The Mediated Role of Satisfaction in Boosting the Perceived Progress via Interaction in Online Learning: Empirical Evidence from Private Universities in Vietnam

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Abstract. Online education is an inevitable trend in the era of digital transformation, but effective implementation is not easy. This research was conducted to understand the relationship between interaction and the perceived progress of online learning, under the mediated effect of satisfaction. Data was gathered from 223 full-time learners at nine universities in Vietnam, using Google Forms. Since the study had a mediating variable, the partial least squares structural equation modeling (PLS-SEM) method was used. The results show that learner–lecturer interaction, learner–learner interaction, and learning content have positive impacts on online learning satisfaction. The findings of this study reveal that satisfaction has a positive influence on overall progress, which means that, as satisfaction increases, perceived progress in online learning interaction increases as well. Based on the findings, the authors suggest using the flipped classroom model to increase the interactivity and effectiveness of online teaching. This study sheds new light on the relationship between interactions and perception of progress in online education at private universities in Vietnam's southern region.

Keywords: interaction; online learning; perceived progress; PLS-SEM; satisfaction

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1. Introduction

Interactive teaching belongs to open teaching and contributes to the formation of interest, responsibility, and activeness in learning (Lin et al., 2017). The interactive classroom solution allocates to learners the role of planning, being practice-oriented, and participating in group cooperation. However, interaction is easier to do in the form of face-to-face learning than online learning (Duc-Long et al., 2021). The COVID-19 pandemic has had an immense impact all aspects of every nation in the world, including learning and teaching activities (Wang et al., 2021). It is argued that online learning is the best method to cope with Covid-19 pandemic challenges (Lanzotti et al., 2020). According to Wang et al. (2021), online education has become the new normal, which has prompted researchers to study the relationship between student achievement and student satisfaction in online environments.

Knowledge acquisition and intellectual abilities should be major indicators of learning outcomes (Ayanbode et al., 2022). According to Barker (1994), interaction plays a critical role, not only in knowledge acquisition, but also in cognitive progression and developing physical skills. It is believed that interaction is a fundamental element of both traditional lessons and distance learning (Maheshwari, 2021).

In the online learning environment, interaction is vitally important for achieving effective learning and teaching results (Lin et al., 2017). Song and McNary (2011) emphasize that one of the most important determinants of learning experiences is learner interaction. In addition, interaction in virtual or online lessons, which are quite different from face-to-face interaction in traditional ones, occurs via supported technological tools or platforms, such as chatrooms, email, learning management systems, and so on. A shift to online, distance interaction from a physical one helps overcome distance barriers and to curtail the spread of disease infection. However, understanding how learners interact in the online learning environment is critical, since interaction affects the learning quality significantly (Ayanbode et al., 2022). Hence, in support of this argument, interactions are classified into three types: learner–content interaction, learner–lecturer interaction, and learner–learner interaction (Moore, 1989). Although many scholars have written on this subject, under new circumstances, such as that of the pandemic and the explosion of information technology, it is necessary to undertake further research that focuses on interaction in online education, and to produce empirical results that explain the effect of interaction on learning effectiveness.

In the context of the effect of the Covid-19 pandemic on Vietnam, the Ministry of Education and Training suspended all face-to-face education activities across the nation as part of quarantine solutions, to prevent the virus spreading (UNICEF, 2021). Vietnam has developed online education in recent years (Duc-Long et al., 2021), so, in the quarantine periods, online learning was enhanced from piloting to massive implementation.

A number of researchers have referred to online learning and teaching in Vietnam. The study of Nguyen (2009), for example, which was conducted at Tra Vinh

University, focused on exploring lecturer–learner interaction in online classes. Phạm and Trần (2020) did their research at the Hanoi campus of a polytechnic university to investigate lecturers and learners' perceptions of fundamental courses, as well as that of administrators regarding the online learning environment. Maheshwari (2021) studied factors that influence learners' intention to learn online, and reveals that support by the institution and satisfaction affect learners' intention to learn online. Although the results of these studies have shown the effect of satisfaction on learning, there is no clear demonstration of the role of satisfaction in online learning (Moore, 2012). Hence, a quantitative research method was applied, and this paper reports on findings in relation to the meaningful relationship between interaction and perceived progress, under the mediated effect of satisfaction, at private universities in Vietnam.

2. Literature review

Interaction is one of the factors that promotes effective online learning (Song & McNary, 2011). However, increasing interactive activities is not easy, and requires appropriate teaching strategies. Learners should also define clear learning goals.

2.1. Achievement goal theory

The theory owes its existence to McClelland and Atkinson's pioneering work on needs and motives. The theory defines the types of goals that guide achievement-related behaviors, and is more concerned with understanding why than what individuals are attempting to accomplish with certain goals (Urdan & Maehr, 1995).

Avoiding failure and the reason for wanting to achieve success are two achievement motives. The motivation to attain achievement is related to the approval of goal orientation and the goal of outperforming others; these goals are referred to as performance-approach goals in the literature, because they focus on demonstrating competence. The desire to avoid failure is linked to the desire to avoid demonstrating incompetence, or what is now more commonly known as performance targets (Torun, 2019).

Learners are not always highly motivated in the university context. Higher education not only expects learners to achieve, it also values the process of learning and improving learners' skills, and encouraging learners to exert the effort required to develop, apply, and maintain skills and knowledge for long-term development. Motivation is, thus, a result of education (Na et al., 2020). From the viewpoint of education, achievement goal theory attaches the experience to the goals that learners set for their course or academic task.

Regarding investigating learners' motivation in academic settings, the theory has received a great deal of attention. The theory defines the types of goals that motivate achievement-related behaviors. As online learning is applied more in higher education, researchers should investigate the impact of pursuing multiple goals on learners' perception, use of strategies and behaviors to achieve goals in an online learning environment (Yeh at el., 2019).

2.2. E-learning satisfaction

E-learning is defined as using telecommunication technology to deliver information in order to educate and train people (Kulkarni et al., 2020). The e-learning system is one of several education methods (teaching and learning procedures) that allow for flexible, learner-centered education. It is a World Wide Web-based information system (Edelhauser & Lupu-Dima, 2020). The ability to achieve a higher-level consistency of teaching is one advantage of e-learning. With traditional training, different individuals are likely to provide training for a single workforce. Time and distance have always been major barriers to training. E-learning, in contrast, virtually eliminates these two barriers. E-learning features encompass all the requirements of modern learning, and it is in higher demand in businesses and higher education institutions as a result of this particular quality (Kulkarni et al., 2020).

Satisfaction refers to the degree of happiness or disappointment with the service received (Moore, 2012). It is an internal feeling that expresses the level of satisfaction and happiness expressed by learners regarding the effectiveness of course content delivery. According to Moore (2012), learning strategies, challenges in learning, interactions, data usability, and learning outcomes were found to have an impact on learner satisfaction. The satisfaction or dissatisfaction of a learner with e-learning is an important factor in encouraging learners to continue studying online. If learners are satisfied with online learning, they will continue to study and if they are not, they are unlikely to apply this type of study (Rajabalee & Santally, 2021).

2.3 Interactions in and satisfaction with e-learning

Interaction is an essential part of e-learning – it is at the heart of any successful e-learning program. There are three types of interactions, based on the parties involved, that is, learner and lecturer, learner and learner, and learner and content (Moore, 1989).

2.3.1 Learner–lecturer interaction

The results of interaction between learners and lecturers assess how engaged trainers are with learners and how close they perceive the trainer to be, based on their online presence (Keskin et al., 2019). This interaction creates an environment that encourages learners to understand the material. Interaction between learners and lecturers can occur for two reasons: instrumental reasons, and emotional and social reasons. If the interaction takes place for instrumental reasons, the instructor will search for postings that are mainly about finding and providing help, whether it is scientific questions about study materials and content, or queries about assignments and study structure. Depending on the teaching method, the lecturers can play a prominent (instructor-centered) or a facilitator role. In interaction that takes place for emotional and social reasons, postings are primarily about seeking and providing reassurance and assistance in response to social or emotional questions, and issues related to the course (Shariq et al., 2022). The level of participation of online lecturers and learners is not synchronized, which can lead to learner dissatisfaction (Arbaugh, 2018). So, the role of learner–lecturer interaction is very important.

2.3.2 Learner–learner interaction

Interaction between a learner and their peers is referred to as learner–learner interaction (Pillutla et al., 2020). Another way of describing learner–learner interaction is as the communication between one learner and another, either alone or in groups (Dönmez et al., 2010). Interaction between learners can also occur for two reasons: instrumental reasons and emotional/social reasons. Interaction helps to stimulate thinking and curiosity, thereby affecting learners' knowledge acquisition. In the study of Pillutla et al. (2020), the authors found that the interaction between learners affected the results of the knowledge that was acquired. Learner-centered education, according to the research of Junus et al. (2015), paves the way for learners' ultimate satisfaction.

2.3.3 Learner–content interaction

Learner–content interaction is especially important for online course participants, because it contributes to successful learning outcomes and course completion (Fredrickson, 2015). Interaction between learners and content is fundamental in all forms of education (Vrasidas, 2000), and is the most important type of interaction, because it is here that learner learning occurs (Tuovinen, 2000). Web facilities, such as laboratories and computer support, promote passive interaction between learners and content, and open up many opportunities for interaction for learners and lecturers (Edelhauser & Lupu-Dima, 2020). This is the interaction between the learner and the learning material, which can be presented in a variety of formats, such as text, audio, video, graphs, and images. Technology has expanded the possibilities for material storage, indexing, and distribution, while computer simulation, instructional tools, and distance laboratories have altered learner–content interaction behavior and structure (Fredrickson, 2015).

According to Lin et al. (2017), satisfaction during the interaction affects the success of the online lesson. The research of Ayanbode et al. (2022) shows that learner–content interaction is positively related to learner satisfaction. Interaction with course content was found to be a significant predictor of perceived learning.

2.4 E-learning satisfaction and perceived progress

The extent to which individual students perceive the benefits of taking the e-learning course is defined as perceived learning. The benefits of online collaborative learning are concerned with intellectual development or process knowledge (Edelhauser & Lupu-Dima, 2020). The perceived level of the quality of learners' learning experience in online lessons is used to measure the perceived progress of learners (Eom & Ashill, 2016). According to Ayanbode et al. (2022), when learners interact with peers and lecturers, their satisfaction increases, and their cognitive progress also improves (learner–teacher).

3. Hypotheses of the study

The purpose of this study was to investigate the relationship between interaction and learning outcomes under the mediated influence of satisfaction. Based on achievement goal theory and previous studies, the authors propose four research hypotheses, as follows:

H_1. Learner–lecturer interaction is positively correlated with satisfaction.

H_2. Interaction between learners is positively correlated with satisfaction.

H_3. Learner–content interaction is positively correlated with satisfaction.

H_4. E-learning satisfaction is positively correlated with perceived progress.
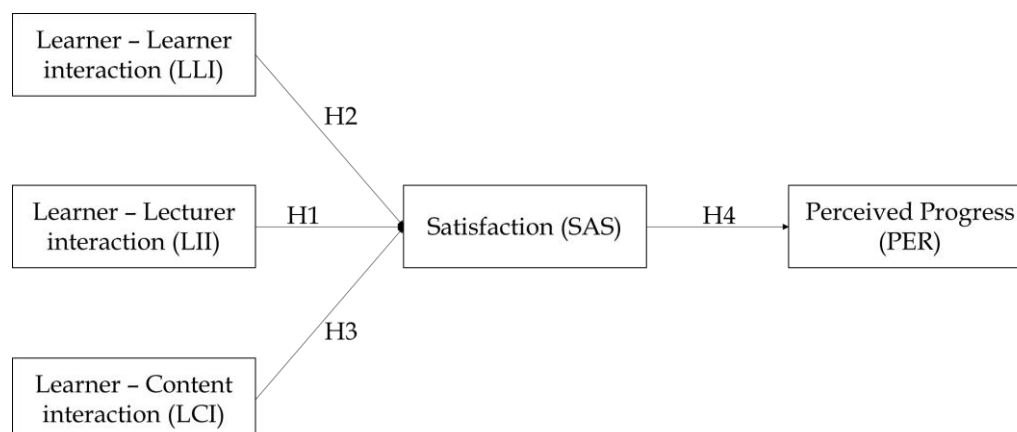
The research model is shown in Figure 1.

Figure 1. The research model

4. Methodology
To verify the research hypotheses, the authors applied a particular research design, and engaged in data collection and data analysis. The process is described as follows.

4.1. Research design
The purpose of this research was to determine the relationship between interaction, satisfaction, and perceived learning at private universities in Vietnam's southern region. The research population comprised respondents at private universities, named UEF, Hong Bang, Van Lang, Van Hien, Technology, Hoa Sen, Huflit, FPT, and Nguyen Tat Thanh. The research did a survey of full-time learners at these institutions. The survey was carried out using Google Forms. The benefit of using Google Forms is that the respondents can complete the survey at any time of the day or night. The questionnaire was piloted with a small group of learners (n = 10), to determine whether a question was difficult to answer due to sentence construction or use of technical terms or formulas, and to improve the questionnaire validity (Shadish et al., 2002).

4.2. Data collection and sampling
The selected respondents were from two large private universities – UEF and Hoa Sen – and they were given a pre-test survey. Then, 250 survey questions are designed on Google Forms and distributed via email. A total of 223 valid respondents were collected, which was an 89 percent response rate. It is considered a good response rate, which decreases the chance of response bias (Cheung et al., 2006). In the partial least squares structural equation modeling (PLS-SEM), the minimum sample size is at least 10 times the number of structural

paths (Hair et al., 2014). The sample had to be greater than 40, because there were four possible paths. So, 223 responses met the PLS-SEM criteria in this study.

4.3 Measure of constructs

The questionnaire was designed and had been adjusted from the studies of Quadir et al. (2022), and Eom and Ashill (2016). The interaction scale is based on the research of Eom and Ashill (2016), and Quadir et al. (2022). The perceived progress scale and satisfaction scale are based on the research of Eom and Ashill (2016). Table 1 displays all measures and constructs.

Table 1. Questionnaire and their sources

Learner–content interaction (LCI)	
Source: Quadir et al. (2022)	
LCI1	I can view text, graphics, animation, audio, video, and other media presentations.
LCI2	I have access to instructional materials that are specifically tailored to my needs.
LCI3	I have access to customized test or quiz items.
LCI4	I can submit content-related questions and receive immediate online assistance.
LCI5	I can provide relevant links with course-related information.
LCI6	I can attend the events, attracted and encouraged by special incentives, such as a prize for the learner who submits the most interesting posts.
Learner–lecturer interaction (LII)	
Source: Eom and Ashill (2016)	
LII1	In class, interaction with my lecturer is often constructive and positive
LII2	In this class, interaction between lecturer and learners is often constructive and positive.
LII3	In this class, the positive interaction between the lecturer and the learners helped me to increase my outcomes.
LII4	Positive and constructive interactions between learners and lecturers make an important contribution to learning outcomes.
Learner - Learner interaction (LLI)	
Source: Eom and Ashill (2016)	
LLI1	I had many positive and constructive interactions with my classmates.
LLI2	Learner interaction in this online classroom is positive and constructive.
LLI3	I learned a lot of good things from my classmates while studying online.
LLI4	The quality of my learning improves due to positive and constructive interactions with other learners.
Perceived progress (PER)	
Source: Eom and Ashill (2016)	
PER1	The quality of the class is higher than the quality of the in-person classes.
PER2	The knowledge I learned from this online class is equivalent to what I learned in the face-to-face class.
PER3	I have learned more knowledge in the online classroom during the pandemic.

PER4	The quality of learning was found to be higher in online classes during the pandemic.
Satisfaction (SAS)	
Source: Eom and Ashill (2016)	
SAS1	When studying with this lecturer, learners will get more benefits.
SAS2	This online course is something I would recommend to other learners.
SAS3	In the future, I would take another online course at this university.
SAS4	During the pandemic, I was very pleased with this online course.

4.4 Data analysis

This study was conducted to determine the impact of interaction on learning perception under the influence of the mediating variable satisfaction, by using the PLS-SEM approach. PLS-SEM is thought to be the best approach for such studies, because this study was exploratory in nature (Hair at el., 2014). PLS-SEM is suitable for small sample sizes (Rigdon, 2016).

The research model is a reflective model. To evaluate measurement models, the indicator loadings must be examined first. Loadings greater than 0.708 are suggested, because they imply that the construct reports more than half the variance in the indicator, suggesting appropriate reliability.

The second step is to evaluate internal consistency reliability. Most of the time, composite reliability (CR) was used. Composite reliability is greater than 0.70 and less than 0.95 (Hair et al., 2014). Cronbach's alpha is another measure of internal consistency reliability that uses the same thresholds as CR, but yields lower values. Dijkstra and Henseler (2015) propose rho_A as an as an alternative; it is an approximate measure of construct reliability that typically lies between Cronbach's alpha and the CR. As a result, rho_A may be a good compromise if the factor model is correct, recommended 0.70–0.90.

The third step was evaluating a reflective measurement model to determine the convergent validity of each construct measure. Hair et al. (2014) propose considering the external loading of the item and the extracted mean-variance (AVE) to determine convergent validity, and whether acceptable AVE is equal to or greater than 0.50.

The fourth step was to evaluate discriminant validity, which refers to how distinct a construct is empirically from other constructs in the structural model. The threshold should be between 0.65 and 0.85.

Finally, goodness-of-fit indices were used to assess model fit for both the measurement and structural models. These include Chi-square-based model fit measures, and the standardized root means square residual (SRMR) (Henseler et al., 2016).

5. Findings

Theoretical models were used to examine the association of the four pathways by means of the four research hypotheses. The results, after applying PLS-SEM, are as follows.

5.1 Assessing measurement model

The reliability of individual items can be assessed using outer loadings, which are the loadings of the reflective manifest variables with their associated latent variables. A loading of LCI6 and LLI1 is less than 0.708, so, we removed these two items; the remainder was greater than 0.708, which indicates that the project is trustworthy.

The CR of all items is greater than 0.763 and less than 0.858, which meets the threshold. Cronbach's alpha of items ranges from 0.763 to 0.858, rho_A is from 0,763 to 0,872, and AVE is greater than 0,638 ≥ 0,5, which indicates that they meet the threshold.

Table 2. The results from the measurement model estimation

Latent variable	Manifest variable	Outer weight	Outer loading	CR value	AVE	Cronbach's alpha	rho_A
Learner–content interaction	LCI1	0.204	0.747	0.898	0.638	0.858	0.872
	LCI2	0.235	0.779				
	LCI3	0.301	0.851				
	LCI4	0.275	0.843				
	LCI5	0.230	0.767				
Learner–lecturer interaction	LII1	0.304	0.825	0.731	0.799	0.799	0.799
	LII2	0.313	0.854				
	LII3	0.288	0.801				
	LII4	0.310	0.811				
Learner–learner interaction	LLI2	0.392	0.818	0.848	0.786	0.763	0.763
	LLI3	0.409	0.824				
	LLI4	0.413	0.829				
Perceived progress	PER1	0.372	0.885	0.857	0.857	0.856	0.856
	PER2	0.392	0.878				
	PER3	0.371	0.880				
	PER4	0.284	0.823				
Satisfaction	SAS1	0.275	0.775	0.830	0.830	0.825	0.825
	SAS2	0.300	0.800				
	SAS3	0.316	0.808				
	SAS4	0.342	0.854				

Source: Authors' findings

5.2 Assessing structural models

5.2.1 Discriminant validity results

According to Fornell and Larcker's (1981) criteria, there is no violation of discriminant validity in Table 3.

Table 3. Discriminant validity results

	LCI	LLI	LII	PER	SAS
LCI	0.799				
LLI	0.691***	0.823			
LII	0.724***	0.561***	0.844		
PER	0.632***	0.657***	0.581***	0.881	
SAS	0.715***	0.633***	0.685***	0.810***	0.810

Note: ** indicates a significant at p < 0.01; *** indicates a significant at p < 0.001
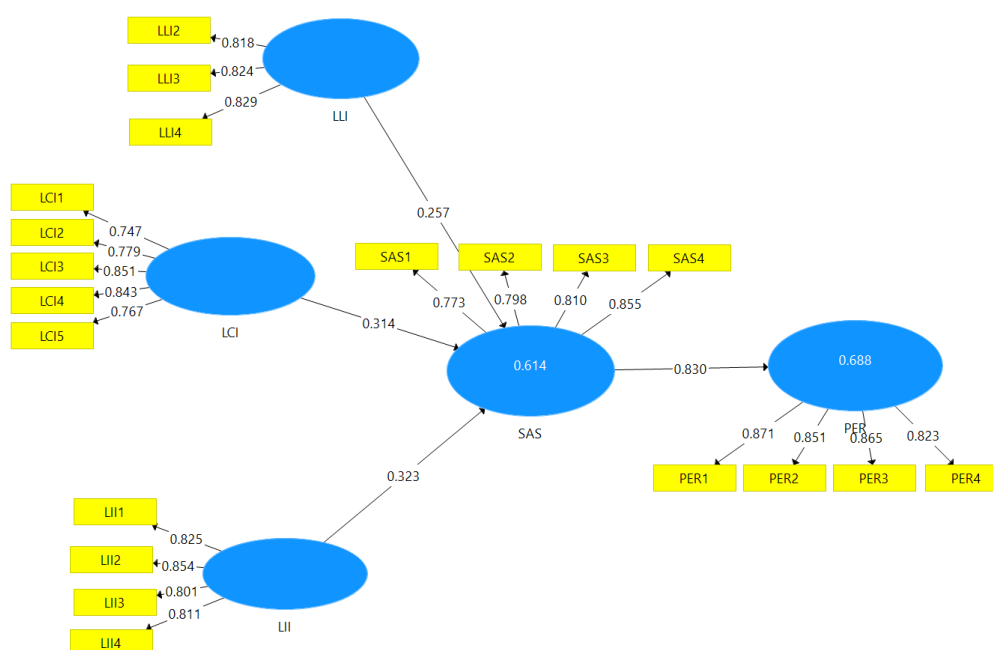
Source: Authors' findings

According to model fit statistics, the data is a perfect fit for the model. The result of χ2 is 644.988, value of df = 254 and p = 0.000, the result of CMIN/df is equal to 2.539, SRMR = 0.072 (Hair et al., 2014). As a result, all constructs are trustworthy, acceptable, and distinguishable from one another (Hair et al., 2014).

Table 4. Discriminant validity results

Hypothesis	Relationship	Proposed effects	SRW	Results
H1	Learner–lecturer interaction → Satisfaction	Positive	0.323	Supported
H2	Learner–learner interaction → Satisfaction	Positive	0.257	Supported
H3	Learner–content interaction → Satisfaction	Positive	0.314	Supported
H4	Satisfaction → Perceived progress	Positive	0.830	Supported

Source: Authors' findings

5.2.2. Structural equation modeling-partial least squares

Figure 2. Path coefficient diagram results

Source: Authors' findings

Research results show that learner–lecturer interaction, learner–learner interaction, and learner–content interaction have a positive impact on satisfaction. This result is compatible with the study of Ayanbode et al. (2022). This result shows that, when learner–lecturer interaction increases, satisfaction will increase. Research results also show that satisfaction has a positive impact on perceived progress, which means that when satisfaction increases, perceived progress increases.

6. Discussion

Research results show that learner–lecturer interaction is positively correlated with satisfaction. This result is compatible with the studies of Ayanbode et al. (2022) and Nguyen (2009). A lesson must bear the mark of a lecturer, not only in terms of knowledge, but also in style and unique features that distinguish one lecturer from another. Therefore, lectures for a subject taught by a lecturer in the form of e-learning must be delivered by the lecturer directly to learners via the Internet, not a prerecorded lecture that is implemented by a group of lecturers. Activities, such as forums, exchanges and discussions, should also be designed, to increase the interaction between lecturers and learners. A virtual classroom that maintains lecturer-learner interaction similar to that of a traditional classroom will increase the lecturer's excitement, enthusiasm, and responsibility and attract learners to participate in the learning process. This is an important factor that makes online training programs attractive and successful.

It was also noted in the research results that learner–learner interaction is positively related to learner satisfaction. This result is compatible with the study of Ayanbode et al (2022). It can be explained that, when studying in groups, learners are more motivated, the receive input from other members of the group, and they do not feel isolated. Instructors need to plan for learner–learner interaction by considering their collaboration and information sharing, they must build a sense of community among the participants of the course, create a learning atmosphere where they can participate, give feedback, draw positive feedback, and communicate with concise, focused messages. Doing so will foster strong relationships between learners and help them to understand the material lecturers present material better. In addition, lecturers should enable learners to interact with each other through technology. Lecturers can get started with discussion boards, telecommunications tools, such as email and chat rooms, and social collaboration tools.

Moreover, the results show that learner-content is positively correlated with satisfaction. The course structure is very important in online teaching and learning. This result also suggests to administrators how to design online courses using competency-based design to engage students better and to improve overall learner satisfaction and experience.

The results also show that learner satisfaction increases perceived progress in online learning. Thus, the interaction helps create satisfaction and, in turn, satisfaction helps to improve learning results. This finding is compatible with the study of Ayanbode et al. (2022).

7. Conclusion

While learners have been able to return to school under the new normal, the impact of the pandemic has forced many classes to take advantage of online instruction. For a long time, online learning has involved limited interaction between lecturers and learners, thereby seriously affecting the quality of education. In addition, in this era of booming digital technologies, higher education institutions must make investing in online learning a strategic goal, not only to increase their market share of learners, but also to build learning platforms that use technology to change teaching methods, improve quality, and transform organizational training models. Interaction is critical to the success of an online classroom.

Research results of a study at Vietnamese private universities show that learner–lecturer interaction is positively correlated to satisfaction, learner–learner interaction is positively related to learner satisfaction, learner–content interaction is positively correlated to satisfaction, and learner satisfaction increases perceived progress. Hence, the research found that levels of interaction have an impact on developing student satisfaction, which, in turn, improves learning outcomes.

8. Recommendations

As a result of this study, the authors propose introducing a type of flipped classroom in online education to improve interactivity and effectiveness. Flipped classroom solutions not only help improve the quality of online training, increase learner interaction and make learning fun, but are also crucial steps in the digital transformation of education to improve the quality of training, and will continue to do so when learners return to face-to-face lessons. A flipped classroom requires a combination of technological equipment and classroom organization methods. The main objective of this technique is to transform a training approach from a lecturer-centered one to a learner-centered one. The authors recommend the models shown in the Table 5.

Table 5: Flipped classroom

Home		Phone Classroom		Physical Classroom
Learning management system (LMS)		Online meeting platforms (MS Teams, Zoom, GG Meet, Cisco Webex etc.)		Lecture hall, simulation practice room, creative center, enterprise etc.
Learners access learning materials (videos, podcasts, ebooks, SCOM etc.) Learners do simple exercises to test their basic knowledge		Learners interact with lecturers (ask and answer questions)		
		Learners prepare group exercises (Case studies, discussion topics, research projects etc.)		
Learners prepare group exercises		Learners work in groups under the supervision and guidance of lecturers		Learners work in groups, visit businesses, conduct field surveys under the supervision and guidance of lecturers

Home		Phone Classroom		Physical Classroom
		Under the supervision of the learners, learners present the findings of their group's research, discussion, and debate.		
		Learners submit their homework via the LMS		
Lecturers mark learners' homework on LMS		Lecturers evaluate learner work results (research objectives completed, skills)		

Source: Authors' proposal

To implement the above models optimally, education institutions need to develop learning management systems, equip online platforms, and improve learning environments, in addition to investing in technology. Adequate training, creative centers, simulation labs, and teachers' and learners' preparation are some of the issues that need to be addressed.

The role of the teacher will undoubtedly become more critical, and will shift from imparting knowledge to instructing learners on how to approach and solve problems. The demands on lecturers are undiminished; instead, lecturers need advanced professional qualifications and teaching skills to support learners in actively searching, organizing, and selecting information, not only at the level of knowledge and understanding, but also knowing how to use, analyze, synthesize, and criticize. The direct interaction between learners and lecturers, as an essential part of education quality, has a strong emotional impact on learners, and is the driving force that supports learners in discovering and mastering the process of autonomous knowledge construction, to build up personal knowledge, and to create new knowledge for society.

It is necessary to provide learners with adequate and appropriate technological equipment, so that they can access course content outside the classroom. The transition to so-called reverse learning requires a high degree of self-control, and learners' imperfect time management could result in delayed results from self-study, and lesson preparation. Extracurricular activities may not be attractive to learners. In contrast, implementing an inverse model at an integrated level significantly increases the amount of home learning experience (knowledge, practice); however, if the monitoring and evaluation of the learning process is not appropriate, learners may not be motivated to complete it.

9. Limitations
The study did not compare the effectiveness of perceptual learning before and after interaction. Furthermore, due to limited data sources, this paper is unable to compare the effectiveness of interaction with other universities in Vietnam, or other countries in the region.

Acknowledgment

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