

E-Learning as a Supplementary Learning Method

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Abstract - The objective of this paper is to explore whether E-learning could be a supplementary or substitute learning method. The paper examines M-Learning as one E-Learning approach. By verifying whether M-Learning is a substitute or supplementary learning method, this paper would provide a practical policy guideline for stakeholders in higher education. This research employed quantitative method where discrete and continuous probabilities were used for hypothesis testing. The proposed model consists of three independent variables, namely frequency of use of mobile devices (X1), application types (X2), and anticipated benefits (X3). We tested two dependent variables, namely M-learning as a substitute (Y1) and as a supplementary method (Y2). The methodology employed in this paper is unique because we simultaneously tested two proposed models. The data came from 112 surveys of undergraduate students studying Business English and Marketing at a private university in Thailand. The findings show that M-Learning could not operate as a stand-alone unit or independent learning module. Empirical testing shows that $T < 1.64$ and ANOVA for both proposed model were $F(111,111) = 26.71$ compared to the theoretical value of 1.35. This paper offers practical insight into M-Learning by identifying key factors that institutions of higher learning must consider in E-Learning policy.

Keywords - Education Methods, M-Learning, Supplementary, Substitute

I. INTRODUCTION

Based on the recent study on the readiness for developing E-Learning in Thai universities, it was found that most universities (93%) have started E-Learning and assigned a department to oversee the E-Learning services. More than 75% expressed readiness to accommodate E-Learning. E-Learning technology among higher educational institutions is adequate and ready to serve university personnel and students. The open source Learning Management System (LMS), for example, is widely used to manage courses, distribute learning materials online and communicate with students. E-Learning involves the use of technology in the classroom to create an integrated instructional approach [1]. It was found that E-Learning is used mostly as a supplementary learning approach. This paper focuses on M-Learning, as an example of E-Learning, and examine how M-Learning functions as a learning method.

We aim to test two hypotheses: 1) whether M-Learning is a supplementary learning method and 2) whether M-Learning is a substitute learning method. We used simple regressions and multiple regressions to test and verify our proposed models.

II. LITERATURE REVIEW

M-Learning is the use of using mobile and wireless technologies for learning. It enables learners to merge their learning experiences in a shared environment [2]. Much has been written about M-Learning. There are several research studies have been done on various aspects of M-Learning environment, such as design [3], architecture [4], model [5] and current trends [6]. There has been research on the usage of mobile phones in the classroom to assist the learning process, the use of various applications or programs of M-Learning applications in the market that which enable teachers to manage their online quizzes, course learning and monitor students' progress. These applications include Aykko [7], Moodle [8] and more recently, Poodle [9], for example. Research has been done on the readiness of students using M-Learning in Thailand, and issues/problems with M-Learning.

A. *M-Learning in Thailand*

The use of mobile phones in the classroom is increasingly becoming commonplace in Thailand. This enables M-Learning to happen in the classroom once students have access to these mobile devices.

B. *Benefits of M-Learning*

The current literature on M-Learning illustrates a variety of benefits that mobile phones could have on education. Mobile devices impact educational outcomes by facilitating alternative learning processes and instructional methods collectively known as new learning [10].

The key benefits of M-Learning include:

- **Interaction:** Learners can interact with instructors and others without restriction of time and place.
- **Flexibility:** M-Learning can be just-in-time learning where learners can quickly and conveniently access information at the place and time that they need it.

- Mobile Learning helps learners to identify areas where they need assistance and support.

- Content available in a designated M-Learning format may be accessed frequently. It provides learner with choices about how and when they access learning materials [11].

The disadvantages of M-Learning include:

- Limit of devices capacities such as (small screens, memory size and computing power).

- Lack of common operating system and application programs.

- High cost and privacy issues [12].

- Educators are still reluctant to utilize mobile learning initiatives in their teaching [13].

Several research studies focused on the impact of using M-Learning in higher education. In one study, students used an experiment software and demonstrated a higher level of knowledge of the subject matter covered in the course when compared with students choosing not to use the tools [14]. This study supports the idea that the use of mobile learning can make a significant difference in the outcome.

A study in a Japanese university and concludes that students who use mobile phones, mobile devices, etc. received higher test scores than those students who only used paper material to study [15]. Student's reactions to using mobile phones were positive. This study illustrates the idea that M-Learning is supplementary learning method which helps with the overall learning of students.

A further study on M-Learning researched students at an Australian regional university on how they use their mobile phones to support the learning [16]. The findings support the idea that M-Learning is a supplementary learning

method that the researched students favored in order to contribute to the effectiveness of the classroom learning environment.

There are several research studies that have been done on M-Learning in the higher education classroom in Thailand. For instance an experiment in the use of mobile phones for testing was conducted at King Mongkut's Institute of Technology, North Bangkok [17]. The results of this experiment concluded that there was no significance difference in test scores by students using the three methods of traditional paper and pen, visual-phone simulation and audio-phone simulation. As a result, this means that mobile phones or M-Learning could increase access to educational services and also be used as a technology for educational reform in Thailand. This project illustrates that M-Learning is a supplementary learning method.

One other research study in Thailand investigated the behavioural aspects of Thai students towards cell phone adoption in the classroom [18]. The findings show that the Thai students use their cell phones not only to learn English and understand the lessons, but also to be able to interact with the teacher and other students in a meaningful task based activities involving the use of cell phones. This study demonstrates that the use of cell phones or M-Learning is a tool that students use for their learning and as a quick reference and is essentially a supplementary learning method as well.

C. Education Theory

M-Learning must be understood in the context of theories of learning which include rationalism, behaviorism and cognitivism. Reference [19] defines rationalism is the view that reason is the principle source of knowledge and behaviorism as an objectivist and monist perspective with regards to individual actions and decisions. Behaviorism equates learning with changes in either the form or frequency of observable performance. Cognitivism theories stresses the knowledge and internal mental structures and focus on the conceptualization of students'

learning processes and address issues of how information is received, organized and stored and retrieved by the mind [20]. This paper explains how does M-Learning place in these three theories.

III. DATA

The subjects in this study were students in two sections of an undergraduate Business English course and one section of a Marketing course at a private university's international program in Thailand. The purpose for selecting students from two majors is to maintain objectivity and potential sampling bias By so doing we could compare the data to see student's perceptions on M-Learning. From Appendix 3, the students were 2nd, 3rd, and 4th year students comprising 3th year students are 67 students, 4th year students are 41 students, and 2th year students are 4 students. The sample size was n=112, comprising 82 students from the two sections of the Business English course and 30 students from Marketing course. Of the 112 students surveyed, 69 were female and 43 were males with 80 being Business English majors, 31 being Marketing majors and 1 from other major. The make-up of the surveyed subjects was 65 Thai students and 47 Non-Thai.

The instrument used in this study was a scaled survey. The survey solicited quantitative, ordinal and nominal data. The rationale for collecting this mixture of data is to allow us the benefit of continuous and discrete probability analysis in hypothesis testing.

IV. RESEARCH METHODOLOGY

This research paper proposes two models to M-Learning as a substitute or supplementary learning method. Model 1 is M-Learning as a substitute and Model 2 is M-Learning as a supplementary learning method as shown in Table I. We tested model 1 to answer the question of whether M-Learning is a substitute learning method and we also tested model 2 to answer the question of whether M-Learning is a supplementary learning method.

TABLE I
M-LEARNING MODEL

<p>Model 1 Substitute $Y1 = a_1 + b_1 x_1 + b_2 x_2 + b_3 x_3$</p> <p>Model 2 Supplementary $Y2 = a_2 + b_1 x_1 + b_2 x_2 + b_3 x_3$</p> <p>X1 = Frequency of Using Devices in Class (Input) X2 = Using Mobile Application in Class (Process) X3 = Anticipated Benefit (Output)</p>

For the Substitute model, the dependent variable Y1 is defined as M-Learning as a substitute learning method. The independent variables comprise X1 (frequency of using devices in class), X2 (using mobile applications in class), and X3 (anticipated benefit of using mobile devices). For the Supplementary model, the dependent variable Y2 is defined as M-Learning as a supplementary learning method. The independent variables in this model X1, X2, and X3 are the same in the Substitute model. We tested Model 1 and Model 2 by running simple regressions and multiple regressions. In cases, the models were assessed by ANOVA testing.

V. FINDINGS AND DISCUSSION

A. Nonparametric Testing

The majority of the students spent 20 minutes online which consisted of 43 students of 112 or 39 percent of the total students surveyed. This is not statistically significant as $F(Z) = 43\%$ which is less than $Z(1.65) = 95\%$. In Appendix 1, students spend 20 minutes online using mobile devices in class which has duration of 3 hours. For the other remaining time, students spent online had the following results, for 5 minutes $F(Z) = 39\%$, 10 minutes $F(Z) = 44\%$, 40 minutes $F(Z) = 35\%$, over 40 minutes $F(Z) = 36\%$. Results from the times students spent online in our survey were all not significant as the value for $F(Z)$ is less than the value for significance which is 95%.

The overall results from the Applications used for E-Learning in our survey were all not significant as the value for $F(Z)$ is less than the value for significance which is $Z(1.65) = 95\%$.

$$Z = X_n - np / \sqrt{npq} \tag{1}$$

The results on applications used for E-Learning or M-Learning as a supplementary learning method in Appendix 2, reveal that students used and ranked the applications in the following order, Dictionary 40%, $F(Z) = 44\%$, Web search engine 30%, $F(Z) = 48\%$, Learning Management System 17%, $F(Z) = 40\%$, Social networking 16%, $F(Z) = 40\%$, and Communication tool 5%, $F(Z) = 56\%$. The Z values were calculated using equation (1). The information from the applications used for E-Learning highlight the fact that E-Learning or for that matter, M-Learning, is not a substitute learning method but rather a tool that is available to help students with their learning.

B. Parametric Testing

We tested multiple regression models, the F score for ANOVA, Y1 is 56.47 and F ANOVA, Y2 is 59.6 compared to the theoretical value of F ANOVA 1.35. It is asserted that the models testing explained the data. It means that the student's perception of M-Learning conforms to have benefits in class study.

The ANOVA results indicate that M-Learning is a significant element for supporting students in class study whether it is substitute or supplementary. Students anticipate that the frequencies of using mobile devices and mobile applications in class benefit their learning output. The predictive function for both hypotheses are:

$$Y1 = 1.02 + 0.27 x_1 - 0.18x_2 + 0.43 x_3$$

$$Y2 = 2.04 - 0.01 x_1 + 0.16x_2 - 0.28 x_3$$

VI. CONCLUSION

We have found empirical evidence to support the hypothesis that M-Learning is both a supplementary and potential substitute model in E-Learning. How M-Learning contributes to the theory of behaviorism is that it offers a way to understand the actions of students and their behaviour to assess their learning in the

classroom. It enables the student to pay more attention to listen and have more interaction with the teacher. Also, M-Learning contributes to the student's understanding of knowledge in the classroom. From our research findings M-Learning may contribute to the theory of rationalism. M-Learning can be the only principle source of knowledge for students learning depending on the type of knowledge provided in the classroom as a substitute learning method. For the cognitive theory of education M-Learning provides a method of approaching the learning process in class with the support of mobile devices which benefits the students by offering convenience for inputting data and retention of information. This research is a contribution because it provides information on M-Learning for stakeholders such as universities (policy guidelines), teachers (course design) and students (classroom learning) to consider if M-Learning is to be used in the classroom.

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APPENDIX

(APPENDIX 1) TIME SPENT ONLINE

Time	X = The number of people	P	Z	F(Z) = %
5 minutes	16	0.15	-0.21	0.4031
10 minutes	34	0.31	-0.15	0.4404
20 minutes	43	0.39	-0.16	0.4364
40 minutes	10	0.1	-0.38	0.352
>40 minutes	9	0.09	-0.36	0.3594
Total	112			

(APPENDIX 2) APPLICATIONS USED FOR E-LEARNING

Type of Application	X = first	P	Z	F(Z) = %
Learning Management System	17	0.16	-0.24	0.4052
Communication tool	5	0.05	0.17	0.567
Social networking	16	0.15	-0.21	0.4031
Web search engine	30	0.27	-0.05	0.4801
Dictionary	44	0.4	-0.15	0.4404
	Total = 112			

(APPENDIX 3)
DEMOGRAPHIC INFORMATION

Gender	Male	Female	
	43	69	
Nationality	Thai	Non Thai	
	65	47	
School Year	2nd	3rd	4th
	4	67	41
Major	English Business	Marketing	
	82	30	