context of the entire online learning system, including university and peer support, and within other online learning contexts, such as blended online learning rather than live online learning. As a result, there is a lack of understanding of how online instructor quality influences online student readiness and engagement or satisfaction. Therefore, it is imperative to explore these relationships to provide guidelines for universities that continue to adopt live online learning in the post-COVID-19 period.

2.5 Research model and hypotheses

The purpose of this study was to use the structural equation modeling analysis technique to investigate the relationships between online instructor quality, online student readiness, and online student engagement and satisfaction by testing the mediating effect of online student readiness factors (Martin et al., 2020). Figure 1 presents the research model and proposed hypotheses.

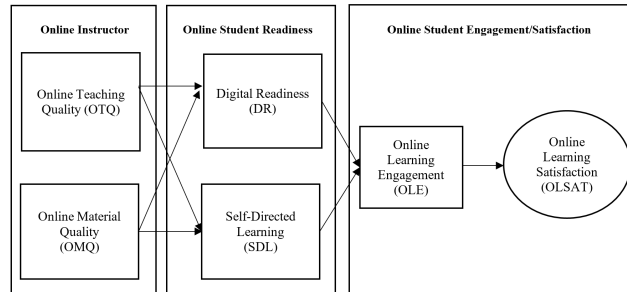


Fig. 1. Research model

This research model was used to test the following hypotheses:

- H1. Online teaching quality positively (OTQ) affects digital readiness (DR).
- H2. Online teaching quality (OTQ) positively affects self-directed learning (SDL).
- H3. Online material quality (OMQ) positively affects digital readiness (DR).
- H4. Online material quality (OMQ) positively affects self-directed learning (DR).
- H5. Digital readiness (DR) positively affects online learning engagement (OLE).
- H6. Self-directed learning (SDL) positively affects online learning engagement (OLE).
- H7. Online learning engagement (OLE) positively affects online learning satisfaction (OLSAT).

3. METHODOLOGY

3.1 Measurements

In the present study, we adapted the measurement from previous studies the existing literature. Online learning adopted in Vietnam was mainly live online learning integrating different real-time online teaching support tools such as Google Hangouts, Microsoft Teams, Zoom, Skype, email and social networks (Nguyen & Pham, 2020). Additionally, the items of variables were selected according to the specific identified variables. Table 1 below shows the details of measurement development.

Table 1. Measurement items

| Measurement scale | Coding | Number of items | Source |
|------------------------------|--------|-----------------|--|
| Online Teaching Quality | OTQ | 4 | Pham et al. (2019) |
| Online Material Quality | OMQ | 4 | Pham et al. (2019) |
| Digital Readiness | DR | 4 | Martin et al. (2020) |
| Self-Directed Learning | SDL | 5 | Smith et al. (2003); Dray et al. (2011); |
| Online Learning Engagement | OLE | 5 | Dixson (2015) |
| Online Learning Satisfaction | OLSAT | 4 | Wei and Chou (2020) |

(Source: Authors' adapted)

3.2 Sampling and Data Collection

A self-administered online survey was conducted to gather data for the present study. We targeted students of a large multi-discipline university in Hanoi. We chose this university for three reasons. Firstly, this university is the leading one in Hanoi, with many member colleges and schools. The total number of students is over 40,000. Secondly, this university has pioneered digital transformation in education activities. Thirdly, all university students have been participating in live online learning classes since early 2020, when the COVID-19 pandemic started.

The Google Form link of the questionnaire was sent to a contact person in the Student Association, then forwarded to all students. After two months, we received 427 valid responses for our analysis.

3.3 Data Analysis Strategy

The reliability and validity of the measurements were examined in SmartPLS 3.0 software. We used the partial least squares structural equation path modeling (PLS-SEM) technique to test the proposed hypotheses.

4. RESULTS AND DISCUSSIONS

4.1 Sample Profile

Data were analyzed in SPSS to identify the sample characteristics. As shown in Table 2 below, the majority of our respondents are female (77.3%). In addition, most of our respondents are second and third year students (72.4%).

Table 2. Sample characteristics (n = 427)

| Characteristic | Frequency | Percent (%) |
|--------------------------------------|-----------|-------------|
| Gender | | |
| Male | 97 | 22.7 |
| Female | 330 | 77.3 |
| Level in the bachelor program | | |
| 1 st year | 32 | 7.5 |
| 2 nd year | 187 | 43.8 |
| 3 rd year | 122 | 28.6 |
| 4 th year | 85 | 19.9 |
| 5 th year | 1 | 0.2 |

(Source: Own elaboration)

4.2 Reliability and Validity of Measurements

The reliability of measurements was checked in SmartPLS using several criteria, including Cronbach's alpha, item outer loadings, and the composite reliability (CR). Table 3 shows the results.

Table 3. Reliability, validity, convergence of the measurements

| Constructs | Items | Loadings | VIF | Cronbach's alpha | Composite Reliability (CR) | Average Variance Extracted |
|-------------------------------|-------|----------|-------|------------------|----------------------------|----------------------------|
| Online Teaching Quality (OTQ) | OTQ1 | 0.780 | 1.802 | 0.872 | 0.912 | 0.721 |
| | OTQ2 | 0.884 | 2.518 | | | |
| | OTQ3 | 0.867 | 2.384 | | | |
| | OTQ4 | 0.862 | 2.098 | | | |
| Online Material Quality (OMQ) | OMQ1 | 0.853 | 2.548 | 0.874 | 0.914 | 0.727 |
| | OMQ2 | 0.858 | 2.610 | | | |
| | OMQ3 | 0.881 | 2.683 | | | |
| | OMQ4 | 0.817 | 2.029 | | | |
| Digital Readiness (DR) | DR1 | 0.712 | 1.401 | 0.837 | 0.892 | 0.675 |
| | DR2 | 0.876 | 2.590 | | | |
| | DR3 | 0.869 | 2.420 | | | |
| | DR4 | 0.819 | 1.816 | | | |
| Self-Directed Learning (SDL) | SDL1 | 0.809 | 1.943 | 0.876 | 0.910 | 0.670 |
| | SDL2 | 0.729 | 1.641 | | | |
| | SDL3 | 0.878 | 2.698 | | | |
| | SDL4 | 0.804 | 2.166 | | | |

| Constructs | Items | Loadings | VIF | Cronbach's alpha | Composite Reliability (CR) | Average Variance Extracted |
|---|--------|----------|-------|------------------|----------------------------|----------------------------|
| | SDL5 | 0.865 | 2.628 | | | |
| Online Learning Engagement (OLE) | OLE1 | 0.788 | 2.550 | 0.857 | 0.897 | 0.636 |
| | OLE2 | 0.837 | 2.931 | | | |
| | OLE3 | 0.811 | 2.029 | | | |
| | OLE4 | 0.777 | 2.576 | | | |
| | OLE5 | 0.774 | 2.627 | | | |
| Online Learning Satisfaction (OLSAT) | OLSAT1 | 0.853 | 2.273 | 0.857 | 0.902 | 0.698 |
| | OLSAT2 | 0.819 | 1.728 | | | |
| | OLSAT3 | 0.845 | 2.419 | | | |
| | OLSAT4 | 0.825 | 2.088 | | | |
| Note: CR = Composite Reliability, AVE = Average Variance Extracted Recommended value: Cronbach's alpha ≥ 0.7 ; Outer loadings ≥ 0.5 ; VIF < 5 ; CR ≥ 0.7 ; AVE ≥ 0.5 | | | | | | |

(Source: Own elaboration)

In addition, the discriminant validity was checked using the Fornell-Larcker test and HTMT criterion results. Table 4 shows the details of the Fornell-Larcker test.

Table 4. Fornell-Larcker criterion test

| | SDL | DR | OLE | OLSAT | OMQ | OTQ |
|-------|--------------|--------------|--------------|--------------|--------------|--------------|
| SDL | 0.819 | | | | | |
| DR | 0.572 | 0.821 | | | | |
| OLE | 0.733 | 0.717 | 0.798 | | | |
| OLSAT | 0.524 | 0.649 | 0.62 | 0.835 | | |
| OMQ | 0.472 | 0.617 | 0.617 | 0.548 | 0.852 | |
| OTQ | 0.383 | 0.538 | 0.562 | 0.517 | 0.724 | 0.849 |

(Source: Own elaboration)

According to Fornell and Larcker (1981) and Hair et al. (2013), discriminant validity is satisfactory when the square root of AVE for each endogenous variable is greater than the latent variable correlations. We determined the discriminant validity of each construct by comparing the square root of each AVE in the diagonal to the correlation coefficients (off-diagonal) in the relevant rows and columns. As shown in Table 4, the square root of the AVE ranges from 0.798 to 0.849 for all constructs (the values in bold), and it is greater than any of the correlation coefficients in the vertical and horizontal related cells. Overall, discriminant validity between the constructs tested in this study was supported.

The HTMT criterion test was also conducted in SmartPLS to check the discriminant validity of the measurement scales. As presented in Table 5, the HTMT values of all constructs were below the threshold value of 0.85, so the discriminant validity of measurement scales is acceptable in this study (Henseler et al., 2015).

Table 5. HTMT criterion test

| | SDL | DR | OLE | OLSAT | OMQ | OTQ |
|-------|-------|-------|-------|-------|-------|-----|
| SDL | | | | | | |
| DR | 0.662 | | | | | |
| OLE | 0.836 | 0.846 | | | | |
| OLSAT | 0.595 | 0.758 | 0.711 | | | |
| OMQ | 0.534 | 0.719 | 0.711 | 0.627 | | |
| OTQ | 0.423 | 0.622 | 0.639 | 0.602 | 0.823 | |

(Source: Own elaboration)

4.3 Hypothesis Testing

To test the proposed hypotheses, we ran bootstrapping analysis in SmartPLS. Results are shown in Figure 2 and Table 6 below.

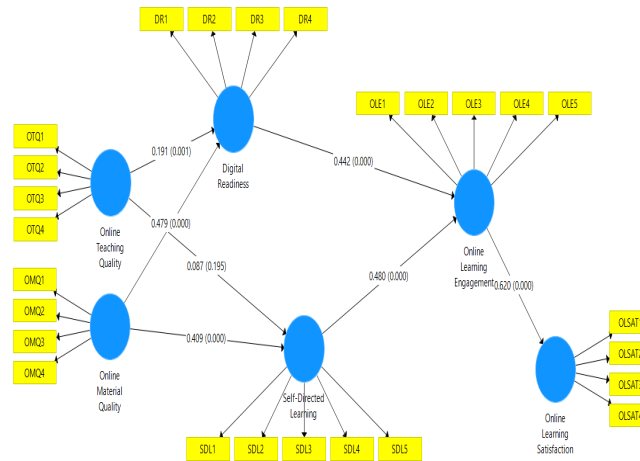


Fig. 2. SEM analysis results

Table 6. Hypothesis testing results

| Hypothesis | Path | β | T value | P Value | Result |
|------------|-------------|---------|---------|---------|----------|
| H1 | OTQ → DR | 0.191 | 3.325 | 0.002 | Accepted |
| H2 | OTQ → SDL | 0.087 | 1.296 | 0.195 | Rejected |
| H3 | OMQ → DR | 0.479 | 8.153 | 0.000 | Accepted |
| H4 | OMQ → SDL | 0.409 | 5.819 | 0.000 | Accepted |
| H5 | DR → OLE | 0.442 | 9.960 | 0.000 | Accepted |
| H6 | SDL → OLE | 0.480 | 10.515 | 0.000 | Accepted |
| H7 | OLE → OLSAT | 0.620 | 16.792 | 0.000 | Accepted |

It is revealed in Table 6 that 6 out of 7 hypotheses were accepted, only hypothesis H2 was rejected ($p = 0.175 > 0.05$).

4.4 Discussions

In the present study, we found that online learner engagement (OLE) and satisfaction (OLSAT) are determined by their digital readiness (DR) and self-directed learning (SDL). In turn, DR and SDL are affected by online teaching quality (OTQ) and online material quality (OMQ). The relationship between these factors is discussed as follows.

First, student digital readiness (DR) was strongly affected by both instructors’ online teaching quality (OTQ) and online material quality (OMQ). Particularly, OMQ ($\beta_3 = 0.479, p = 0.000 < 0.05$) had stronger affect on DR than OTQ ($\beta_1 = 0.191, p = 0.002 < 0.05$). Our finding can be due to the research context during the COVID-19 pandemic when students have no choice but to study online to avoid the Coronavirus infection. Thus, most students were not ready for live online learning. In this regard, instructors are critical in promoting students’ readiness. This finding is in line with the study of Wei and Chou (2020) . However, the present study focuses more on the instructor’s role in live online learning than previous studies.

Second, student self-directed learning (SDL) was determined by OMQ ($\beta_4 = 0.409, p = 0.000 < 0.05$), but it was not influenced by OTQ ($\beta_2 = 0.087, p = 0.195 > 0.05$). The positive relationship between OMQ and SDL is supported by the study of Chau et al. (2021).

However, unlike previous studies, our study found that OTQ does not affect the SDL of students. Our finding is different from the study of Wei and Chou (2020), which insisted that OTQ positively SDL when treated as an element of the whole blended learning system. It is observed that in the online learning environment, SDL is related to the students' adaptability to the system. SDL is triggered by the student's internal motivation but is also affected by external factors. In this study, OTQ did not influence SDL because students often found it hard to follow the instructors' guidelines during the live online sessions. The difficulties for students might happen due to time constraints, unstable internet connection, and the isolation students might perceive while studying online. Consequently, students often lose their concentration in live online sessions and spend time reading the written guidelines after class rather than trying to listen to the online instructors.

Third, online learning engagement (OLE) was positively influenced by both DR ($\beta_5 = 0.442$, $p = 0.000 < 0.05$), and SDL ($\beta_6 = 0.480$, $p = 0.000 < 0.05$), but SDL has more effect on OLE than DR. This finding is attributed to the fact that online learning is still in its embryonic stage in Vietnam. Before the COVID-19 pandemic, this way of learning was not popular in higher education institutions. Thus, students were not familiar with the online learning system. Many students felt anxious about how to participate in live online learning classes and how to comprehend the learning materials without in-person interaction with the instructor. Therefore, the student's engagement is mainly determined by their internal motivation, self-discipline, and capability to adjust their learning. In other words, the students must have self-regulation, self-promotion ability, and learning planning skills in the online learning environment. Previous studies have confirmed that self-regulation is the most critical factor that affects the students' engagement in live online learning classes Gunuc and Kuzu (2018) and Cole et al. (2021).

Fourth, online learning engagement (OLE) positively influences OLSAT ($\beta_7 = 0.620$ $p = 0.000 < 0.05$). Meanwhile, OLE is affected by DR and SDL. In other words, OLE was a mediator in the relationship between DR, SDL, and OLSAT. This finding is our contribution to the existing literature, as previous studies did not treat student engagement as a mediating factor and focused on different e-learning environment types. For example, Pham et al. (2019) examined the direct influence of the overall e-learning system quality on student satisfaction. These two authors treated instructor and material quality as two elements of the e-learning system. In addition, Wei and Chou (2020) investigated the direct impact of online learning readiness on student satisfaction in a blended learning environment.

Meanwhile, Chau et al. (2021) only studied the impact of SDL on synchronous e-learning setting. Chau et al. (2021) confirmed that students who have high SDL will have a higher perception of the e-learning system, and they are more engaged in e-learning. Unlike previous studies, our research focuses more specifically on the instructor's role in promoting students' digital readiness and self-directed learning.

5. CONCLUSION

The model developed in this study offers a more comprehensive understanding of how online instructors promote online student engagement and satisfaction in live online learning. Firstly, it clarifies the mediating role of online student readiness in the relationships between online instructor quality and online student engagement and satisfaction, which is absent in the current literature on distance and online education Wang et al. (2021), Muir et al. (2019), and Chuang et al. (2021). Secondly, the model details key online student readiness components in the context of live online learning by identifying the crucial roles of online student digital readiness and self-directed learning in facilitating their engagement and satisfaction Kim (2018), Chau et al. (2021) and Wei and Chou (2020). Thirdly, it identifies the critical facilitating roles of live online instructors in promoting online student readiness, engagement and satisfaction Meletiou-Mavrotheris (2022) and Chau et al. (2021). Finally, the empirical data analysis in a Vietnamese university has shown that online teaching quality did not affect online student self-directed learning. Only online material quality did. The empirical study verifies the model and might be contextually varied.

This study, however has some limitations which could suggest the directions for future research. First, the empirical findings of this study are only applied to the Vietnam education context, where students have experienced live online learning since the outbreak of the COVID-19 pandemic. Other countries may have different research results. Thus, this model must be tested in other contexts to verify its validity and explore its variation. Secondly, although the constructs of OTQ, OMQ, DR, and SDL in this study provide a reasonable structural model to advance the understanding of engagement facilitating strategies in live online learning, the scales of these variables still have room to develop further. Future research can revise and propose a better measurement model. Thirdly, this study is exploratory research using quantitative data and a structural equation modeling approach. Future research can consider other qualitative methods to collect richer data to reduce bias and possible measurement errors.

In addition to the above theoretical contributions, the empirical results of this study suggest a few recommendations improve live online student engagement and satisfaction in the Vietnam education context. First, Vietnamese universities adopting live online learning for distance education should focus on developing live online teaching and material design capabilities necessary for online instructors to promote online student readiness. Especially techniques in material design that facilitate self-directed learning are a critical factor for effective live online learning of university students.

Furthermore, Vietnamese online instructors need to explore online teaching strategies that enable online student digital readiness and adopt them consistently during their live online courses at universities. In particular, the online materials should be designed in an attractive, concise, and innovative manner to increase students' self-directed learning.

Furthermore, there should be more training courses for students to enhance their digital readiness and self-directed learning. Online instructors should also notify the different learning styles of students to be flexible in promoting their self-directed learning. Finally, it is suggested that online instructors should communicate more often with online students via online forums or e-learning platforms.

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