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Regression Analysis on Predicting Students' Satisfaction with Online Learning During COVID-19

Az'lina Abdul Hadi[1]*, Nur Adibah Muhammad[2], Nurul Najihah Mohamad Fadzil[3], Oliver Steve Walter Glispin[4] Nornadiah Mohd Razalil[5] and Nur Niswah Naslina Azid @Maarof[6]

[1,2,3,4,5]Mathematical Sciences Studies, College of Computing, Informatics and Media, Universiti Teknologi MARA Negeri Sembilan, 70300, Negeri Sembilan, Malaysia
[6]Mathematical Sciences Studies, College of Computing, Informatics and Media, Universiti Teknologi MARA Kelantan, Bukit Ilmu, Machang, Kelantan, Malaysia

azlinahadi@uitm.edu.my*, adibahnasir51@gmail.com, najihah@gmail.com, oliversteve4s2@gmail.com, nornadiah@uitm.edu.my and niswah@uitm.edu.my

*Corresponding author

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Abstract: The COVID-19 pandemic forced governments throughout the world to shutter educational institutions, implying the transition from traditional learning to online learning. Hence, the aim of this study was to determine the significant effect that contributed to students' satisfaction with online learning. A further goal of this study was to examine the significant difference in students' satisfaction with online learning according to their gender. To reach the objectives of the study, a cross-sectional study was carried out. Convenience sampling was employed in collecting data from 114 undergraduate students at selected universities in West Malaysia. An online questionnaire was adapted and disseminated to these selected students. The main analysis of multiple linear regression was performed to achieve the first goal of the study. From the multiple linear regression analysis, it was found that there were three significant factors that contributed to students' satisfaction with online learning during the COVID-19 pandemic: gender (p-value = 0.011), course management (p-value = 0.001), and online tutorial quality (p-value = 0.000). Apart from the analysis, an independent t-test was applied, and it was found that there was a significant difference in students' satisfaction between genders (p-value=0.015).

Keywords: COVID-19, regression, satisfaction

1 Introduction

A new virus known as coronavirus disease (COVID-19) was discovered on December 31, 2019, scaring the entire world [1]. Everyone's ability to participate in social and public events, as well as go to school and university, was restricted by COVID-19 pandemic. Most countries around the world have temporarily shut down educational institutions in an effort to halt the COVID-19 virus from spreading [2]. Students were unable to take part in in-person classes at school or on campus since educational institutions are closed. As a result, an online learning strategy has been used. Google Meet, Microsoft Teams, Webex, Discord, Telegram, Zoom, and WhatsApp were among the online learning tools that have been used. In Malaysia, higher education institutions have also adopted online learning during this pandemic. The outburst of dissatisfaction among students produced various studies on dissatisfaction with online learning.

Satisfaction is defined as a person's attitude or feelings related with various factors that are affecting a particular situation [3]. As written by Kotler and Keller [4], satisfaction can be described as an individual's feeling as the result of the differences between the perceived performance and the

expectation. Specifically, in tertiary education, students' satisfaction is a key metric for assessing whether learning outcomes live up to expectations. Tough [5] defined students' satisfaction as their perceptions or attitudes of their educational experiences. The implication is that satisfying the students will lead to happiness or a motivated learning style. In addition, Topala and Tomozii [6] discovered in their study that learning satisfaction shows learners' feelings and attitudes toward the learning process or the perceived level of fulfilment that leads to one's desire to learn that is caused by learning experiences.

Based on the statistics reported by Higher Education Statistics [7], more and more female students are finding success in establishing themselves at universities. As a result of this fact, academicians at worldwide or even national level continue to pay close attention to the subject of gender disparities. Numerous studies have been done to look at how gender affects students' satisfaction in the academic setting. Most literature finds that gender has a significant effect on students' satisfaction [8, 9], with female students having higher satisfaction as compared to male students in online distance learning [9].

The other factor that affects students' satisfaction is interaction, which has been widely discussed in previous studies. Students would be more inclined to take part in online learning sessions if they are satisfied. The interaction between instructors and students can be noticed clearly during face-to-face learning sessions. This can improve their ability to communicate with one another and make studying simpler. This is in contrast with online learning which involve far less interaction because it can only be done via phones, laptops, or computers. As stated by Baber [10], interaction is crucial in determining students' online learning satisfaction and learning results. Several studies [11] – [12] described effective communication between instructors and students as a key factor in determining student happiness. Additionally, She et al. [13] discovered a positive correlation between interaction and online learning satisfaction during the COVID-19 pandemic among Chinese university students.

Technology is crucial in assisting students in their academic success. In distance learning, access to technology has a significant impact on students' satisfaction [14]. The learning or teaching process might be hampered by technological restrictions and inadequate connectivity when taking an online course. Consequently, this may have an impact on students' level of satisfaction. These days, a wide variety of applications have been created to aid with studying. Since every student comes from a different family background, the devices used by the students might not really support the application or platform used during online learning. This issue will undoubtedly result in varying levels of satisfaction among students with their device. Additionally, online learners must be well accustomed with the technology used in successfully completing the course [15].

An instructor is a person identified as a teacher of a college or university subject who normally teaches a restricted number of classes. Interaction with instructors is one of the most significant drivers of students' satisfaction, and instructors play a beneficial effect in students' engagement and satisfaction [16]. An equivalent finding was also reported by DeBourgh [17] and Hiltz [18], who found that the performance of the instructors, particularly regarding reaction time and availability, is substantially connected with students' satisfaction. Finaly-Neuman [19] discovered the same finding: an instructor serves as a source of motivation for students' satisfaction. Hence, the instructors (lecturers/teachers) should be involved in choosing the technology that would best support the online learning process.

Students without technical support may experience frustration with online environment. The technical support, which included access to sources such as textbooks and libraries as well as consultation with the instructors, will determine the level of satisfaction among the students. During the COVID-19 pandemic, these sources were limited in access, which implies dissatisfaction among the students. Previous studies done from the researchers [20] and [21] showed participants were highly satisfied with the platform used by instructors in course management and assessments.

It is critical for students to be satisfied with the quality of online tutorials if they want to learn more effectively and efficiently. An improvement of the learning experience, the appealing design of online tutorials, their features and currentness, as well as the materials presented in online tutorials, all contribute to quality. Wands and Le Blanc [21] discovered that appropriate and relevant interactive

learning with the aim of education may boost student engagement, which results in their satisfaction. Besides, recorded grades were significantly higher in the blended format than in the face-to-face format, as observed by Potter [22], which then concluded that the adoption of the blended format resulted in modestly positive effects on students' satisfaction.

In conclusion, there are six factors considered in this study in achieving the listed objectives of the study. They are gender, interaction, technology, instructor, course management and online tutorial quality. The main objective of the study intends to determine the significant effect that contributed to students' satisfaction with online learning. A further goal for this study was to examine the significant difference in students' satisfaction with online learning according to their gender.

2 Methodology

This section describes the study design, data collection method, instrument, and method of analysis for this research.

A Study Design

A cross-sectional study was chosen for the study. The primary reason for using this design was that the data was collected at a single point in time. Furthermore, this design allowed the researcher to have a better understanding of the relationship between variables.

B Data Collection Method

A total of 114 undergraduate students were sampled from selected public higher education institutions in West Malaysia. The names of the chosen universities were not revealed in this study due to confidentiality. The number of selected samples was determined by using Slovin's formula [23]. Convenience sampling was employed to disseminate a web-based (online) self-administered questionnaire to the selected sample, whose ages ranged from 21 to 25 years old. A cover letter was included in the questionnaire to explain the purpose of the study and what participation entails. Students were provided with a link to access and complete the questionnaire within 15-30 minutes. Data collection took place in the period between March and April 2022.

C Instrument

The instrument consists of three sections. The first section is the demographic information, which includes information on gender, age, residential area, and the total number of contact hours in online courses. The second section encompasses the main factors considered in this study, which are interaction, technology, instructors, course management, and online tutorial quality. The third section focuses on the items that comprise students' satisfaction. The second and third sections were adapted from [24] and [25]. Initially, the total score of the second and third sections was calculated using Statistical Package for Social Sciences (SPSS) version 26 before further analysis was conducted. The summary of the items is given in the following tables.

Table 1: Construct

Factor	No of Item	Scale
Interaction	6	A five-point likert response range from strongly disagree to strongly agree
Technology	6	
Instructor	5	
Course Management	5	
Online Tutorial Quality	6	
Students' Satisfaction	9	

D Ethical Consideration

Ethical approval was obtained from the Research Ethics Committee, Universiti Teknologi MARA. Participants were advised that completing the questionnaire is voluntary and their responses will be kept confidential and anonymous.

E Data Analysis

A combination of descriptive and inferential analysis was used in this study. Both analyses were run using SPSS version 26.

i. Descriptive Analysis

The first part of the data analysis used graphical presentation and numerical measures that included a pie chart and measures of central tendency, respectively. These analyses aided the author in developing preliminary ideas about the data.

ii. Independent Samples t-test Analysis

This analysis was used to determine whether there is significant difference on students' satisfaction towards online learning based on gender. In the preliminary analysis, all the assumptions on the Independent Samples t-test were checked before further analyses were carried out.

iii. Multiple Linear Regression Analysis (MLR)

The data analysis focuses on using Multiple linear regression (MLR) to determine the contributing factors to students' satisfaction. MLR was used to achieve the study's main goal. All the analyses in MLR were compared with a p-value less than 0.05. The equation is given as follows in Eq. (1).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \epsilon \quad (1)$$

where Y is the students' satisfaction towards online learning
X_1 is gender (female = 0, male = 1)
X_2 is interaction
X_3 is technology
X_4 is instructor
X_5 is course management
X_6 is online tutorial quality.
B_0 is the intercept.
B_i is the coefficient for each independent variable.
ε is the error term.

In order to make sure that the result obtained in MLR was accurate, the model adequacy checking process was used to check whether the assumptions were fulfilled. All regression assumptions had been met based on all the data presented in accordance with model adequacy checks.

3 Results and Discussion

i. Descriptive Analysis

Figure 1 depicts the percentage of respondents according to gender. Almost 73% of the respondents were female, while the remaining were male students.

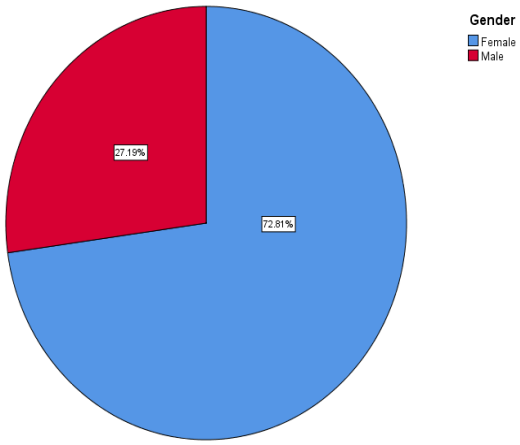

Figure 1: Distribution of Student by Gender

Based on Table 2, the overall mean student satisfaction regarding online distance learning was 2.856. Since this score was between 2 and 3, it can be concluded that the students had moderate satisfaction with online distance learning during COVID-19.

Table 2: Students' Satisfaction

Mean	2.856
Minimum	1.33
Maximum	5.00

Table 3 indicates the average total score for all the factors included in this study. Among all factors, online tutorial quality had the highest total mean score (mean=26.535), followed by technology (mean=22.939), interaction (mean=21.008), instructor (mean=18.956), and course management (mean=18.886), which had the lowest mean of the total score.

Table 3: Factors on Students' Satisfaction on Online Learning

Scale	**Mean (SD)**
Interaction	21.008 (3.827)
Technology	22.939 (3.598)
Instructor	18.956 (3.382)
Course Management	18.886 (3.665)
Online Tutorial Quality	26.535 (4.311)

ii. Independent Samples t-test Analysis

Based on the result in Table 4, a t-test showed a significant difference in students' satisfaction between the genders (p-value=0.038). Female students, in particular, have higher levels of satisfaction (mean=32.7711) than male (mean=29.7742) students. It can be concluded that female students are more satisfied compared to male students. This finding is consistent with previous research by González-Gómez et al. [26], who discovered that female students are more satisfied in e-learning subjects than male students.

Table 4: Test Statistic

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Independent t-test	2.100
sig.	0.038

iii. Multiple Linear Regression (MLR) Analysis

In aiming for the main goal of this study, MLR analysis was performed. Table 5 shows that interaction, technology, and instructor have no significant effect on students' satisfaction with online learning since all the p-value for respective factors were greater than 0.05. Meanwhile, this study found that there is a significant effect of gender (p-value=0.013), course management (p-value=0.009), and online tutorial quality (p-value=0.000) on students' satisfaction with online learning.

Table 5: Coefficient

Model	Unstandardized Beta Coefficients	sig.
Constant	0.678	0.990
Gender	2.258	0.013
Interaction	0.176	0.293
Technology	0.195	0.280
Instructor	-0.200	0.158
Course Management	0.597	0.009
Online Tutorial Quality	0.693	0.000

As a result, model adequacy was checked by removing the non-significant predictor. Table 6 shows the coefficient of determination value, R-squared (0.637), depicted that 63.7% of the total variation in students' satisfaction with online learning is explained by these significant predictor variables, while the remaining is explained by other factors beyond those examined in this study. Besides, the overall fit model statistic showed that the model is highly significant (p = 0.000). In conclusion, there are three significant factors that affect students' satisfaction with online learning, which are gender (p-value=0.011), course management (p-value=0.001), and online tutorial quality (p-value=0.000).

Table 6: Coefficient

Model	Unstandardized Beta Coefficients	sig.
Constant	0.599	0.810
Gender	2.314	0.011
Course Management	0.643	0.001
Online Tutorial Quality	0.748	0.000
R^2		0.637
Overall Fit Mode, F	64.441	0.000

Hence, the final equation is given as follows in Eq. (2).

$$Y = 0.599 + 2.314X_1 + 0.643X_2 + 0.748X_3 \quad (2)$$

where X_1 = Gender
X_2 = Course Management
X_3 = Online Tutorial Quality

Based on Eq. (2), for each additional unit in course management, it is expected that female students will have a higher score on students' satisfaction with online learning (0.643). Besides, it is expected that female students with higher scores in online tutorials will increase (0.748) their satisfaction with online learning.

4 Conclusion

The overall objective of this study was to explore the determinants of students' satisfaction in online learning during the pandemic by using the independent t-test and MLR. In evaluating the first objective, which was to find the difference in students' satisfaction between genders, an independent t-test was used. Based on the result, there was a significant difference in students' satisfaction between genders. Female students, in particular, had higher levels of satisfaction than male students.

For the second objective, MLR was used to identify the significant factors that affect students' satisfaction with online learning. In this study, there were only three variables that were significant to the model. The variables were gender, course management and online tutorial quality. It can be summarized that females with suitable course management and good online tutorials will increase students' satisfaction with online distance learning. The variables interaction, technology, and instructor were not significant since the p-value was greater than 0.05. This result was different from the previous study done by Ramly et al. [27]. This situation might arise because of the difference in the number of observations. The researcher anticipated contrary results on technology, perhaps because of the similar medium that has been used among the instructors. Therefore, the researcher found that gender, course management and online tutorial quality were two important aspects that have influences on students' satisfaction with online learning. Students' satisfaction is so important during online learning because when they are satisfied, they may feel motivated to join every class and do the assignments. This implies that students' satisfaction with online learning increases as a result of an increase in the course management and quality of online scores.

There are opportunities to enhance the outcome of the study. Future research should seek to further investigate the non-significant relationships among the remaining variables. Besides that, it is recommended to consider other factors that might contribute to students' satisfaction with online learning. Additionally, future studies should use more sophisticated measures of the variables that affect students' satisfaction with online learning, either quantitatively or qualitatively.

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