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### Vietnamese Students' Barriers to Online Learning during the COVID-19 Pandemic

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#### Abstract:

The paper used the partial least squares structural equation modeling (PLS-SEM) method, which was applied to analyze the data of this study, based on the snowball sampling method, enabling the validation of the barriers related to students' academic skills, technical skills, motivation, and feelings toward online learning and their influence on students' academic achievements in online learning environments. The results show some significant impacts of academic skills and students' feelings toward online learning on their results in online learning environments. These results can be used by decision-makers, and managers in Vietnam's HEIs to improve the online courses, and lecturers and students can try to improve their skills to produce better results in the future. Besides, scholars can use this study as a source of reference to expand the research onto other factors like administrative/instructor issues, social interactions, time and support for studies, cost and access to the Internet, technical problems, and attain a wider variety of samples from more regions and both public and private sector. The novelty of the results contributes to the practice of students' barriers to online learning in the context of transitioning from face-to-face learning to online learning.

**Keywords:** online learning, students' barriers, COVID-19, Vietnam.

### 新冠肺炎大流行期间越南学生在线学习的障碍

#### 摘要:

本文使用偏最小二乘结构方程模型（偏光扫描电镜）方法，基于滚雪球抽样方法，应用于分析本研究的数

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据, 能够验证与学生学术技能、技术技能相关的障碍、动机和对在线学习的感受及其对在线学习环境中学生学业成绩的影响。结果显示, 学术技能和学生对在线学习的感受对其在在线学习环境中的成绩有一些显著影响。这些结果可供越南高等教育机构的决策者和管理人员用来改进在线课程, 讲师和学生可以尝试提高他们的技能, 以便在未来取得更好的成绩。此外, 学者们可以将这项研究作为参考来源, 将研究扩展到其他因素, 如行政/教师问题、社会互动、研究时间和支持、成本和互联网接入、技术问题, 并获得更广泛的影响。来自更多地区以及公共和私营部门的样本。结果的新颖性有助于在从面对面学习过渡到在线学习的背景下学生对在线学习的障碍的实践。

**关键词:** 在线学习, 学生的障碍, 新冠肺炎, 越南。

## 1. Introduction

In 2020, the world was struck by a pandemic with powerful impacts that have changed the many faces of global development. Perhaps at that time, few people could imagine COVID-19 would still be rife even over a year after its appearance. Internationally, the recorded data shows that the 'contagion' from the COVID-19's crisis is still spreading (Acuto, 2020), and the COVID-19 waves vary across countries. In Vietnam, it is recorded that until April 2021, there were three waves of the pandemic, in which the first lasted from March to April 2020, the second from July to April 2020, and the third from January to March 2021. In such a situation, distance learning, especially online learning, became a distinguished resort for Vietnamese institutions (Pham & Ho, 2020). As the country is facing a high risk of the fourth wave, there is a possibility that schools will have to suspend, and Vietnamese students must learn at home.

The outbreak of COVID-19 has directly affected Vietnam's education, including at the tertiary level. In Vietnam, HEIs must rely on online learning as one of the vital solutions to maintain teaching and learning in the emergence of public health risks (Vietnam Ministry of Education and Training, 2020). Vietnamese university students switched from traditional face-to-face to online learning as "the use of electronic technology and media to deliver, support, and enhance both learning and teaching and involve communication between learners and teachers using online content" (Howlett et al., 2009). Since the first implementation, although the Vietnamese government has taken control of the situation, Vietnamese institutions remain ready for online learning whenever necessary. Online learning thus transforms from a temporary answer to the emergency to the core solution in blended learning (Thi Thu Dao & Thi Kim Le, 2020).

As COVID-19 started in Vietnam, some studies on different issues concerning Vietnamese students' online learning in the context of the pandemic have been conducted. Some studies are based on the TAM model to verify the elements affecting students' acceptance of online learning and e-learning during the pandemic (Maheshwari, 2021). Regarding the technical issues, many studies focus on students' perspectives on the acceptance of video conferencing tools (Bui et al., 2020), while some others focus on the problems related to students' online learning habits (Trung et al., 2020) or

their mental health at the transition between traditional and online learning methods (Lan et al., 2020). Besides those aspects, students' barriers to online learning have received much attention as an understanding of such problems would suggest solutions to the improvement of online learning quality (Nuridin, 2021). After the outbreak of COVID-19, this topic has been even more widely studied worldwide (Baticulon et al., 2021; Yassine et al., 2022). However, in Vietnam, students' problems concerning the transition to online learning in the context of the pandemic have not been thoroughly investigated.

Therefore, our research group has designed a questionnaire on university students' barriers in the context of online learning during COVID-19 in Vietnam. This research aims to verify the influences of barriers related to students' academic skills, technical skills, and motivation during the online learning period on their academic achievement. To fulfill that purpose, we seek the answers to the following questions:

1. What are the Vietnamese students' barriers when learning online in the context of COVID-19?
2. What are the influences of those barriers on the students' academic achievement?

It is expected that knowledge of the barriers and their impacts will benefit researchers and practitioners in the field. From these insights, education administrators, teachers, and related agents like parents, enterprises, and the community should be able to propose solutions to the problems that affect the students' learning efficiency and result.

## 2. Literature Review

### 2.1. Academic Skills

Academic skills such as language skills, writing skills, communication skills, typing skills, etc., are the fundamental skills that students should acquire for studying. Muilenburg and Berge's (2005) research on students' barriers to online learning suggests that the factors are related to the students' perceived hindrances as their academic skills are insufficient. The lack of such skills results in difficulties in studying on online learning platforms, thus affecting students' learning outcomes. Hence, the following hypothesis is put forward:

*H1:* Academic skills for online learning have a positive impact on their academic achievements in

online learning.

**2.2. Technical Skills**

On online learning platforms, students’ technical skills are optimal for the efficiency of their learning (Baticulon et al., 2021). These technical skills are defined as the students’ ability to effectively use online systems, software, or hardware to learn online (Muilenburg & Berge, 2005). These skills are related to students’ perceived barriers, as they are discouraged when seeing new tools when learning online, when they lack the skills to use software, or when they are not accustomed to online learning tools. What is more, the barriers are categorized into two main types (Dabaj, 2009). The first one includes barriers that are clearly shown, for example, the inefficient use of technology, the communication cost, or the problematic access to websites.

However, the second type, which includes the unwillingness or fear to use technology, or the preference for traditional education, is more subtle. Panda and Mishra (2007) also claimed that if students do not have the required fundamental computer skills, their chances of online learning or e-learning employment in open universities may decline. Nonetheless, online learning has been proven to have positive impacts on students’ results (Aljaraideh & Al Bataineh, 2019). There is also a confirmed link between the efficiency of online learning and students’ technical competence (Arbaugh, 2000). Therefore, the following hypothesis was developed:

*H2:* Technical skills for online learning have a positive impact on their academic achievements in online learning.

**2.3. Learner Motivation**

Studies have shown that students’ motivation is one of the decisive elements that influence the learning (Kim & Frick, 2011), and several learning results like perseverance (Vallerand & Reid, 1984), long possession (Lepper & Cordova, 1992), and accomplishment (Eccles, 1983). Chen and Jang (2010) argued that students’ motivation should be considered equally important in online learning, while Fyans Jr. and Maehr (1987) pointed to the link between their motivation and their study result. In online learning, the role of students’ motivation is also crucial to their performance and attainment (Lamb, 2017). A study by Muilenburg and Berge (2005) has determined the relationship between students’ motivation and their psychology, which leads to hindrance in their achievements. Some psychological factors have an impact on their aspiration to learn online. Procrastination, the selection of easier tasks, or feelings of vague inspiration when learning online are examples of such reasons. Hence, this hypothesis was proposed:

*H3:* Learner motivation has a positive impact on their academic achievements in online learning.

**2.4. Feelings of the Students toward Online Learning**

According to Zeelenberg et al. (2008), the term “feelings” is defined as being perceived physical or mental sensations. In particular, feelings are a type of emotion that is the core of the learning (Wortha et al., 2019). Previous studies have also shown that learners’ emotions have a significant influence on learners’ academic achievement (Boekaerts & Pekrun, 2015). In this research, we propose that the feelings of students toward online learning have a positive impact on their academic achievements in online learning (H4).

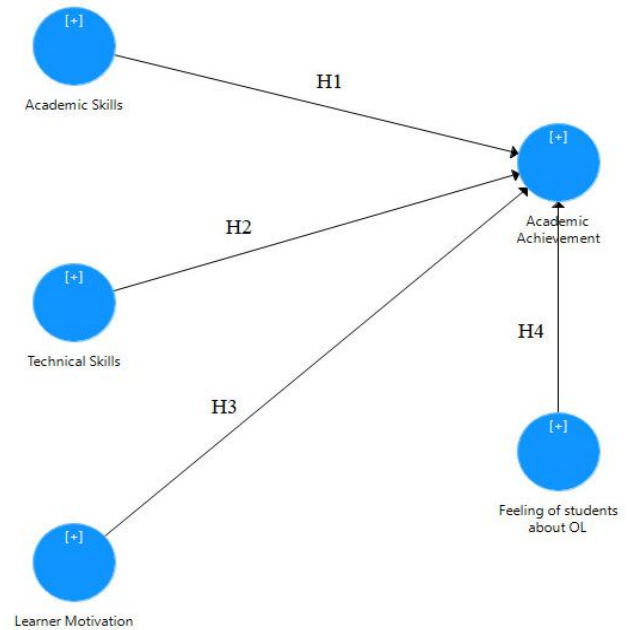


Figure 1. The research model (developed by the authors)

**3. Methodology**

To answer the research questions, the PLS-SEM, partial least square structural equation modeling, was applied. This method was highly recommended for adapting exploratory research (Hair et al., 2019). The main steps of the research process are summarized in Figure 2.

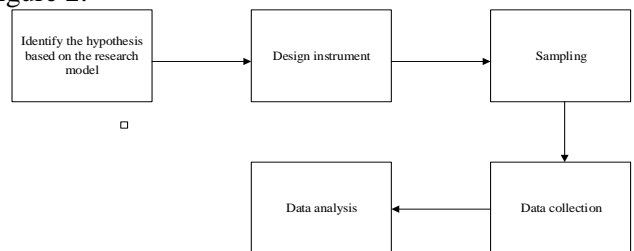


Figure 2. The research methodology

**3.1. Instrument**

A questionnaire was used to collect the data. It included 22 items divided into two parts, in which five items were about the characteristics of participants and 17 items about the student’s perceptions of their inefficient online learning. In the first part, characteristics of participants included their gender (male, female), university academic year (5-Likert scale: from the first year to the fifth year), area of residence (rural, urban), feeling of students to online learning (5-Likert scale: from 1-Not at all interested to

5-Very interested), and academic achievement in the period of online learning (5-Likert scale: from 1-Weak to 5-Excellent). In the second part, there were five scales. Three scales, academic skills, technical skills, and learner motivation, referred to the questionnaire of Muilenburg and Berge (2005). It consisted of 17 items, of which six belonged to the academic skills scale, six to the technical skills scale, and five to the learner motivation scale. These items referred to the 4-Likert scale, from 1-Not at all like me to 4-Very much like me. The questionnaire was designed on Google Forms and delivered to participants via Internet applications (e.g., Gmail, Facebook, Zalo).

### 3.2. Sample

Vietnamese students who had learned at least an online course from their university when COVID-19 spread out were focused on as participants. They voluntarily completed the online questionnaire. 801 students provided their personal information. Almost all the samples were female respondents (82.9%), while only 17.1% were males. In terms of the academic year, the first-year and second-year students dominated the group of respondents, with 43.4% and 41.1%, respectively. Based on the living area, 60.7% of students were rural, and 39.3% were urban. Regarding their interest in online learning, 50.2% of the respondents were interested in it, and the others were not. Classified by academic achievement, the group of excellent and good students was 47.9%, 34.6% of the sample was from the group of average ones, and the rest were below average and weak (Table 1).

Table 1. Characteristics of the respondents

Characteristic	N	Percentage	Cumulative Percent
<b>Gender</b>	<b>801</b>	<b>100</b>	<b>100</b>
Male	137	17.1	17.1
Female	664	82.9	100
<b>University year</b>	<b>801</b>	<b>100</b>	<b>100</b>
First-year	348	43.4	43.4
Second-year	329	41.1	84.5
Third-year	48	6.0	90.5
Fourth-year	71	8.9	99.4
Fifth-year	5	0.6	100
<b>Area</b>	<b>801</b>	<b>100</b>	<b>100</b>
Rural	486	60.7	60.7
Urban	315	39.3	100
<b>Interest in online learning</b>	<b>801</b>	<b>100</b>	<b>100</b>
Not at all interested	72	9.0	9.0

Continuation of Table 1

Not very interested	85	10.6	19.6
Neutral	242	30.2	49.8
Somewhat interested	191	23.8	73.7
Very interested	211	26.3	100
<b>Academic achievements in online learning</b>	<b>801</b>	<b>100</b>	<b>100</b>
Weak	43	5.4	5.4
Below average	97	12.1	17.5
Average	277	34.6	52.1
Good	206	25.7	77.8
Excellent	178	22.2	100

### 3.3. Data Collection

The online questionnaire which was applied followed the snowball sampling method. The participants were provided with the information of the survey. The authors asked their volunteers to answer all the questions and ensured their information was confidential. The volunteer participants who had completed the survey were encouraged to invite their peers, who also learned online, to fill out the questionnaire. The data were gathered in 32 days, from 5 April to May 6, 2021. All the information was exported as Master Excel (CSV file), which was used to clean the data. There were no missing data, so the final dataset consisted of 801 available records.

### 3.4. Data Analysis

Following Hair et al.'s guideline (2019), a two-step analysis, measurement model, and structural model were applied. First, the measurement model consisted of four indices, including indicator loadings (equal or higher 0.708), consistency reliability (minimum 0.70 or 0.60 in exploration research), convergent validity (AVE  $\geq 0.50$ ), and discriminant validity (HTMT  $< 0.90$ ). Second, the structural model had four indices, including collinearity (VIF  $> 5$ ), coefficient of determination ( $R^2$ ), predictive relevance of model ( $Q^2$ ), and PLSpredict ( $Q^2_{\text{predict}}$ ).

Moreover, a comparative analysis was adapted within the measurement model to explore the significant difference between subgroups of sample characteristics, which are gender (male and female), area (rural and urban), and university year (the first year and the others). All results presented in the next section were calculated using Microsoft Excel 2016 and SmartPLS 3 (<https://www.smartpls.com>).

## 4. Results

### 4.1. Measurement Model

The assessment results of the measurement model

are shown in this section. All values of the factor loadings in Table 2 were higher than 0.70. Because each factor had only one item, academic achievement and the feeling of students to online learning both had value 1. Their Cronbach alpha values were higher than 0.70, and their Average Variance Extracted (AVE) values were higher than 0.50 (Table 3). Table 4 presents the heterotrait-monotrait (HTMT) values, which were below 0.90. Figure 3 shows the measurement model with four independent variables (feelings of students towards online learning, academic skills, learner motivation, and technical skills) and one dependent

variable (academic achievement). Table 5 shows the results of the hypothesis test. *H1*: Feelings of students toward online learning were positive and significantly related to academic achievement ( $t = 8.626, p < 0.001$ ). *H2*: Academic skills were positive but did not significantly correlate with academic achievement ( $t = 0.349, p > 0.05$ ). *H3*: Learner motivation was positive and not significantly concerned with academic achievement ( $t = 0.787, p > 0.05$ ). *H4*: Technical skills were negative and significant to academic achievement ( $t = 2.920, p < 0.01$ ).

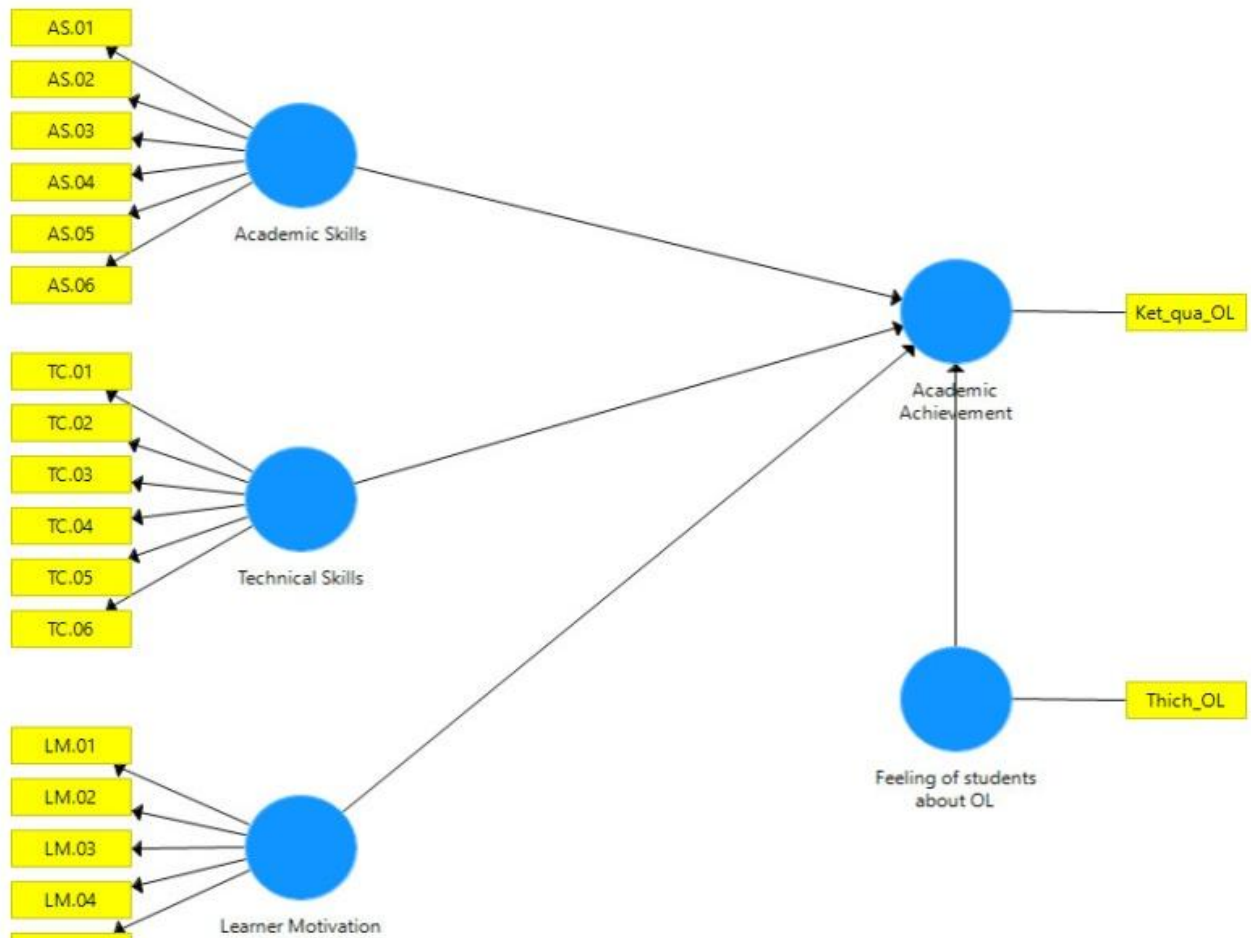


Figure 3. Measurement model (developed by the authors)

Table 2. Factor loadings

Variable	Item	Academic Achievement	Feelings of the students toward online learning	Academic Skills	Learner Motivation	Technical Skills
AS.01	Lack of language skills for online learning			0.839		
AS.02	Lack of writing skills for online learning			0.804		
AS.03	Lack of reading skills for online learning			0.833		
AS.04	Lack of communication skills for online learning			0.860		
AS.05	Lack of typing skills for online learning			0.848		

AS.06	Shy or lack of confidence in online learning		0.906
Academic Achievement	Academic achievement classification	1	
LM.01	Procrastinate, cannot get started		0.906
LM.02	Lack of personal motivation for online learning		0.839
LM.03	Having to take on more responsibility for learning		0.761
LM.04	Choose easier, less demanding aspects of assignments		0.727
LM.05	Online learning environment is not inherently motivating		0.848
TC.01	Fear of new tools for online learning		0.869
TC.02	Fear computers and technology		0.800
TC.04	Lack of skills to use the delivery system		0.862
TC.05	Unfamiliar with online learning technical tools		0.859
TC.06	Fear different learning methods used for online learning		0.909
Students' feelings toward online learning	Interest in online learning	1	

Note: Academic skills, technical skills, and learner motivation are adapted to the questionnaire of Muilenburg and Berge (2005).

Table 3. The average variance extracted (AVE) values of the variables

Variable	Cronbach's Alpha	rho_A	Composite Reliability	Average variance extracted (AVE)
Academic achievement	1	1	1	1
Students' feelings toward online learning	1	1	1	1
Academic Skills	0.940	0.940	0.952	0.769
Learner Motivation	0.910	0.915	0.933	0.736
Technical Skills	0.935	0.936	0.950	0.793

Note: Academic skills, technical skills, and learner motivation are adapted to the questionnaire of Muilenburg and Berge (2005).

Table 4. The heterotrait-monotrait (HTMT) values of variables

Variable	Academic Achievement	Feeling of students about online learning	Academic Skills	Learner Motivation	Technical Skills
Academic achievement					
Feelings of the students toward online learning	0.340				

Continuation of Table 4

Academic Skills	0.210	0.338		
Learner Motivation	0.213	0.356	0.866	
Technical Skills	0.238	0.288	0.874	0.895

Note: Academic skills, technical skills, and learner motivation are adapted to the questionnaire of Muilenburg and Berge (2005).

Table 5. Results of the hypothesis test

Code	Hypothesis	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values	Conclusion
H1	Feelings of students toward online learning -> Academic Achievement	0.309	0.309	0.036	8.626	0.000	Supported
H2	Academic Skills -> Academic Achievement	0.026	0.023	0.074	0.349	0.727	Not supported
H3	Learner Motivation -> Academic Achievement	0.058	0.058	0.074	0.787	0.431	Not supported
H4	Technical Skills -> Academic Achievement	-0.215	-0.212	0.074	2.920	0.004	Supported

Note: Academic skills, technical skills, and learner motivation are adapted to the questionnaire of Muilenburg and Berge (2005).

#### 4.2. Structural Model

In assessing the structural model, the effect size ( $f^2$ ), coefficient of determination ( $R^2$ ), and predictive relevance of the model ( $Q^2$ ,  $Q^2_{\text{predict}}$ ) were detailed. All values of the variable VIF in Table 6 were below 5. Table 7 shows the R square of academic achievement 0.142. This meant that four independents in the model explained a 14.2% variance in students' academic achievement related to the online learning method. Table 8 represents the effect size of each variable. The predictive relevance of the structural model ( $Q^2 = 0.122$ ,  $Q^2_{\text{predict}} = 0.124$ ) was strong (Hair et al., 2019).

Table 6. VIF

Variable	VIF
AS.01	3.432
AS.02	3.917
AS.03	4.111
AS.04	3.305
AS.05	2.784
AS.06	2.373
Academic achievement	1
LM.01	2.931
LM.02	3.462
LM.03	2.414
LM.04	2.359
LM.05	2.421

Continuation of Table 6

TC.01	3.11
TC.02	2.874
TC.04	4.048
TC.05	3.348
TC.06	2.984
Feelings of the students toward online learning	1

Table 7.  $R^2$ 

Variable	R Square	R Square Adjusted
Academic Achievement	0.142	0.138

Table 8.  $f^2$ 

Variable	Academic Achievement
Academic achievement	
Feelings of the students toward online learning	0.100
Academic Skills	0.001
Learner Motivation	0.003
Technical Skills	0.018

Table 9.  $Q^2$ 

Variable	SSO	SSE	$Q^2 (=1 - SSE/SSO)$
Academic achievement	801	703.284	0.122

Continuation of Table 9

Feelings of the students toward online learning	801	801
Academic Skills	4806	4806
Learner Motivation	4005	4005
Technical Skills	4005	4005

Note: Academic skills, technical skills, and learner motivation are adapted to the questionnaire of Muilenburg and Berge (2005).

Table 10.  $Q^2_{predict}$

Variable	RMSE	MAE	MAPE	$Q^2_{predict}$
Academic achievement	0.725	0.581	18.772	0.124

### 4.3. Comparison between the Subgroups of the Sample

Table 11 shows the result of the comparison between the male group and the female group. There was a significant difference between the two groups in H1 (mean = -0.237,  $p < 0.05$ ). Other paths had no significance ( $p > 0.05$ ).

The result of the comparison between the first-year student group and the others is listed in Table 12. The p-value of each path was higher than .05, which meant

that there was no significant difference between these groups in the relationships.

Three paths showed a significant difference between the rural group and the urban group (Table 13). They were H1 (mean = 0.233,  $p < 0.01$ ), H3 (mean = -0.546,  $p < 0.05$ ), and H4 (mean = 0.354,  $p < 0.05$ ). However, there was no significant difference among these groups in H2 (mean = -0.020,  $p > 0.05$ ).

Table 11. Comparison between the male group and female group

Code	Path	Total Effects-diff (male-female)	t-Value (male vs. female)	p-Value (male vs. female)
H1	Feelings of students toward online learning -> Academic achievement	-0.237	2.512	0.012
H2	Academic skills -> Academic achievement	-0.041	0.216	0.829
H3	Academic skills -> Academic achievement	-0.249	1.185	0.236
H4	Technical skills -> Academic achievement	0.183	0.932	0.352

Note: Academic skills, technical skills, and learner motivation are adapted to the questionnaire of Muilenburg and Berge (2005).

Table 12. Comparison between the first-year student group and the others

Code	Path	Path Coefficients-diff (first_year - others_year)	t-Value (first_year vs. others_year)	p-Value (first_year vs. others_year)
H1	Feelings of students toward online learning -> Academic Achievement	-0.054	0.733	0.464
H2	Academic Skills -> Academic Achievement	-0.07	0.512	0.609
H3	Learner Motivation -> Academic Achievement	0.012	0.083	0.934
H4	Technical Skills -> Academic Achievement	-0.016	0.112	0.911

Note: Academic skills, technical skills, and learner motivation are adapted to the questionnaire of Muilenburg and Berge (2005).

Table 13. Comparison between the rural group and urban group

Code	Path	Path Coefficients-diff (rural-urban)	t-Value (rural vs. urban)	p-Value (rural vs. urban)
H1	Feelings of students toward online learning -> Academic Achievement	0.233	3.190	0.001
H2	Academic Skills -> Academic Achievement	-0.020	0.127	0.899
H3	Learner Motivation -> Academic Achievement	-0.546	2.546	0.011
H4	Technical Skills -> Academic Achievement	0.354	2.256	0.024

Note: Academic skills, technical skills, and learner motivation are

adapted to the questionnaire of Muilenburg and Berge (2005).

## 5. Discussion

As COVID-19 remains in Vietnam, through the generalization and analysis of related studies, our research group has employed a questionnaire adapted from Muilenburg and Berge's research (2005) to verify the impacts of students' barriers such as academic skills, technical skills, learner motivation related to online learning and feelings of students toward online learning, on students' academic results. The PLS-SEM approach is used to assess the measurement and structural models. The results are specifically discussed below.

First, the findings indicated that 14.2% of the variability of students' academic results could be explained through four factors: academic skills, technical skills, learner motivation, and feelings of students toward online learning. However, only the first (Ho et al., 2010) and the last-mentioned factors were statistical. This finding fell in line with most previous



studies.

Though a great number of previous studies showed that both technical skills (Arbaugh, 2000) and learner motivation (Fyans Jr. & Maehr, 1987; Lamb, 2017) had certain obvious statistical impacts on students' academic results in an online learning environment, this study proved the opposite (Hayashi et al., 2004).

Second, the different levels of impact on Vietnamese students' academic results were determined. In terms of gender, the differences were not only related to the feelings of students toward online learning but also to learner motivation and technical skills. Compared to the rural students, urban students had better results thanks to the better feelings of students toward online learning and technical skills. Yet, their motivation had a lower influence than that of the rural students. This finding had a certain resemblance with those in the United States (Jones & Blankenship, 2018), China (Ren et al., 2020), and Chile (García-Hermoso et al., 2017). However, a comparison between first-year students and students of different academic years showed no differences in the impact of the abovementioned factors on their results.

With the ongoing developments of COVID-19 and the tendency of digital education at the tertiary level (Benavides et al., 2020), there has been a fast-paced switch from face-to-face teaching and learning to wholly or partly online education (Rasheed et al., 2020). As a result, these findings are a source of reference for decision-makers, managers, lecturers, and students in Vietnam's HEIs if they are heading toward the improvement of online learning efficiency during the COVID-19 pandemic in particular and in learning environments with online factors in general.

Decision-makers and managers in Vietnam's HEIs may learn that they should focus on the development of online learning skills to increase the effectiveness of education and enhance students' results in online learning environments. These goals can be achieved by using online learning skill courses, reading skill courses, fast typing skill courses, online communication skill courses, etc.

At the same time, the organization of online activities, which may not necessarily be related to learning, with various content and models, is vital to creating interesting experiences for students. This will lead to enthusiasm for online activities and possibly to students' extrinsic and intrinsic motivations (Chen & Jang, 2010) for better results in online learning environments.

Lecturers can use the results of this study to find ways to engage experience-based activities in their lessons to improve students' academic skills and interest in online learning and, simultaneously, avoid negative mental effects like "Zoom fatigue" (Nadler, 2020).

Students' awareness of barriers affects their academic results in online learning environments as they can find ways to tackle the problems (Muilenburg & Berge, 2005). Therefore, this study suggests a way for them to learn online more efficiently through the

enhancement of academic skills, which in turn leads to better academic results.

## 6. Conclusion

This study has determined and verified the barriers to Vietnamese students' online learning during COVID-19, including academic skills, technical skills, learner motivation, and feelings of students toward online learning. Through quantitative research that employed the PLS-SEM model, the study also mentions the factors influencing students' academic results in online learning environments. The findings show the considerable impact of academic skills and feelings of students toward online learning on their results in online learning environments. Moreover, the predictive relevance of the structural model was strong. Therefore, they propose some suggestions to decision-makers, managers, lecturers, and students in Vietnam's HEIs to enhance and improve necessary skills, which promise better results in similar scenarios in the future.

Although the study reveals interesting results about the link between barriers in online learning environments and students' results, there are certain limitations yet to be considered. Firstly, the snowball sampling technique was not suitable for all student participants. Due to the large proportion of female students, there may be a gender bias in the analysis results. Therefore, more general results can be achieved if other techniques are applied. Secondly, as the research dealt with public universities, the results did not show the patterns of private universities. Thirdly, the study has only determined some factors which were considered barriers to students' online learning during the COVID-19 crisis. In the future, scholars can use this study as a source of reference to expand the research into other factors like administrative/instructor issues, social interactions, time and support for studies, cost and access to the Internet, technical problems, and attain a wider variety of samples from more regions and both public and private sector.

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## Authors' Contributions

Nguyen Thi Thanh Thuy (20%) – literature review, discussion;

Xuan-An Nguyen (20%) – main idea, the concept article, discussion;

Cao Xuan-Thuc-Anh (20%) – article format and revision;

Thanh-Thuy Ngo (20%) – methodology, data analysis;

Vu Thi Quynh Nga (10%) - data analysis, results;

Le-Van-Dung Nguyen (10%) – results, conclusion.

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