

# Thailand University Students' E-Learning Behavior during the Global Pandemic

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## Abstract

The Covid-19 global pandemic has brought massive disruption to education throughout the planet. This study sought to provide understandings of the relationships between e-learning activity and the independent variables of gender, maturity, study major, region of origin, and class level. Multiple regression and logistic regression were employed to understand the relationship between the dependent variable of e-learning activity with other variables considered in the study. Descriptive statistics showed that Freshmen were more active online than other class levels while Education majors demonstrated the highest online activity. Results of the multiple regression model indicated that Freshmen and Information Technology majors were statistically much more active online when compared with enrollees in other majors or with those who came from other class levels. The logistic model found that students who were not freshman or were not Information technology majors were significantly less likely to be active e-learning users.

**Keywords:** *Pandemic, e-learning, regression*

## Introduction

All higher education institutions throughout the world have been hit with the same crisis of developing ways to support students online in light of the global pandemic. At the peak of this global crisis, 1.6 billion students or 91% of all students on the planet were no longer able to attend traditional classes (United Nations Educational, Scientific and Cultural Organization, 2020). In many ways, this may have been the largest platform migration in education in all of human history.

With such a massive migration to online facilities many, if not most, higher education institutions were unprepared (Gwamba et al., 2018). This has led to economic pressure in universities from lost revenue, research funding, sports activities, and demands by students for a refund (Anderson, 2020; Fies & Hill, 2020). In addition, many students who have been forced to move online claim to have lost the motivation to study, have struggled to gain access to the technology they need, and generally are discouraged by the social isolation that accompanies social distancing (Hall & Batty, 2020; Hobbs, 2020). All this has happened in such rapid succession that there was little time to develop strategies to support students.

Within Thailand, the government voted to close all schools in the midst of the Covid 19 pandemic ("Cabinet Approves Plans," 2020). This had an impact on approximately 20 million students from kindergarten to university (Ministry of Education, 2008). Of those 20 million, around 20,000 were international students. Some of these students chose to return home, which put further distance between them and their institution.

Given the uniqueness of the situation that has compelled most of the world to move to online education, it is critical to study student behavior in the context of online learning. One major benefit of exploring this is to provide insights for educators and administrators who are struggling with how to support students in a context that is unfamiliar to them. Therefore, this study aimed to investigate the online activity of international university students during the Corona Virus global pandemic.

E-learning has been defined as material or information that is delivered over the internet (Roger et al., 2009). For others, e-learning is seen as a specific form of online learning with a focus on communication and education, through some form of a delivery method such as a learning management system (Sangrà et al., 2012). Generally, efficient e-learning encourages traits such as the development of thinking skills, collaboration, and empathy (Gachago et al., 2017).

During the pandemic, e-learning has become highly popular in one form or another (Radha et al., 2020). However, at times, students and teachers' beliefs and expectations are not always met in the context of e-learning (Scott, 2016). A specific complaint concerning the implementation of e-learning during the pandemic was a lack of proper planning, a heavier use of assignments, and a lack of ease of use (Rohman et al., 2020). Although it cannot be said that students and teachers are unanimously disappointed with e-learning, there were concerns that the users were indeed affected. General complaints, not limited to the context of the pandemic, about e-learning among students have been related to access, financial stress, and the competence of teachers (Harrison et al., 2017). Other problems are related to teachers' lack of social presence in the online course (Damm, 2016). Furthermore, students have made such statements as feeling injustice and being "lost at sea" when learning online (Reid et al., 2016). Students who take more and more courses online have experienced a decline in both effective teaching and interactions with others (Dumford & Miller, 2018). It may be safe to say that a negative perception of e-learning is not surprising and affects many (Abbasi et al., 2020).

Nonetheless, it is possible to create a positive e-learning experience for students. For instance, it was found in one study that the use of a flipped classroom led to an improvement in thinking mathematically; however, this was limited to a blended learning context (Chen et al., 2016). Other studies have found that e-learning in general was correlated with satisfaction with learning and verbal/written proficiency (Alqurashi, 2019). Visual engagement and the structure of the learning environment involving the use of forums has been found to be correlated with student satisfaction in an online learning course (Farhan et al., 2018). Furthermore, students who were enrolled in more online courses also have been found to be more engaged in quantitative reasoning (Dumford & Miller, 2018). The quality of the system used and information about how to use it has been found to be associated with peoples' ease of using e-learning tools (Thongsri et al., 2019).

Among students who are academically successful in online courses, researchers have found that these students are intrinsically motivated, show self-regulation, and are higher in self-efficacy (Broadbent, 2017; Kew et al., 2018; Kizhakkacharuvil & Duangkanong, 2017). Time management and elaboration strategies are also important factors in student success online (Broadbent, 2017). One study found a difference in engagement based on concentration of study (major) among various medical students (Browne, 2019). As such, online success may be based on personality traits and choice of subjects among students.

Studies that looked at differences in online learning behavior based on the students' ages are inconclusive. For example, younger students do better by taking a mix of online and traditional classes, while older students struggle as they take a larger proportion of online courses (Glazier et al., 2020). However, another study found no difference between groups based on age (Li & Lee, 2016). Student age and employment predicts their adoption of mobile learning options (Han & Shin, 2016). Differences have also been found in longitudinal studies of new students in relation to the students learning and perception of teaching (Li et al., 2017).

In a study that compared students above the age of 45 with those below 45, the researchers found that younger students valued clear instructions and expectations for grading while the older students were most concerned with course technology facilities (Barczyk et al., 2017). There also has been a study that found a difference between academic levels at university in terms of motivation levels in the context of e-learning (Kew et al., 2018). Therefore, despite the controversy over whether there are differences based on age involving factors related to e-learning, it appears that more often differences are found than are not found.

Research also indicates that there is not much agreement in terms of gender differences in relation to e-learning. Men and women have been found to perform equally well in online classes while women outperformed men in traditional classes (Amparo et al., 2018). In the context of blended learning, no difference was found in assessments based on gender (Wongwuttiwat et al., 2020). However, there may still be some variations based on gender. For example, feelings have been found to predict the final grade of males while the course design was a better predictor of the final grades of females (Chen et al., 2016). Females suffer less from multitasking in online courses than males do in terms of academic performance (Alghamdi et al., 2020). In addition, as the number of online courses taken by males increases, their performance decreases (Glazier et al., 2020). Lastly, men and women tend to be motivated differently when they study online (Liu & Young, 2017).

In Southeast Asia (SEA), among ASEAN nations, e-learning is being mainstreamed and the perceptions of online learning generally are reported as positive (Flor, 2018). Furthermore, students have indicated that they have a readiness in terms of e-learning use (Widyanti et al., 2020). However, not all parts of ASEAN community are equally ready for e-learning (The & Usagawa, 2018). This indicates a willingness to use e-learning but without the corresponding skills with e-learning tools.

Studies conducted in Thailand deal with a variety of concerns related to e-learning. Ease of use, performance expectancy, and social influence have been found to be associated with actual use of tools associated with e-learning (Thongsri et al., 2019; Thongsri & Bao, 2019). In the context of blended learning, studies have found a weak association between blended learning and academic performance, while another study found that blended learning students performed better than traditional students (Thomas, 2018; Wongwuttiwat et al., 2020). Self-efficacy was found in several studies to affect student behavior online as those who had higher self-efficacy towards technology were more comfortable online (Thongsri & Bao, 2019). Lastly, several studies within Thailand have found that students who study online have slightly positive attitudes towards e-learning, were moderately motivated, and that the use of online learning systems had a positive influence on thinking and motivation skills (Chootongchai & Songkram, 2018; Kew et al., 2018; Ngampornchai & Adams, 2016).

Based on the review of literature the following research questions were addressed in this study.

1. What is the relationship between e-learning behavior and region, maturity, major, class level, and gender?
2. What is the relationship between active/inactive users and region, maturity, major, class level, and gender?

## **Methodology**

### ***Sample/Setting***

The setting of this study was an international university located in Thailand that fully employed online teaching after the shutdown commenced. Random sampling was employed in the selection of courses with a sample size of  $N = 378$  students from the selected courses. Demographic statistics indicate that 54% of the sample was male and 46% was female. Based on maturity, 86% of the students were considered less experienced while 14% were classified as more experienced (26 years old or older). In the selection of majors, 35% were from education, 28% were from business, 14% were information technology (IT), 9% were English, 7% were religion, and 7% were science majors.

According to regions, 10% of students came from Africa or Western countries, 9% came from other parts of Asia, 55% were from Mainland Southeast Asia (i.e., Cambodia, Laos, Myanmar, Thailand, and Vietnam), 25% came from Maritime SEA (Indonesia, Malaysia (East Malaysia), the Philippines, Singapore). Malaysia is normally divided into Peninsular and Maritime, with Peninsular being classified as being a part of Mainland SEA and East Malaysia is classified as being a part of Maritime SEA. However, at the University from which students came, almost all of the Malaysian students are from East Malaysia, which is why Malaysia was not divided by region but fully classified as being a part of Maritime SEA.

### ***Research Design***

A cross-sectional survey design was employed. Data was culled at the conclusion of the semester from the learning management system (LMS) employed by Asia-Pacific International University. The LMS employed at the institution is Moodle, which is a commonly used open-sourced LMS. Among the data collected by the LMS was the number of times students clicked on links and activities in the various courses in the system. This action of clicks within the system was used to measure e-learning activity, as this is a form of click behavior that is used in industry to examine customer behavior (Jerath et al., 2014). The use of the LMS in each class was left to the discretion of teachers. However, all courses in this study required an online final exam as indicated in the

course design. There were no complaints of internet access problems from the students in a way that influenced the results. All other data collected was demographic, which included gender, major, class level, and region of origin.

### **Data Analysis**

The e-learning activity (clicks) constituted the count data. It was log transformation before multiple regression analysis in order to normalize the data and meet the assumptions of multiple regression. In addition, the assumptions of multiple regression were checked in regards to homoscedasticity, independence and normality, as discussed concerning the log transformation. Lastly, the continuous variable "number of clicks" was described using means and standard deviations.

For logistic regression, the clicks variable was divided categorically. The top 1/3 of participants were classified as "active" users while the bottom 2/3 were classified as "inactive" users. For the demographic variables, contingency tables were used to compare active/inactive users with the other demographic variables (region, gender, experience, major, class level). Multiple regression was used to explain the number of clicks, while logistic regression was used to explain active/inactive users.

### **Results**

For online activity, the average number of clicks was 831.8 with a 95% CI of 748.74–914.82. The means, recorded by groups, are provided in Table 1. Freshmen students had the highest mean of any group, while Senior students returned the lowest mean. The statistical significance for the means of each group was calculated in the multiple regression results. Table 1 also shows the proportion of active versus inactive users. Students who were less experienced had the highest proportion of active and inactive users of all groups. The sum of each group was 100%. The significance of the active versus inactive users was calculated using the logistic regression results.

**Table 1.** Descriptive Statistics of E-learning Behavior and Contingency Values of Active and Inactive Users

Group		Clicks Mean	95% CI	Active vs Inactive Users
Experience	More	860.76	601.06–1120.46	5% vs 8%
	Less	827.26	739.64–914.88	29% vs 57%
Gender	Male	872.96	764.99–980.94	20% vs 36%
	Female	779.19	648.98–909.39	14% vs 29%
Major	Business	783.63	637.61–929.67	9% vs 18%
	Education	939.52	767.00–1112.04	13% vs 22%
	English	595.11	426.93–763.30	2% vs 7%
	Information Technology	894.96	763.30–1026.63	7% vs 7%
	Religion	731.51	393.61–1069.42	1% vs 6%
	Science	761.61	398.89–1124.34	2% vs 5%
	Region			
Region	Mainland SE Asia	899.57	782.59–1016.55	21% vs 34%
	Maritime SE Asia	750.09	605.60–894.58	8% vs 17%
	Asia	915.09	607.24–1222.93	3% vs 6%
	Africa & West	592.95	339.23–846.67	2% vs 8%
Class Level	Freshmen	1080.59	904.44–1256.74	15% vs 24%
	Sophomore	832.51	721.64–943.38	12% vs 18%
	Junior	546.23	436.09–656.37	4% vs 12%
	Senior	466.30	373.91–558.68	2% vs 12%

Table 2 provides the answer for research question one and displays the multiple regression results with the log of clicks as the dependent variable. Results indicated that there was a difference between Mainland SEA and participants from Africa and the West ( $b = -.36$ ,  $t(364) = -2.36$ ,  $p < .05$ ). The exponentiation of the beta coefficients was calculated comparing Mainland SEA with Africa and the West. Being a participant from Mainland SEA meant an increase of 30% in the geometric mean of e-learning activity.

Differences were also found when comparing IT students with Business students ( $b = -.30$ ,  $t(364) = -2.12$ ,  $p < .05$ ), English students ( $b = -.39$ ,  $t(364) = -2.17$ ,  $p < .05$ ), science students ( $b = -.43$ ,  $t(364) = -2.23$ ,  $p < .05$ ), and Religion students  $b = -.48$ ,  $t(364) = -2.64$ ,  $p < .001$ ). The exponentiation of the beta coefficients was calculated and indicated that if a participant was an IT student, it meant an increase in the geometric mean of clicks of 26% when compared to Business students, 33% when compared to English students, 35% increase compared to Science students, and 39% increase compared to Religion students.

Differences were also found when comparisons were made between Freshman and Juniors ( $b = -.64$ ,  $t(364) = -5.31$ ,  $p < .001$ ) and Seniors ( $b = -.68$ ,  $t(364) = -5.15$ ,  $p < .001$ ). When comparing a Junior with a Freshman one can expect a 47% increase in the geometric mean and a 49% increase when compared to Seniors. No differences were found between young and older students or by gender.

**Table 2.** Regression Results using Log(Clicks) as the Criterion

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>sr</i> <sup>2</sup>	<i>sr</i> <sup>2</sup> 95% CI [LL, UL]	Exp <i>b</i>	<i>t</i> -value
(Intercept)	6.85**	[6.55, 7.16]			946.51	43.80
Region: Maritime SE Asia	0.05	[-0.15, 0.25]	.00	[-.00, .00]	-0.05	0.46
Region: Asia	0.02	[-0.26, 0.31]	.00	[-.00, .00]	-0.02	0.16
Region: Africa & West	-0.36*	[-0.66, -0.06]	.01	[-.01, .03]	0.30	-2.36
Experience: Yes	0.13	[-0.12, 0.37]	.00	[-.01, .01]	-0.13	1.04
Major: Business	-0.31*	[-0.58, -0.03]	.01	[-.01, .03]	0.26	-2.12
Major: Education	-0.18	[-0.46, 0.09]	.00	[-.01, .02]	0.17	-1.31
Major: English	-0.40*	[-0.76, -0.04]	.01	[-.01, .03]	0.33	-2.17
Major: Science	-0.43*	[-0.82, -0.05]	.01	[-.01, .03]	0.35	-2.23
Major: Religion	-0.49**	[-0.85, -0.13]	.02	[-.01, .04]	0.39	-2.65
Class Level: Junior	-0.64**	[-0.87, -0.40]	.06	[.02, .11]	0.47	-5.31
Class Level: Senior	-0.68**	[-0.94, -0.42]	.06	[.02, .10]	0.49	-5.15
Class Level: Sophomore	-0.16	[-0.35, 0.04]	.01	[-.01, .02]	0.14	-1.59
Gender: Male	0.05	[-0.13, 0.23]	.00	[-.00, .01]	-0.05	0.56

$$R^2 = .174^{**}$$

Note. \* indicates  $p < .05$ . \*\* indicates  $p < .001$

Research question two is answered with the logistic regression results that are found in Table 3. The results indicate that if a participant was from Africa and or the West, they were 57% less likely to be an active user when compared to an individual who was from Mainland SEA. If a participant was a Business major, they were 47% less likely to be an active user compared to an IT major. English majors were 72% less likely to be classified as active users than IT majors, whereas Science majors were 71% less likely; Religion majors were 87% less likely to be classified as active users than IT majors. On a class level basis, Juniors were 47% less likely to be classified as active members compared to Freshmen and Seniors were 75% less likely to be classified as active users when compared to Freshmen. There were no differences for student experience or for gender.

## Discussion

The results of this study have led to several conclusions. First, Freshman students were much more active online than other class levels. In addition, there was a clear decline in activity from Freshman to Seniors when

examining the group means. These results seem counter-intuitive as often it is expected that coursework becomes more rigorous as one advances academically. However, it is possible that newer students were less efficient at studying and or had a general enthusiasm about using a LMS. In general, enthusiasm for learning decreases over time and this may happen in the online learning context as well (Brenneman, 2016). In addition, upper division courses are more project based and rely less on traditional summative assessments, such as quizzes and exams. Therefore, it may be due to the nature of the courses that there was a decline in LMS use from Freshman to Senior students.

**Table 3** Logistic Regression Results using Active/Inactive Users as the Criterion

Predictor	Estimate	Std. Error	Z value	Prob	Exp Estimate
(Intercept)	0.48	0.44	1.01	.27	-0.62
Region:Maritime SE Asia	0.17	0.29	0.59	.55	1.19
Region: Asia	-0.13	0.41	-0.31	.76	0.88
Region: Africa & West	-0.84*	0.48	-1.74	.08	0.43
Experience: Yes	0.39	0.35	1.11	.27	1.48
Major: Business	-0.63*	0.38	-1.70	.09	0.53
Major: Education	-0.88	0.39	-2.29	.02	0.41
Major: English	-1.27*	0.54	-2.35	.02	0.28
Major: Science	-1.22*	0.58	-2.12	.03	0.29
Major: Religion	-2.00**	0.62	-3.21	.01	0.13
Class Level: Junior	-0.64**	0.35	-1.83	.06	0.53
Class Level: Senior	-1.35**	0.44	-3.11	.01	0.25
Class Level: Sophomore	-0.13	0.27	-0.49	.62	0.88
Gender: Male	0.07	0.26	-0.31	.76	0.92
AIC: 481					

Null deviance: 486.56 on 377 degrees of freedom

Residual deviance: 453.28 on 364 degrees of freedom

Second, IT was the most active major for both regression models in terms of e-learning behavior. This is not surprising given the content of this major. IT majors generally have a more positive disposition towards technology and thus will use it more. In addition, IT teachers are often highly supportive of technology and this may create a positive feedback system, where the students use the technology and the teachers provide more opportunities to use technology such as an LMS. Only a few have looked for a difference based on major and the results of this study provide a foundation for further investigation (Thongsri & Bao, 2019).

Third, students who were from further away in terms of geography were not considered as active as users from SEA. This may be due to this group being a smaller portion of the sample. Another possibility is the difference in culture. Students from African and Western countries are culturally more different compared with the other students involved. This may be one reason why even their participation online was less. One study found that students experience culture shock just from moving online (Leeds, 2014). Examining e-learning activity in the context of culture shock or adjustment would help confirm the results of this study.

Fourth, there were no differences found when considering the age of the students or their gender. This confirms studies that have looked at both of these factors (Amparo et al., 2018; Barczyk et al., 2017). In the context of e-learning, age and the gender of the students may not be a concern. Nonetheless, in the context of the traditional classroom, there are times when these two factors are significant (Glazier et al., 2020)

### Recommendations

Several recommendations can be made based on this study's results. For example, schools may want to consider finding ways to support students, particularly those who are far from home, as this study indicates that they are less active online. These students may also lack the local social support of regional students and

thus may require more care, even if the studying is online. Establishing social support is critical to student retention in the traditional classroom and may be critical in the context of online learning (Reid et al., 2016).

Second, Freshmen may need training in how to use the LMS of an institution. This study did not look at how the students used the LMS but it is clear that Freshmen were much more active online. Helping this group of students to become more efficient can be beneficial to retention and motivation (Abbasi et al., 2020; Dumford & Miller, 2018). Peer mentoring online would be one example of how to achieve this, without increasing the faculty burden.

In terms of further study, it would be beneficial to examine more closely not just the quantity of activity online but also the quality of the activity. This could be done perhaps through interviews structured in a qualitative manner. A study that more closely examines the role of culture in the context of e-learning would help understand the challenges that international students face when they need to adjust to studying in a place different from home.

## Limitations

This study had several limitations. The amount of variance explained by the multiple regression model was low. This indicates that many explanatory variables were not included in the model. However, it is not often that one is presented with an opportunity to study a phenomenon that impacts the entire educational system worldwide. As such, the data collected was what was available at the time. In addition, the scope of this study means that the results can only be extrapolated to a similar context. What was facing one university in Thailand is not the same as what may be facing a different institution in the United States or Europe. A similar context such as other schools in the ASEAN region would be more appropriate.

## Conclusion

This study looked at students' e-learning activities during a context where all students were moved to online learning due to an international crisis. Less experienced students and IT majors were the most active online. Students from further away were less active than those who were from SEA. In addition, older students and gender made no difference. Therefore, educators need to support foreign students and help less experienced students to become more efficient when studying online.

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