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Technology's influence on student engagement in online learning

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ABSTRACT

Online learning has become an indispensable learning method in an environment of unpredictable changes. This study was conducted with the aim of assessing the factors affecting students' satisfaction and engagement in learning under the influence of technology. A survey of 368 university students experienced in online learning in Da Nang, Vietnam, yielded 339 valid responses. Data analysis employed Microsoft Excel, SPSS, and AMOS, with hypotheses tested via structural equation modeling (SEM). Service quality, student expectation and perceived enjoyment positively impact student satisfaction with perceived enjoyment having the strongest effect. Increased satisfaction significantly enhances student engagement. Ease of use, however, does not significantly affect satisfaction. The findings reflect cultural and contextual differences, consistent with global studies. The study emphasizes creating enjoyable, high-quality, and expectation-aligned learning experiences to boost satisfaction and engagement. Educational administrators should prioritize a culture of lifelong learning, the service-oriented spirit of lecturers, expectation management, and engaging learning environments, personal enjoyment and social factors such as knowledge sharing and collaboration. This research highlights the unique dynamics of online learning, emphasizing the influence of cultural factors on student satisfaction and engagement.

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1. INTRODUCTION

The strength and success of a nation depend not only on its economic growth or military advancements but also significantly on the caliber of its education system. Education serves as a foundation for national progress, nurturing talent, promoting intellectual growth, and driving innovation. It also serves as a significant source of foreign exchange, with international students contributing to the global standing of countries with excellent higher education systems. Higher education, in particular, is vital for driving economic growth and ensuring political stability. Human resources, developed through quality education, remain invaluable assets in disseminating and advancing knowledge.

In today's rapidly evolving society, university education empowers individuals to not only acquire knowledge but also to share and apply it effectively. This knowledge dissemination improves the overall quality of education and fuels societal progress. The integration of modern technology and the internet has further revolutionized learning, making it more accessible than ever before. During the COVID-19 pandemic,

for instance, countries like Vietnam leveraged online learning, remote work, and restricted physical interactions to minimize the virus's spread [1], [2].

The concept of online learning has historical roots, with study [3] introducing the "virtual classroom" model. This innovation demonstrated how education could transcend physical boundaries through computer networks. Since then, online learning has been validated by numerous studies and has evolved into virtual and web-based formats, gaining widespread adoption worldwide [4]–[6]. Its popularity can be attributed to diverse application platforms, which enhance accessibility and convenience [7], [8]. Additionally, online learning transforms traditional teaching methods, enhances satisfaction [9], [10] and fosters engagement [11] all while reducing costs for learners and institutions alike [12]. Despite its advantages, online learning faces challenges. It has received criticism from parents and students due to limited interaction, unengaging lectures, inappropriate teaching methods [13] and technical or accessibility issues [14]. Some studies even suggest that online learning may produce inferior outcomes compared to traditional methods [15], [16]. These challenges have prompted researchers to explore factors that influence the effectiveness of online learning, with a focus on student satisfaction, service quality, and engagement.

By addressing the gaps in existing research and proposing a comprehensive model, this manuscript offers valuable insights into optimizing online learning in Vietnam. Creating engaging, enjoyable experiences fosters student satisfaction and intrinsic motivation, while enhancing collaboration fosters community and belonging. The association of expectation and service quality with expectations and high-quality service delivery also promotes satisfaction. However, ease of use shows minimal impact due to student familiarity with the technology. Education administrators should focus on transparent, personalized communication, global standards, and continuous service improvement to increase student engagement and maintain a competitive advantage in online education. The findings not only contribute to the academic understanding of online education but also provide practical implications for educators and policymakers striving to enhance its efficacy. Therefore, this paper will introduce a new concept of entrepreneurial education framework that will expose young children to entrepreneurship thinking.

2. LITERATURE REVIEW

2.1. Customer satisfaction

Customer satisfaction is a cornerstone of business marketing strategies [17] and a critical factor for achieving success [18]. Over time, it has gained prominence across diverse disciplines, underscoring its significance. Satisfied customers play a vital role in business growth by spreading positive word-of-mouth (WOM) and electronic word-of-mouth (e-WOM) information, which enhances a company's competitive edge [19]. Additionally, customer satisfaction fosters the introduction of potential customers, the development of long-term relationships [20] and the likelihood of repeat purchases [19]. In essence, customer satisfaction serves as a performance metric for achieving business objectives [21]. In marketing, customer satisfaction is defined as the customer's assessment of whether their needs and expectations for a product are met [22]. This evaluation often includes comparisons with offerings from competitors [23]. Similarly, in the field of education, students are regarded as critical customers who influence the formation, existence, and development of educational institutions. Consequently, student satisfaction reflects the quality of a school's educational services [24]. Satisfaction is often described as the psychological state of students [25] or their emotional response [26] when comparing the actual outcomes of the learning process with their initial expectations. Expanding on these definitions, Zhao *et al*. [27] suggested that students assess various elements, including course content, teaching methods, the learning environment, and results, to determine their overall emotional state.

2.2. Ease of use

Perceived ease of use has been extensively explored and validated as a fundamental construct in research on technology adoption. Su and Li [28] first demonstrated that ease of use refers to the degree to which a technological innovation is simple to understand, operate, or superior to alternative options. Later, Davis *et al*. [29] in the technology acceptance model (TAM), defined ease of use as the degree to which an individual believes that utilizing information technology (IT) will require minimal effort. This concept has gained prominence with the increasing integration of technology into daily life. Researchers argue that perceived ease of use reflects the extent to which individuals accept that effectively using technology will provide freedom and convenience [30], [31]. From the research findings of Ba and Johansson [32], it is evident that customer satisfaction is significantly influenced by ease of use. Additionally, when customers feel comfortable and confident using electronic devices for shopping or learning, they tend to report higher satisfaction with the service provider [33]. In some cases, learners perceive that the seamless application of social media in online learning increases their engagement with lectures [34]. From the perspective of guidance and support, other tools for online learning, such as interactive features and sample tutorials, also enhance the enthusiasm of online learners [34]. As such, numerous studies have demonstrated the causal relationship

between the ease of using online learning materials and satisfaction [35]. Based on the above discussion, it is hypothesized that the degree of EU positively affects satisfaction in online learning: H1: ease of use positively influences student satisfaction in online learning.

2.3. Student expectation

Students embarking on online learning often experience a mix of excitement and apprehension. Bourdeaux and Schoenack [36] emphasize the unique expectations students form for this new learning environment. Consequently, student expectations emerge as a critical factor in assessing their satisfaction. Bhattacherjee [37] links expectations to perceived technology usefulness, aligning with expectation-confirmation theory. Within online learning, student expectations represent the envisioned positive outcomes of student effort. The expectation-confirmation model (ECM) posits that expectations strongly influence satisfaction, a relationship supported by various studies [38]. Furthermore, Oliver [39] expectancy-disconfirmation theory highlights the impact of expectation fulfillment on satisfaction. Exceeding expectations enhances satisfaction, while unmet expectations lead to dissatisfaction. This principle extends to tuition fees, where satisfaction is closely tied to perceived value for the cost [40]. In essence, student satisfaction is intricately linked to student expectations. Higher expectations generally lead to greater satisfaction. Based on these insights, the following hypothesis is proposed: H2: student expectation have a relationship with their satisfaction in online learning.

2.4. Service quality

Advancements in technology have significantly increased the importance of service quality in various sectors, including education. Service quality is crucial for determining a business's market position and fostering student satisfaction. In education, student satisfaction directly reflects the quality of the institution's offerings [41]. Eposi [42] defines service quality as a customer's evaluation of service delivery. While service quality has been linked to academic and administrative services [43], online learning introduces unique challenges. Technology quality becomes paramount, as disruptions can lead to dissatisfaction and reduced engagement [44].

Idkhan and Idris [45] emphasize the importance of information quality and system quality in e-commerce, applicable to online learning. This study defines service quality as encompassing both technology system quality and lecture quality. Gist [46] highlight student expectations for effective communication, support, well-structured courses, and instructor engagement. Nurfitriyani and Legowo [47] further emphasize the importance of fairness and recognition in fostering student satisfaction. Based on this, the following hypothesis is proposed: H3: service quality has a positive relationship with satisfaction in online learning.

2.5. Perceived enjoyment

Perceived enjoyment, encompassing pleasure, relaxation, and satisfaction in online learning, significantly influences student acceptance and engagement [48]. In a globalized context, perceived enjoyment extends beyond individual enjoyment to include the joy of sharing [49]. This study conceptualizes perceived enjoyment as comprising two key elements: personal joy, arising from the convenience and engaging nature of online learning, and shared joy, stemming from the satisfaction of knowledge exchange with peers. Numerous studies have demonstrated a strong positive relationship between perceived enjoyment and satisfaction. Tashtoush [50] identified a link between perceived enjoyment and satisfaction with online courses, while Kalankesh *et al*. [51] argued that perceived enjoyment explains user satisfaction with information systems. Recent research by Nurfitriyani and Legowo [47] further confirms this strong relationship in the context of online learning. Accordingly, the following hypothesis is proposed: H4: perceived enjoyment has a positive relationship with student satisfaction in online learning.

2.6. Customer engagement

In the context of many challenges in the relationship between business and consumers, a research issue that many scholars have interested in and focused on in recent research is the engagement, which has become an interesting research topic in both the social sciences theory, management and marketing literature and organizational behavior. In fact, the concept of engagement has been studied in a number of disciplines, such as education [52], psychology [53], management [54] and information systems [55]. However, there are the different definitions of engagement, and a noticeable lack of consistency in understanding the concept. This inconsistency arises from its use in different contexts, resulting in many 'engagement' terms. Bilro and Loureiro [56] argued that the diversity of these concepts stems from the increase in similar research in the marketing field, while Kamyabi *et al*. [57] agreed that this is a "new hot" topic for branding and marketing strategy.

While many have attempted to address the concept of customer engagement, Hu and Bentler [58] defined customer engagement as "customers engage with luxury brands not just for product utility but for

symbolic meanings and self-expression". In a similar vein, Willis [59] conceptualized it as a consumer's psychological state regarding their interactive, co-creative experience with a focal brand, whilst Dass *et al.* [60] defined engagement as a "behavioral manifestation" toward a brand.

Inconsistency also occurs with its subject and object; in fact, subject of engagement is often either 'customer' or 'consumer', the object of engagement is stem from specific products (health care and public transportation), specific services (e.g., mobile-phone) to brands or brand communities [56]. These differences have generated distinct dimensions of customer engagement. Gong [61] generated a new scale of customer engagement based on dimensional dimension of online context. Particularly, Yusnara and Soepatini [62] combined utilitarian, hedonic, and social dimensions, then Vinerean and Opreana [63] and Winell *et al*. [64] suggested three dimensions of cognition, emotion and behavior that seem to dominate in the literature [65]. The multi-dimensional point continues to develop widely as [56] posed cognitive, processing, affection and activation dimensions, and Dass *et al.* [60] proposed enthused participation, consumer attention, and social connection, after then vigor, dedication and absorption dimensions have been advanced in the research of Ndhlovu and Maree [66]. The exploration of reviewed literature [56], [59], [67] exposes a quite interesting issue that customer engagement is thought to be related to, yet conceptually distinct from several other concepts, such as involvement, connection, loyalty, and so on. It implies that comparing the construct of customer engagement to other relational constructs should clarify customer engagement distinct characteristics.

Within the educational context, student engagement is recognized as a crucial factor in predicting academic success [68] and serves as a key indicator of active participation and dedication to achieving learning goals [69]. Research consistently demonstrates a strong link between satisfaction and their commitment to the institution and its faculty [69], [70]. In this study, student engagement is defined as an emotional and behavioral manifestation towards a specific university stem from assessing cognition from student experience.

Hakimzadeh *et al*. [71] and Kankhuni *et al.* [72] contend that higher satisfaction with educational services fosters greater student retention, improved online course performance, and collaborative value creation. Satisfied students are more likely to develop trust, passion, and a deeper level of engagement with the institution [73]. This heightened engagement ultimately enhances student retention and increases the likelihood of course completion [70]. Based on these findings, the following hypothesis is proposed: H5: student satisfaction has a positive relationship with student engagement in online learning.

3. METHOD

3.1. Research instruments

The service quality scale developed by Kamakoty and Singh [74] evaluates the quality of the teaching staff and the quality of IT-related systems. The satisfaction developed by Diloreto *et al.* [75] and Cook and Ellaway [76] assesses overall contentment and emotional responses to the learning content, including enjoyment and humor. The student engagement scale developed by Moubayed *et al.* [68] focuses on assessing students' feelings toward their learning experience, involvement in academic activities, and critical thinking and problem-solving skills. The "ease of use" measures are adapted from Davis *et al*. [29] and the "student expectations" measure is adapted from Oliver [39] study. The "perceived enjoyment" measures are adapted from [49].

The questionnaire was originally written in English. However, since the research subjects were Vietnamese students, it was translated into Vietnamese using the back-translation method, as suggested by Kowal [77]. To ensure the accuracy and appropriateness of the content in both the Vietnamese and English versions, a sample survey of 20 students was conducted. Based on the feedback, some questions were adjusted to make them more suitable. Once this process was completed, the questionnaire was sent to 368 university students, with a total of 24 items gathered from previous studies and adapted to the current research context. Using a five-point Likert scale, students were asked to respond to all questions by indicating their level of agreement (from strongly disagree to strongly agree). The response rate was high, with 339 valid questionnaires used for further evaluation.

3.2. Sample and methods

The research was conducted in two steps. First, items were collected through a review of previous studies and then reviewed by two specialized lecturers to ensure the appropriateness of the wording in the context of this research. The questionnaire was compiled, edited, and sent to the survey subjects. About sample size, the basic research on sample size selection, must ensure the minimum ratio between sample size and number of observed variables is 5:1 [78], but must be at least 100 [79]. In this study, the minimum required sample size is 24*5 =120 (respondents). To ensure reliability, the study conducted a survey with 368 university students, the number of valid returned questionnaires was 339, which is suitable for this study.

The study selected Vietnamese students studying at four major universities of The University of Danang, such as the University of Economics, University of Science and Technology, Vietnam-Korea

University of Information and Communication Technology, University of Education, and Duy Tan University. These schools include most majors such as economics, IT, and pedagogy to ensure the representativeness of the survey sample. In addition, the research sample also ensures diversity in school areas, including both public and private schools. This is the perfect choice to test the quality and emotional factors in the research model. Only students who have used online learning methods are eligible to take the survey. More importantly, the research results from this sample survey will provide educational administrators with an overview of the blended learning method, assessing the level of influence of the factors, and thereby propose appropriate management strategies in this context. The questionnaire was sent randomly to students via Google Forms. The first question asked whether they were users of this form of learning.

The data collected from the survey was processed using specialized tools such as Microsoft Excel, SPSS, and AMOS to check the reliability of the scale and test the proposed hypotheses. Exploratory factor analysis (EFA) is used to reduce a set of many interdependent measurement variables into a smaller but more meaningful set of variables, while still containing most of the information content of the original set of variables [80]. According to Wang *et al*. [81] the simple correlation coefficient between variables and factor loading must be greater than or equal to 0.4 in a factor to ensure the scale achieves convergent validity. To ensure discriminant validity, according to Brackett and Mayer [82], the difference between factors must be greater than or equal to 0.3. According to Hair *et al*. [80] the number of factors is determined based on the Eigenvalues index, only factors with coefficients above 1 are considered significant and retained. In addition, it is necessary to evaluate the model fit index in CFA. Based on a collected data set, the study needs to test the suitability between this measurement model and the input data. According to According to Hair *et al*. [80] the indexes considered to evaluate the model fit index include chi-square/degrees of freedom ratio (CMIN/df) CMIN/df≤2 is good, CMIN/df≤5 is acceptable; comparative fit index (CFI)≥0.9 is good, CFI≥0.95 is very good, CFI≥0.8 is acceptable; goodness-of-fit index (GFI)≥0.9 is good, GFI≥0.95 is very good; root mean square error of approximation (RMSEA)≤0.08 is good, RMSEA≤0.03 is very good.

4. RESULTS

4.1. Profile

The majority of the students were male, comprising 54.8% of the sample, while females made up 45.2%. Regarding age distribution, 82% were under 22, and 18% were over 22. Most students (67 %) were in their third year, with 6% in their first or second year, and the rest in their final year. Additionally, 65% of the students were studying IT, while 35% were enrolled in economics programs.

The study used quantitative research methods to test the reliability of the relevant scales. According to Ghiselli *et al*. [83] reliability is an essential factor when evaluating the usefulness of a scale. The results of testing the reliability of the scales through Cronbach's alpha coefficient showed that the results were all good (Cronbach's alpha coefficient greater than 0.6). Reliability estimates for the model indicate that the coefficient alphas range from 0.921 to 0.962 across 6 domains. The 6 constructs all achieved an acceptable alpha level of 0.70. Consequently, all observed variables were deemed suitable and will be utilized for EFA.

The analytical outcomes reveal that the Bartlett test yielded a significance (Sig.) value of 0.000, which is less than the threshold of 0.05. This finding signifies a significant overall correlation among the observed variables within the factor analysis. Furthermore, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was determined to be 0.911, exceeding the recommended value of 0.5. This indicates that the factor analysis exhibits a strong fit with the research data [84].

The EFA results, with 6 components extracted and a cumulative variance explained of 57.171%, demonstrate that these 6 factors account for a substantial portion of the data variability. In the factor rotation matrix, all variables exhibited factor loadings exceeding 0.5. The EFA results successfully grouped 23 variables into 6 distinct factors, aligning with the initial theoretical framework. Notably, each variable loaded onto a single factor, indicating a clear and unambiguous factor structure. These findings collectively suggest that the factor analysis was satisfactory. Therefore, all scales selected for the variables within the model were deemed to meet the necessary criteria and are thus suitable for subsequent analyses.

Additionally, convergent and discriminant validity were assessed to evaluate the robustness of the measures. Convergent validity was evaluated based on factor loadings and the average variance extracted (AVE) values. All construct factor loadings and AVE values surpassed the recommended threshold of 0.50, as outlined by Hair *et al.* [85]. The composite reliability ranged from 0.776 to 0.851 across the 6 domains, exceeding the acceptable level of 0.70 [58]. The AVE ranged from 0.539 to 0.590 across the 6 domains, also exceeding the acceptable AVE level of 0.50 [58].

Additionally, based on the criteria proposed by Hu and Bentler [58] the confirmatory factor analysis (CFA) results revealed that all fit indices of the measurement model were within the recommended levels. As shown in Table 1, chi-square/df=2.016, GFI=0.913, incremental fit index (IFI)=0.949, CFI=0.948,

Tucker-Lewis's index (TLI)=0.939, and RMSEA=0.051. This outcome implies that an adequate fit between the measurement model and the observed data has been established.

Table 1. CFAs' results within the 6 latent factors

	Path		Estimate	S.E.	C.R.	p	CR	AVE
ENG2	<---	ENG	.791				.847	.582
ENG3	<---	ENG	.805	.073	15.958	***		
ENG4	<---	ENG	.785	.067	15.56	***		
ENG1	<---	ENG	.661	.066	12.876	***		
SEP2	<---	SEP	.799				.831	.552
SEP3	<---	SEP	.784	.066	15.248	***		
SEP4	<---	SEP	.683	.068	13.212	***		
SEP1	<---	SEP	.699	.064	13.547	***		
SAT1	<---	SAT	.839				.850	.590
SAT4	<---	SAT	.809	.055	17.404	***		
SAT2	<---	SAT	.793	.056	16.999	***		
SAT3	<---	SAT	.61	.058	12.311	***		
SQ3	<---	SQ	.801				.841	.570
SQ2	<---	SQ	.699	.054	13.814	***		
SQ4	<---	SQ	.741	.059	14.77	***		
SQ1	<---	SQ	.776	.057	15.519	***		
PEJ3	<---	PEJ	.797				.828	.547
PEJ1	<---	PEJ	.758	.06	14.868	***		
PEJ2	<---	PEJ	.719	.059	14.05	***		
PEJ4	<---	PEJ	.679	.055	13.188	***		
EU3	<---	EU	.781				.776	.539
EU2	<---	EU	.634	.064	11.407	***		
EU4	<---	EU	.777	.07	13.457	***		

Note: EU=ease of use, ENG=engagement, SEP=expectation, SQ=service quality; PEJ=perceived enjoyment; SAT=satisfaction; AVE=average variance extracted; CR=composite reliability; p=p-value; C.R.=critical ratio; S.E.=standard error; and ***=p<0.001.

To rigorously evaluate the meaning of a measure, as emphasized by Lim [86], it is imperative to establish discriminant validity. Lim [86] posited that discriminant validity is demonstrated when a measure exhibits minimal correlation with other, conceptually distinct measures. As presented in Table 2, the discriminant validity of the model constructs is supported by Hu and Bentler [58], Campbell and Fiske [87].

Table 2. Reliability, convergent, and discriminant validity of constructs

Constructs	C.R.	AVE	ENG	SEP	SAT	SQ	PEJ	EU
ENG	.847	.582	.763					
SEP	.831	.552	.452***	.743				
SAT	.85	.59	.510***	.469***	.768			
SQ	.841	.57	.558***	.451***	.510***	.755		
PEJ	.828	.547	.561***	.506***	.566***	.698***	.739	
EU	.776	.539	.510***	.652***	.465***	.528***	.478***	.734

Note: EU=ease of use, ENG=engagement, SEP=expectation, SQ=service quality; PEJ=enjoyment; SAT=satisfaction; AVE=average variance extracted; and ***=p<0.001.

4.2. Testing the structural model

To empirically test the hypothesized causal relationships among ease of use, student expectations, easy to use, perceived enjoyment, satisfaction, and student engagement, structural equation modeling (SEM) analysis was conducted using AMOS 20 software, the results are shown in Figure 1. An evaluation of the proposed research model, utilizing specific fit indices, revealed a Satisfactory alignment between the structural model and the observed data. Specifically, this model has p-value=0.000, GFI values=0.901, TLI=0.932, IFI=0.934 and CFI=0.934; and RMSEA=0.058. The relative chi-square/df (2.276) was within the suggested range. These fit indices were sufficient and maintaining that the structural model reveals an appropriate data after considering sample size and could possibly be applied to explain the hypotheses in this study [88] which means that all fit indices were set in between the corresponding recommended assessment and the research model offers a good model fit. The estimated results of the key parameters within the theoretical model, presented in Table 3, elucidate the statistical significance of the relationships between independent and dependent variables.

The study shows that student expectation has a very positive influence on the satisfaction (β=0.152, p=0.046<0.05), this research result is consistent with many previous studies such as research by Hasanov and

Hashimov [89]. However, this result contrasts with the findings of the study by Liu *et al*. [90] (β=−0.959, p<0.0001), which can be explained by the cultural differences between Vietnam and Saudi Arabia (collectivist cultures and hierarchical societies). Other factors may include differences in the educational system, policies, infrastructure, and the availability of resources, which may or may not align with students' expectations. Additionally, differences in the research sample and the timing of the research (2021 during COVID-19 vs. now post-COVID-19) may have led to different relationships in these two research contexts. Therefore, this result could also lead to meaningful research implications.

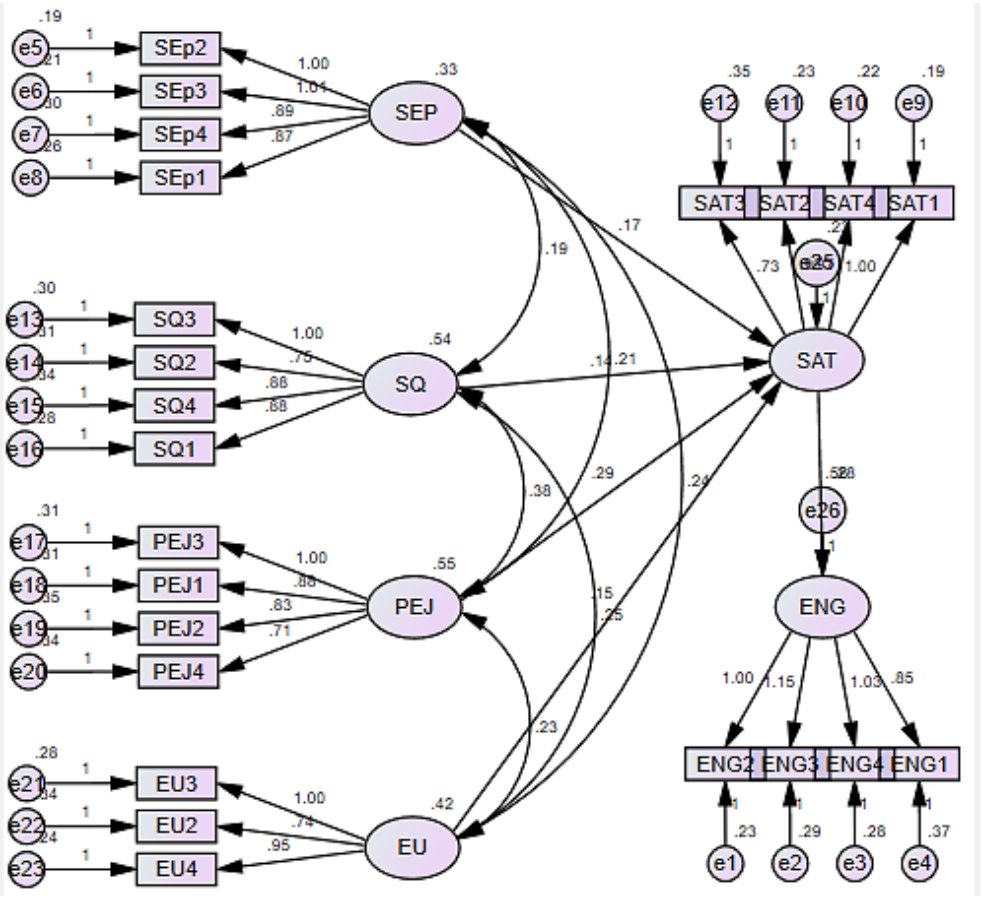

Figure 1. SEM results of the research model

Table 3. Hypothesis verification Result

Path			Estimate	S.E.	C.R.	p	Results
SAT	<---	SEP	.152	.085	1.999	.046	Accepted
SAT	<---	SQ	.162	.072	1.975	.048	Accepted
SAT	<---	PE	.332	.072	3.987	***	Accepted
SAT	<---	EU	.152	.08	1.887	.059	Not accepted
ENG	<---	SAT	.56	.059	9.465	***	Accepted

Note: EU=ease of use, ENG=engagement, SEP=expectation, SQ=service quality; PEJ=perceived enjoyment; SAT=satisfaction; AVE=average variance extracted; p=p-value; C.R.=critical ratio; S.E.=standard error; and ***=p<0.001

Research results also show that perceived enjoyment has the strongest impact on student satisfaction (β=0.332, p=0.000), which is consistent with the results of Hair *et al*. [85] (β=0.395, p=0.000). This consistency emphasizes the overall importance of perceived enjoyment in education. This result suggests that the learner-centered trend in Vietnam aligns with the educational ideology of Spain, as the pedagogical methods in both educational systems focus on experience and interaction, despite cultural and economic differences. Service quality has a positive effect on satisfaction (β=0.162, p=0.048). This result is consistent with the study by Joshi [91] in Kenya. This may stem from the similarity in cultural values related to respect and

professionalism. Additionally, it reflects the reality that competition has entered the higher education environment, prompting educational administrators in various countries to continually strive to improve the quality of services, including human resources, technology, and facilities, to enhance competitiveness

5. DISCUSSION

This study provides some discussion and recommendations regarding the online learning context that can be used in academic research and the classroom. First, whether online learning will become a popular form of learning when it helps save costs and meets the needs of distance learning of students. Second, whether this learning environment will promote or hinder learners' engagement when faced with distraction and passive learning. This can be considered when the role of AI is increasingly supporting. It has led to personalized learning paths, suitable for each learner's style and needs [92]. Through the learning management system platform, the provision of materials and the management of student interactions are easy and effective. Checking the frequency of accessing the platform, time spent using resources such as watching videos, solving quizzes, tracking assignment submissions, and forum participation, especially the effectiveness of taking tests [92]. These will promote learner engagement in this learning environment.

Through this analysis, the study has provided several implications. The findings of this study will contribute to extending the literature on student engagement and satisfaction in a general educational context-in particular, online learning. First, the relationship between ease of use and satisfaction is not established in online learning, which may stem from differences in students' learning styles or instructors' course design methods. Specifically, most students today are very tech-savvy, due to the widespread use of the internet, internationalization, rapid digital transformation, and the design of highly user-friendly interfaces. As a result, ease of use has become a standard expectation for most students, and they may not particularly appreciate the ease of use of popular systems, such as online learning platforms. Moreover, instructor support and guidance have become more comprehensive, with many learning activities, experiences, and adequate resources provided for courses. Consequently, minor technical shortcomings are often overlooked. For students, this is not considered an important factor affecting their satisfaction. From the perspective of education managers, to minimize the impact of technical issues on satisfaction, they should invest in teaching resources and provide timely support. They should also consider the user experience and make efforts to improve the usability of services, thereby maintaining student engagement.

The strong positive relationship between enjoyment and perceived satisfaction highlights the importance of creating engaging and enjoyable learning experiences. This finding aligns with theories of intrinsic motivation and flow experience. It stems from the two components of perceived enjoyment: personal enjoyment and social factors such as knowledge sharing and collaboration. Enjoyable experiences are often memorable, creating positive emotions that lead to higher levels of satisfaction. At the same time, these feelings help reduce stress caused by the academic environment. In online learning environments, promoting cooperation and positive social interactions contributes to creating a sense of community and attachment. These elements bring significant value to students, including improved learning outcomes and the foundation for their ambitions. It also suggests that educational administrators should focus on providing learning tools and designing courses that promote student motivation and assess the impact on psychological health or student engagement with this form of learning. As a result, they can build a clear roadmap for this form of learning, fostering opportunities for students to share, collaborate, and engage in group activities, collaborative projects, and discussions. Alternatively, educational administrators can personalize the learning experience based on the needs and interests of individual students. This aligns with the research of Ahmed *et al*. [93] who argued that personalizing the online shopping environment enhances the consumer's enjoyable experience, making them more engaged and loyal. Besides, according to Sani *et al*. [94] and Monrattanachai *et al*. [95] using virtual reality to increase student performance.

The positive relationship between student expectation and satisfaction is consistent with the expectancy-disconfirmation theory, which suggests that satisfaction is influenced by the extent to which an experience meets or exceeds expectations. Therefore, it is important for educators and service providers to manage student expectation and deliver on their promises. This helps avoid the creation of a gap between the organization's promises and performance and bridges the gap between expectations and experiences. This can be achieved through proper communication, clarity, transparency, and setting achievable goals. Additionally, implementing global standardization in education is a way for educational institutions to meet the expectations and satisfaction of students, parents, and employers, while also responding effectively to the continuous development of society. The positive relationship between service quality and satisfaction supports the importance of providing high-quality services. This finding is consistent with service quality models that emphasize the role of service attributes in shaping customer satisfaction. This can be achieved by providing a team of employees who are regularly trained, committed to lifelong learning, possess a service-oriented mindset, and have access to adequate resources and a supportive learning environment. In short, enhancing the

competitive advantage of educational institutions is closely linked to providing more efficient services, continuously improving them, and creating unique experiences [96] and promote lifelong learning skills [96].

In addition to its contributions, the study also has some limitations that future research could address. First, the results of this study are based on the specific context and population under investigation. Further studies in different contexts and with diverse population groups are needed to strengthen and explore the novelty of the proposed model. Second, additional research is needed to examine how students' personalities and learning motivations affect their satisfaction and engagement with this form of learning. Third, users' acceptance of information systems currently depends on factors such as social influence, gender, religion, culture, and politics. Therefore, further research should assess how these factors may moderate or control the relationships in this model. Furthermore, in the online context, perceived risk is an important factor influencing consumers' decision-making process. Risks in online learning may be related to personal information security, potentially inaccurate learning materials, or the spread of negative comments. Therefore, perceived risk should also be considered as a potential latent variable that could be added to the model for further evaluation. Therefore, it is expected that future conceptual models could solve these limitations by integrating these factors into a new model to evaluate their effect on learner's satisfaction and engagement.

6. CONCLUSION

This study highlights the importance of satisfaction and engagement in online learning. A key contribution of this study is the successful adaptation of the scales for expectation, perceived enjoyment, ease of use, and student expectations in the educational context of Vietnam. It provides meaningful results regarding the relationships between these constructs and satisfaction and engagement. Furthermore, understanding these related constructs helps educational administrators motivate students to engage with a brand and the value they perceive in a competitive environment, as well as assess the level of student interaction and the sharing of brand information. Notably, satisfaction is positively related to service quality, student expectations, and perceived enjoyment, with perceived enjoyment having the most significant influence on satisfaction. This, in turn, leads to strong student engagement in online learning. However, the relationship between satisfaction and ease of use was not found in this research context.

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Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
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Nguyen Thanh Hoai	✓	✓				✓		✓		✓				

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [NHQ], upon reasonable request.

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