Exploring the Influencing Factors of the Online Learning Efficiency, Case Study: Post Graduate Study at College of Arts, Media and Technology, Chiang Mai University

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Abstract

The development of globalization and COVID-19 have caused online learning a norm in education including postgraduate studies. According to NCES, between 2012 and 2016, the online enrollment rate increased by 16%. And in 2018, over 6.3 million students have online learning. A survey of graduate students at Graduate Study at College of Arts, Media and Technology, Chiang Mai University found that 85% of the sample believed that online learning is less efficient than offline learning. Therefore, the purpose of this study is to explore the factors that affect the efficiency of online learning. WHY-WHY Analysis was performed on 10 samples to make a questionnaire. Questionnaires were distributed to 62 postgraduate students and the data were analysed using regression analysis to explore influencing factors affecting online learning.

Keywords: Online learning; earning effectiveness; Influence factor; Why-Why Analysis; Higher education

1. Introduction

The term "online learning" was coined in 1995, when the web-based system WebCT, which subsequently became Blackboard, was built as the first Learning Management System (LMS). In that context, online learning meant using a learning management system (LMS) or posting text and PDFs to the internet. Since then, terminology like e-learning, blended learning, online education, online courses, and others have been used to describe online learning. Globally, especially in the United States, online learning has become an important component of education.

According to NCES, between 2012 and 2016, the online enrollment rate increased by 16%. And in 2018, over 6.3 million students have online learning (Singh & Thurman, 2019).
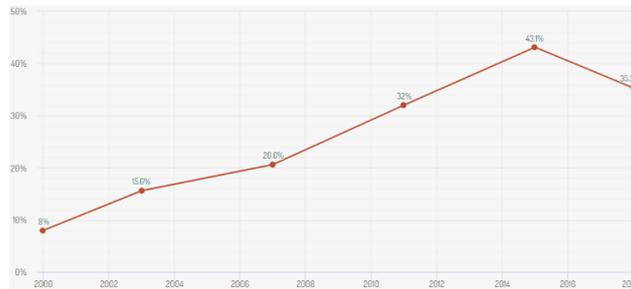

Fig.1. Percentage of students participating in online learning

There are many factors that affect the efficiency of online learning, and different target groups have different influencing factors as table 1: The efficiency of students' online learning will be affected if they lack of textbooks and other study materials such as students may have technical and personal constraints that may prevent them from online study during the lockdown, such as lack of computers/laptops or other gadgets, lack of stable internet access, power interruptions, lack of quiet and isolated room to study, slow and old computers, non-academic responsibilities within the family, and some students may need necessary medical appointments(Lapitan Jr, Tiangco, Sumalinog, Sabarillo, & Diaz, 2021) Study motivation and study readiness have an impact on online study. Compared with classroom study, online study requires higher fundamental computer skills, the efficiency of human-human and human-machine interaction. as well as studying motivation(Volz et al., 2021). To go further motivation is to generate and cause behavior of internal causes, behavior is motivated by activities. Therefore, the learners' study motivation will have an impact on learners' study behavior, thus affecting the learners' study outcomes(Lu & Luo, 2017). Most learners agreed that course design, learner motivation, time management, and comfortableness with online technologies impact the success of an online study experience(Song, Singleton, Hill, & Koh, 2004).

Table 1 Factors of literature review

Reference	(Lapitan Jr et al., 2021)	(Tang et al., 2021)	(Lu & Luo, 2017)	(Song et al., 2004)
FACTORS	1.lack of textbooks and other study materials	1.education level	1.study motivation	1.course design
	2.study methods	2.study motivation	2.independent study ability	2.learner motivation
	3.study motivation	3.study readiness	3.study process support services	3. time management

	4.student's self-efficacy	4.technical facilities s upport services	4.comfortable ness with online technologies

CAMT a new college called the College of Arts, Media, and Technology was established. It offers many undergraduate and postgraduate courses including knowledge management. It awards degrees for both Master's and Doctoral studies at the post-graduate level to experienced knowledge workers.At present, there are 88 graduate students in it, including international students, and it has been conducting online courses for more than a year.

However, according the survey, 85% of the sample believed that online learning is less efficient than offline learning. This means that for most graduate students, the efficiency of online learning is lower than offline learning.

Therefore, this study aims to find out the key influencing factors that affect the efficiency of CAMT postgraduate online learning.

2. Design of the study

This study aims to explore the factors that influence online learning. This study uses WHY-WHY Analysis to conduct a preliminary study on 10 samples to determine the range of factors that affect the efficiency of online learning, and then makes a questionnaire use IOC based on this range and distributes it to 62 samples, and uses linear regression to analyze the results of the questionnaire to finally determine Influencing factors that affect online learning.

2.1. WHY-WHY Analysis:

Why-Why analysis is a strategy of questioning that leads to the discovery of a problem's root cause(s). A why-why is undertaken to uncover remedies to a problem that address the problem's fundamental cause(s), rather than taking steps that are only band-aids. It aids in determining how to truly prevent the issue from recurring. (Koripadu & Subbaiah, 2014).

A random sampling method was used to select ten samples for interviews. The interview will be combined with WHY-WHY Analysis to explore the influencing factors of postgraduate online learning.

2.2. Questionnaire Survey:

Questionnaires are used in sample surveys or censuses to elicit reports of facts, attitudes, and other subjective states.

This questionnaire will use SPSS to test reliability and Item-Objective Congruence (IOC) to test validity. Random sampling will be used to select 62 samples from a sample group with a

total population size of 88 to use questionnaire surveys for data collection, and MLR will be used to analyze the collected data (confidence interval:5%, confidence level: 90%, standard of deviation: 0.5).

Table 2: Why-Why analysis

Problem	Why	Why	Why	Range
	The study process is not smooth	Frequent freezes during online study	The network is not good	Online learning devices
	Not strong study atmosphere	Lack of interaction in online classrooms	Course design lacks interactive parts	Online learning courses feeling
	Not strong study atmosphere	feel lonely	Lack of real-time feedback among students	Online learning courses feeling
	Lazy study process	Lack of study goals	Lack of motivation to study	Online learning motivation
Online study is less efficient than offline study	Difficult to focus on the study process	Lack of study goals	Lack of motivation to study	Online learning motivation
	Can't understand concents	Can't understand some words	Lack of language skills	Online learning ability
	Can't understand concents	Can't understand some words	Lack of language skills	Online learning ability
	Lack of confidence	Can't remember the content	Lack of memory ability	Online learning ability
	Bored with online learning	Bad mood	The College does not provide Psychological services	College support
	Don't know what to learn	Don't provide an explanation of this major	questions asked went unanswered	College support

2.3. Regression Analysis

In statistical modeling, regression analysis is a set of statistical processes for estimating the relationships between a dependent variable and one or more independent variables . regression analysis can be used to infer causal relationships between the independent and dependent variables.

In this study, the efficiency of online learning is used as the independent variable, and the influencing factors are used as the dependent variable. Determine the influence of influencing factors on online learning efficiency by judging the size of the B value of the dependent variable.

3. Results

3.1. WHY-WHY Analysis

As a method to determine the range of influencing factors, the results of WHY-WHY Aanlysis have an important impact on the design of the questionnaire. Table.2 displays the process and results of WHY-WHY Analysis.

After sorting and analyzing the results of WHY-WHY Analysis, it is found that the factors affecting the efficiency of online learning are divided into five ranges: online learning devicesonline learning courses feeling, online learning motivation, online learning ability and colledge support.

Accoding to these five ranges, there is questionnaire was made.

3.2. Questionnnaire

A pre-test of the questionnaire showed: Cornbach's Alpha is 0.795, it indicates that the reliability of the questionnaire is acceptable.

Table 3 Reliability Statistics

Reliability Statistics

Cornbach's Alpha	Cornbach's Alpha Based on Standardized Items	N of Items
.795	.807	20

The questionnaire was submitted to three experts for validity testing using IOC and revised based on expert opinion. Then a qualified questionnaire with both reliability and validity was obtained. The questionnaire was distributed to 62 eligible samples. Finally, the questionnaire data was analyzed and the following results were obtained.

The data was collected form questionnaire that was distributed on a voluntary basis in the College of Arts, Media and Technology, Chiang Mai University among 62 post graduate students. Among the 62 samples, there are 26 males, accounting for 42%, and 36 females, accounting for 58%. Among them, there are 22 first grade students, accounting for 35%, and 25 second grade students, accounting for 40%, and 15 students in the third grade, accounting for 25%.

Sig. values > 0.05 with "Grade" as the independent variable are therefore ignored. "Gender" is positively correlated with the online learning efficiency of the dependent variable in this study, and the B value is 3.374. This indicates that the online learning efficiency of female students is higher than that of male students.

Table 4: Basci information

Model	Unstandardized coefficients		Standardized coefficients		
	B	Std error	Beta	t	Sig.
Gender	3.374	1.244	.344	3.804	.009
Grade	.364	.935	.049	.389	.699

The questionnaire comprises with 5 dimensions derived to 20 questions at appendix. In five dimensions, there are online learning motivation, college support, online learning ability, online learning devices, online learning courses design.

Then perform linear regression analysis.

The results are shown in Table 5.

It appears that "online learning ability", "online learning devices", and "online learning courses design" that their significance are less than 0.05. And another items: "online learning motivation" and "college support", their significance is more than 0.05. Therefore, these two items are not significantly different from the dependent variable.

According to the size of the B, the three items whose significance is less than 0.05 are sorted as follows: "online course design", "online learning devices", "online learning ability" respectively.

Table 5.: Regression analysis results in five dimensions

Model	Unstandardized coefficients		Standardized coefficients		
	B	Std error	Beta	t	Sig.
Online learning motivation	.070	.200	.043	.350	.728
College support	.019	.153	.011	.125	.901
Online learning ability	-.295	.120	-.295	-2.446	.018

Online learning devices	.592	.176	.266	3.354	.001
Online learning courses design	-.661	.127	-.568	-5.184	.000

Then, the more specific results in Table 6. It shows that except for "sufficient language skills", "computer", "appropriate learning difficulty" and "course enough interesting", the significance of other factors is more than 0.05(change). According to the size of the B, the four factors are as follows: "sufficient language skills", "appropriate learning difficulty", "computer", "courses are interesting enough" respectively.

In the five dimensions, "online course feeling" and "online learning ability" are negatively correlated with independent variables, and "online learning devices" are positively correlated with independent variables. The remaining two dimensions "online learning motivation" and "college support" were not significantly correlated with the independent variables. According to the size of the B, the three items are sorted as follows: online course design, online learning devices, online learning ability respectively.

In a further analysis, it was found that only 4 of the 20 dependent variables in the questionnaire were significantly correlated with the independent variables. Among them, "sufficient language skills", "appropriate learning difficulty", and "course enough interesting" are negatively correlated with the independent variable, and "computer" is positively correlated with the independent variable. According to the size of the B, the four factors are as follows: "sufficient language skills", "appropriate learning difficulty", "computer", "courses are interesting enough" respectively.

According to the analysis, because most of the students are not native speakers, their language skills are weak, and online learning also leads to a lack of a good language environment for students. And weak language skills will cause students to feel that the content of the class is difficult to understand, thus losing confidence and interest, and ultimately leading to low learning efficiency.

High learning difficulty and courses are not interesting enough will also cause students to lose confidence and interest in online learning, thereby reducing learning efficiency.

And a good computer plays a good role in the efficiency of online learning. Different from offline learning, online learning is more dependent on devices, so good devices can significantly improve the efficiency of online learning.

Table 6: Regression analysis results of factors

	Unstandardized coefficients		Standardized coefficients		

Model	B	Std error	Beta	t	Sig.
Gender	3.374	1.244	.344	3.804	.009
Grade	.364	.935	.049	.389	.699
Online learning motivation	.279	.798	.043	.350	.728
accomplishment in online learning	.041	.566	-.010	.072	.943
properly motivated	.374	.588	.068	.636	.529
punished appropriately	.568	.371	.133	1.531	.134
confidence in online learning	-.060	.534	-.014	-.111	.912
College support	.076	.613	.011	.125	.901
personalized consulting services©	-.619	.534	-.115	-.1.158	.254
psychological counseling services	-.632	.544	-.131	-1.162	.252
feedback system	.365	.647	.062	.564	.576
enough staffs	.997	.579	.197	1.721	0.93
Online learning ability	-1.179	.482	-.295	-2.446	.018
enough attention	.931	.529	.241	1.758	.087
sufficient energy	-.619	.559	-.161	-1.107	.275
enough remembered ability	-.967	.645	-.221	-1.499	-.142
sufficient language skills	-1.912	.682	-.416	-2.804	.008
enough thinking ability	.775	.674	.154	1.150	.257
Online learning devices	.1.775	.529	.266	3.354	.001
computer	1.566	.514	.290	3.048	.004
network status	.476	.554	.088	.858	.396
online learning environment	.166	.640	.032	.259	.797
Online learning courses feeling	-2.642	.510	-.568	-5.184	.000
interactive parts in online class	-.177	.443	-.044	-.400	.691
appropriate learning difficulty	-1.574	.601	-.337	-2.618	.013
appropriate learning length	.362	.486	.101	.745	.461
Course enough interesting	-1.429	.535	-.384	-2.673	.011

4. Conclusion and Discution

The outcomes and analysis of the current study demonstrated that there are three ranges that affect the efficiency of postgraduate online learning at College of Arts, Media, and Technology of Chiang Mai University: "online course design", "online learning devices", "online learning ability" and five factors: "gander" "sufficient language skills", "appropriate learning difficulty", "computer", "courses are interesting enough".

Therefore, in order to improve the efficiency of online learning, the author puts forward the following suggestions based on these influencing dimensions and factors.

First of all, because the online learning efficiency of female students is higher than that of male students, teachers need to pay more attention to and guide male students in online learning. Improve their online learning interest and online learning confidence. At the same time, male students should learn the experience and knowledge of online learning from female students to improve their online learning efficiency

Second, for the dimension online "course design" and its two influencing factors, "appropriate learning difficulty" and "courses are interesting enough", the author suggests,teachers should discuss with students when formulating course content, and revise and improve the course content according to students' suggestions and the requirements of the syllabus, students should also give their opinions and suggestions to teachers on curriculum design issues. With the communication and improvement of both parties, the learning efficiency of online learning will be improved.

Third, according to the dimension "online learning devices" and the influence factor ""computer", the authors suggest that students replace the devices suitable for online learning, especially computers. The college should also provide help for students who cannot replace devices and lead to a decline in learning efficiency. Different from offline learning, online learning has higher requirements on learning devices, so devices that can conduct online learning smoothly is also particularly important.

Fourth, according to the dimension "online learning ability" and the influencing factor "sufficient language skills", the author suggests that students should improve their online learning ability, including memory ability, thinking ability, language ability, etc. Especially language ability, because most of the graduate students in this college are international students, and language ability is relatively weak. Therefore, it is particularly important to improve language ability in online learning. Students can preview what they have learned before the class, and have an idea of the words and sentences that will be used in the online class. Teachers should adjust the speed of speech and expression appropriately to help students alleviate the problem of language proficiency in online learning.

Finally, with the massive increase in the number of people studying online around the world, the question of online learning efficiency is also emerging. Different regions and different groups of people have different situations and problems. In addition to the great practical significance of this study to the College of Arts, Media, and Technology of Chiang Mai University, it is also useful for other universities to study factors affecting online learning.

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Appendix

CAMT Graduate Student Online Study Efficiency Questionnaire

The purpose of this questionnaire is to explore the factors that affect the efficiency of postgraduate online learning at CAMT of Chiang Mai University. Students are requested to fill in the questionnaire according to the actual situation.

General Information

1. Gender
○Male
○Female

Grade
○Grade1 master
○Grade 2 master
○Grade 3 master

Online Study Efficacy Scale

1. How confident are you that you can complete all the work is assigned in your online study? 您有多大信心可以完成在线学习中分配的所有任务？
○Not at all confident
○Slightly confident
○Somewhat confident
○Quite confident
○Extremely confident

2. When complicated ideas are presented in online study, how confident are you that you can understand them？ 当在线学习中提出了复杂的想法时，您有多大的信心可以理解它们？
○Not at all confident
○Slightly confident
○Somewhat confident
○Quite confident
○Extremely confident

3. How confident are you that you can learn all the material presented in your online study? 您有多少信心可以学好在线学习中所提供的所有材料？
○Not at all confident
○Slightly confident
○Somewhat confident
○Quite confident
○Extremely confident

4. How confident are you that can do the hardest work that is assigned in your online study? 您有多大的信心可以完成在线学习中分配的最难的任务？
○Not at all confident
○Slightly confident
○Somewhat confident
○Quite confident
○Extremely confident

5. How confident are you that you will remember what you learned in your current online study, next year? 您有多少的信心明年您依然记得您在在线学习中学到的东西？
○Not at all confident

○Slightly confident

○Somewhat confident

○Quite confident

○Extremely confident

Influencing factors of online learning

Part 1: Online learning motivation 第一部分：网络学习的学习动力

1. How much do you agree that you get a sense of accomplishment in your online learning? 您在多大程度上同意自己从在线学习中获得了成就感？

○Strongly agree

○Agree

○Neutral

○Disagree

○Strongly disagree

2. How much do you agree that you will be properly motivated after completing your online learning task? 您在多大程度上同意在完成在线学习任务后，您会获得奖励？

○Strongly agree

○Agree

○Neutral

○Disagree

○Strongly disagree

3. How much do you agree that you will be punished appropriately for not completing the online learning task? Such as retaking courses, being dropped from school, being repeated, etc. 您在多大程度上同意您将因未完成在线学习任务而受到适当的惩罚？如重修课程、退学、等。

○Strongly agree

○Agree

○Neutral

○Disagree

○Strongly disagree

4. How much do you agree that you have confidence in the smooth completion of online learning. 您在多大程度上同意您对顺利完成在线学习有信心？

○Strongly agree

○Agree

○Neutral

○Disagree

○Strongly disagree

Part 2: College support 第二部分：学院提供的支持·

5. How much do you agree that the College provide personalized consulting services for your online learning process? 您在多大程度上同意学院为您的在线学习过程提供了个性化的咨询服务？

○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

6. How much do you agree that the College provide psychological counseling services for your online learning process? 您在多大程度上同意学院为您的在线学习过程提供了心理咨询服务？

○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

7. How much do you agree that the College have a student feedback system? 您在多大程度上同意学院提供了学生反馈系统？

○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

8. How much do you agree that the College provide enough staffs to help you with your online learning? 您在多大程度上同意学院提供了足够的员工来帮助您进行在线学习？

○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

Part 3: Online learning ability 第三部分：在线学习能力

9. How much do you agree that in the online learning process, you have enough attention? 您在多大程度上同意在线学习过程中，您有足够的注意力？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

10. How much do you agree that in the online learning process, you have sufficient energy? 您在多大程度上同意在线学习过程中，您有足够的精力？

○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

11. How much do you agree that in the online learning process, you have enough remembered ability? 您在多大程度上同意在线学习过程中，您有足够的记忆力？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

12. How much do you agree that in the online learning process, you have sufficient language skills？ 您在多大程度上同意在在线学习过程中，您有足够的语言能力？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

13. How much do you agree that in the online learning process, you have enough thinking ability？您有多同意，在在线学习过程中，您有足够的思考能力？
○Strongly agree
○Agree
○Neutral

○Disagree
○Strongly disagree

Part 4: Online learning devices 第四部分：在线学习设备

14. How much do you agree that you have a computer that can do online learning well? 您有多大程度上同意您有一台可以很好地进行在线学习的计算机？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

15. How much do you agree that your network status is good enough during online learning? 在在线学习期间，您在多大程度上同意您有流畅的网络状态？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

16. How much do you agree that you have a good online learning environment？
您在多大程度上同意自己拥有良好的在线学习环境？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

Part 5: Online learning courses feeling 第五部分：在线课程的感受

17. How much do you agree that the online courses have enough interactive parts?
您在多大程度上同意在线课程中有足够的互动环节？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

18. How much do you agree that the online courses have appropriate learning difficulty？您在多大程度上同意在线课程的难度适中？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

19. How much do you agree that the online courses have appropriate learning length？您在多大程度上同意在线课程的学习时间设置合理？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree

20. How much do you agree that the online courses are enough interesting？在多大程度上同意在线课程足够有趣？
○Strongly agree
○Agree
○Neutral
○Disagree
○Strongly disagree