Attitude towards Mobile Learning among Malaysian Higher Education Students: A Confirmatory Factor Analysis

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Abstract: This study investigated university students' attitude towards M-learning. The participants were 210 trainee teachers in a university in Malaysia. M-learning in this study refers to the use of Short Messaging Service (SMS) as a method to communicate between students and lecturers. The data for the study were collected from questionnaires. Besides that, SMS were sent to respondents randomly to gauge their feelings about M-learning. The findings of this research indicate that Malaysian students have a positive attitude towards M-learning. They also feel that M-learning should be adopted in future because they believe that it could help them to understand their courses better. Confirmatory factor analysis (CFA) was also employed to examine the factor structure of the students' attitudes towards mobile learning. The CFA results showed that the measurement model had a relative fit.

Keywords: M-learning, attitudes towards M-learning, Short Messaging Services, Confirmatory Factor Analysis

Introduction

Mobile learning or M-Learning has become a benchmark in modern education where the role of the mobile device has expanded beyond that of mere communication. The mobile phone is beginning to make inroads into revolutionizing teaching and learning. Because it is a relatively small device, the mobile phone is easily carried around [11]. Traxler [19] defines M-learning "as any educational provision where the sole or dominant technology is the handheld or palmtop device." Students in the digital era prefer a flexible learning environment where they can learn any time and at any place. Nevertheless, it must be pointed out that the purpose of M-learning is not to replace the traditional way of teaching but to enhance students' learning experience [20]. M-learning offers various advantages in the teaching and learning process. For example Triantafillou, Georgiadou and Economides [18] in their research found that having a test using the mobile device is effective and efficient because it saved time, compared to a pen and paper test. Dong and Agogino [7] point out that M-learning is most useful when it links real-world situations to relevant information resources. Downloading key information to a PDA would help to enrich the learning experience of students, especially when they are on a field trip.

Research has also been conducted to examine the effectiveness of M-learning and students' attitudes towards it. In a research conducted by Lu and Viehland [14] to identify factors that influenced users' intention to use M-learning, 63% of 180 respondents either agreed or strongly agreed that they would enjoy learning via the mobile; they felt that M-learning was an attractive method of teaching and learning. Overall, they concluded that

students had positive attitudes towards M-learning. In a small scale research involving 30 respondents by Mac Callum [15] to explore students' perception towards M-learning, the results showed that the students thought that M-learning was useful and they would be interested to participate in it in future. The respondents also strongly agreed that they would take up subjects that integrated M-learning in future because it would give them the opportunity to learn via mobile technology and various mobile applications. In a research by Al-Fahad [1] involving 186 female students in King Saud University to identify students' attitude towards M-learning and their perception towards the usefulness of this type of learning, the respondents gave positive responses and indicated that they would support using it in future. They also felt that M-learning was an effective learning method and they were ready to use various resources in M-learning such as the laptop, hand phone and PDA to access information.

A survey by Chase and Herrod [5] at Slippery Rock University showed that the respondents were very satisfied with the use of technological devices in the educational process. Meanwhile, Thornton and Houser [17] polled 333 Japanese university students regarding their use of mobile devices, especially the cell phone, to improve learning. The findings indicated that out that 93% of the respondents thought that the mobile phone was a valuable educational tool. They exchanged some 200 e-mail messages each week where 66% peer e-mail were about classes and 44% e-mail on studying. Fozdar and Kumar [8] conducted a survey to measure the attitudes and perceptions of undergraduate science students towards the effectiveness of learning via the mobile phone. The results of this survey indicated that more than half of the respondents were highly supportive of the usage of the mobile phone to enhance the learning experience. Their findings also revealed that the mobile phone was helpful in improving retention by augmenting teaching/learning and supporting the existing learning system. In a research conducted by Baya'a and Daher [2] to examine students' perception towards learning mathematics using mobile phones, it was found that the subjects of the study were very positive about the vast potentialities of the mobile phone in the teaching and learning of mathematics.

Overall, the studies conducted by researchers in various areas concerning the effectiveness of using the mobile phone in teaching and learning, and also students' attitudes towards M-learning have indicated that M-learning is perceived as being effective and that students have a positive attitude towards this new mode of learning. The different phenomenon might be seen in Malaysian's students as we can see that mobile learning still in new phase in Malaysia. It would be interesting if we can know students' attitude toward mobile learning in early stage. It would be useful to know whether Malaysian students in institutions of higher learning would also embrace M-learning as readily and be positive about it. Hence there was a need to conduct a similar study in Malaysia to gauge the undergraduate's perception towards using the mobile phone to enhance the teaching and learning experience.

2. Objectives

The main objective of this study was to gauge the attitude towards M-learning among university students, especially those in teacher education. This study would also employ confirmatory factor analysis (CFA) to examine the factor structure of the students' attitudes toward M-learning in a sample of higher education students.

3. Methodology

This study was carried out in a local university in Malaysia involving 210 trainee teachers. In this study, M-learning refers to the use of Short Messaging Service (SMS) as a medium of communication between the students and their lecturers during their 14 weeks of study (one semester). For this purpose, we used a portal for sending Bulk SMS to the trainee teachers. Each of them received an SMS related to their studies. The contents of the SMS included announcements, information related to their courses, words of motivation, and quizzes. For the quiz questions, the respondents were required to give their answers as part of their course evaluation. Students could also communicate with their lecturers via SMS. However, students' interactions between each other using SMS will not evaluated in this research. This research was focused on the bulk SMS sends by the lecturers to the students only. Questionnaires were then distributed to gauge the students' attitudes toward M-Learning. In addition, respondents also needed to respond via SMS on how they felt about M-learning.

In order to assess respondents' attitudes towards M-learning, we adopted and adapted from the Technology Acceptance Model by Davis [6]. It consisted of eight items. The participants responded to statements using a 5-point Likert scale, with response options ranging from 1 (strongly disagree), 2 (disagree), 3 (slightly disagree), 4 (agree) and 5 (strongly agree). We also analysed their feelings regarding M-learning. A pilot study was conducted with 40 students in one of the classes involved in this study. The alpha cronbach value for this instrument was .797, which was acceptable.

4. Findings

The questionnaire challenge statements to assess students' attitude towards M-learning is shown in Table 1. The overall mean score was 3.81 (SD = .750), which indicated that the students generally had a positive attitude towards M-learning. The item analyses showed that the students were prepared to adopt M-learning in future (Mean = 4.06; SD = .884) as 85.2% of the respondents strongly agreed and agreed to such a move. The respondents also felt that M-learning was a worthwhile tool (Mean = 3.95; SD = .843) as it had assisted them during their learning process (Mean = 3.93, SD = .869). By using M-learning, it could help the respondents understanding the course content (M=3.84, SD= .852) and do well in such courses (M=3.89, SD= .816). However, they were still undecided when asked whether a mobile phone was better than a computer (Mean = 3.24, SD = 1.026) as 23.3% either strongly disagreed or disagreed with it. Overall, they believed that M-learning was very effective (Mean = 3.90, SD = .896), with 20% of the respondents strongly agreeing and 1% agreeing with the statement about the effectiveness of M-learning.

Table 1. Students' Attitude towards M-learning

	SDA	DA	SD	A	SA	Mean	Std Dev
A mobile device is better to use than a computer.	4.3%	19.0%	36.7%	28.6%	11.4%	3.24	1.026
I would do well in a mobile-supported course.	1.9%	5.2%	12.4%	63.3%	17.1%	3.89	.816
M-learning is a worthwhile tool.	2.4%	4.3%	11.0%	61.0%	21.4%	3.95	.843
M-learning is likely to be adopted in the future in some form.	2.4%	4.8%	7.6%	55.2%	30.0%	4.06	.884

M-learning has assisted my overall learning processes this semester.	2.4%	4.3%	14.3%	56.2%	22.9%	3.93	.869
I can plan better for my learning with m-learning than without it.	2.9%	5.7%	24.8%	51.9%	14.8%	3.70	.891
M-learning helps me understand the course content	1.9%	5.2%	18.1%	56.2%	18.6%	3.84	.852
Overall I believe using m-learning is very effective.	3.8%	3.8%	11.4%	61.0%	20.0%	3.90	.896

*SD – strongly disagree ; D – disagree; SD –slightly disagree; A : agree; SA : strongly agree;

A Confirmatory Factor Analysis (CFA) was conducted to validate the underlying critical indicators in the attitude as latent variables. The main aim of the CFA was to investigate how well the indicators of students' attitude played the role as critical measurement of the usage of M-learning. AMOS 18 was used to perform the analysis to test whether the data fitted a hypothesized measurement model.

4.1 Model of Indices

In Structural Equation Modelling (SEM), there are few goodness-of-fit indexes that could be used to test the fitness of the hypothesized model to the current sample. Holmes-Smith [10] suggests the use of at least three fit indexes. Indexes root mean square error of approximation (RMSEA), goodness of fit index (GFI), comparative fit index (CFI), and chi square/degrees of freedom (Chisq/df) are highly recommended as suggested in related literature. Hence, these fittings were used in this study to examine the data collected. Figure 1 shows the level of acceptance of these fittings to be adopted in the data analysis.

Table 2. Goodness-of-fit indexes' level of acceptance and literature support

Index	Level Of Acceptance	Literature	Comments
RMSEA	RMSEA < 0.08	Browne & Cudeck [4]	Range 0.05 to 1.00 acceptable
GFI	GFI > 0.90	Joreskog & Sorbim [13]	GFI = 0.95 is a good fit
CFI	CFI > 0.90	Bentler [3]	CFI = 0.95 is a good fit
Chisq/df	Chisq/df < 5.00	Marsh & Hocevar [16]	The value should be less than 5.00

4.2 Confirmatory Factor Analysis

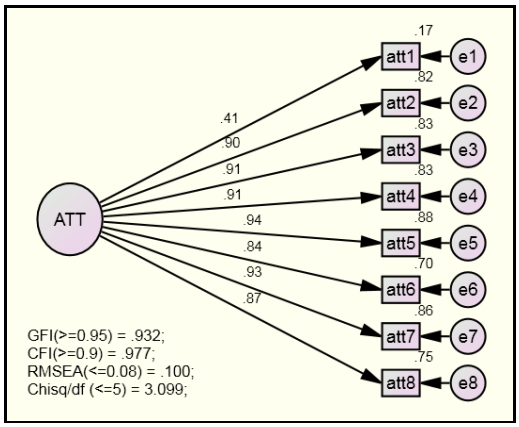

Figure 1. Attitude Confirmatory Factor Analysis (CFA)

Figure 1 shows the measurement model, consisting of eight items (ATT1-ATT8), that was used to measure the students' attitude toward M-learning. The measurement model passed all the criterion values (GFI = .93, CFI = 0.98, RMSEA = .10, and Chisq/df = 3.10) as shown in Figure 1. This figure also indicates that standardized factor loadings are very good. The exception was item ATT1 that had a standardized factor loading estimate of 0.41, whereas Hair, Black, Babin, Anderson, Tatham [9] proposed, as the rule of thumb, that the standardized factor loading estimates should be ideally .70 and above, or .50 and above. Hair et al. [9] also suggests that average variance extracted (AVE) should be higher than .50, and the construct reliability (CR) should be .70 or greater to have sufficient convergent validity. Nevertheless, Item ATT1 still can be accepted since the AVE measure exceeded .50 (.84) and CR exceeded .70 (.94). Therefore, the items met the requirements of convergent validity and the measurement model had a relative fit.

5. Discussion

Mobile devices such as the hand phone, Personal Digital Assistant (PDA), Smart phone and iPod are not used only for communication purposes or entertainment. They can be deployed for educational purposes, to enhance the teaching and learning processes. Most university students can afford to have a notebook, mobile phone or other such gadgets. The new generation uses the mobile phone not only to communicate but also to express themselves [12]. However, the use of the mobile device is usually not for academic purposes. Nevertheless, most students use their mobile phone to send SMSs to their friends, to chat or exchange messages about non-academic matters. There is a need to change students' perception about the usefulness of the mobile device by introducing M-learning. Since students can afford to own at least a mobile phone, it is now easier to promote and implement M-learning.

Nevertheless, since M-learning is a relatively new concept, this educational initiative has not been fully explored except by universities that conduct distant learning. For M-learning to be successfully implemented, students should have a positive attitude towards it so that they will participate in all activities involving M-learning. This study found that that the respondents had a positive attitude towards M-learning, as reflected in their responses. In their opinion, M-learning was a worthwhile tool that could assist them understand their lectures better. They also felt they would do well in a course that integrated M-learning. Analyses based on the SMS received from the respondents also showed that they felt M-learning could make learning much more enjoyable and therefore this was a need that must be catered to in the future.

> +6013322*** (respondent 1)
> *Pd pendapat saya dengan perkembangan sains dan teknologi kini, maka pd masa akan datang pembelajaran m-learning menjadi satu keperluan..ia juga dapat memudahkan pembelajaran (In my opinion, with the advancement of science and technology, M-learning will become as a necessity. It would facilitate learning.)*

Respondent 2 also felt that M-learning was enjoyable and should be implemented in future.

> +60193916*** (respondent 2)

Mudah dan menyeronokkan..jarang dilaksanakan..bagus dan diteruskan.. (Easy and enjoyable. Seldom practised. Good and need to be carried out.)

Respondent 3 felt that M-learning was an alternative to email for students to interact with their lecturer and so it should be implemented.

+601320**** (respondent 3)
Pembelajaran menerusi sms adalah alternatif selain daripada penggunaan emel untuk berinteraktif. Jadi, sistem ini wajar diteruskan. (Learning via sms is an alternative besides using email to interact. This type of learning should be implemented.)

Respondent 4 felt that M-learning could attract students in future because of its appeal and its ease of use.

+601492**** (respondent 4)
Saya rasa pembelajaran melalui sms akan lebih menarik murid pada masa hadapan.. Sebab ini merupakan kaedah yang menarik boleh pelajar walaupun berada di mana jua.(I feel that learning via SMS will attract students in future to study anywhere they want.)

Respondent 5 agreed that M-learning was very useful and he/she would attend courses that incorporate M-learning.

+6019633****
Saya rasa penggunaan M-pembelajaran pada diri saya akan berterusan selagi saya mengikuti kursus-kursus yang mengaplikasikan penggunaan ini. Saya dapat merasakan penggunaan kemudahan ini dengan meluas dapat diterima oleh pelajar kerana ia amat mudah difahami dan digunakan. (I feel that I can continuously use M-learning as long as I attend courses that offer this application. I feel that students will accept M-learning because it is very to understand and use.)

The results from this study, both from responses to the questionnaires and the messages received via SMS clearly showed that students had a positive attitude towards M-learning. They felt it could improve their understanding of their courses, that it was an attractive method of teaching and learning, that was easy to use as it could be deployed at any time and any place. These findings were also in line with those by other researchers such as Xu and Viehland [14], Mac Callum [15] , Al-Fahad [1], Chase and Herrod [5], Thornton and Houser [17], Fozdar and Kumar [8], and Baya'a and Daher [2]. Further analysis by using Confirmatory Factor Analysis showed that the measurement model had a relative fit.

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