An Experiment in the Use of Mobile Phones for Testing at King Mongkut's Institute of Technology North Bangkok, Thailand

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Abstract: The purposes of this study were to investigate and compare the use of mobile phones for testing. The samples were 56 graduate students divided into 2 groups: control and experimental. The control group was tested by the traditional testing method - pen and paper. The experimental group was tested by using a mobile phone. The results indicated that there was no significant difference between the two groups. There was no significant difference between the scores of the experimental group using Audio-phone and the Visual-phone models. There was a significant correlation between the scores tested by the traditional and the mobile-phone methods. It suggests that mobile phones could be used as a part of the utilization of educational technology as stipulated in the National Education Act and education reform.

Background

At present, the educational framework in Thailand is based on the *1997 Constitution* and the *Amended National Education Act 2002*. Realizing the important role of technologies for education in enhancing the competitiveness of Thailand and its people in a knowledge-based economy and society, the utilization of technologies for education was specified therein. Section 40 and 81 of the Constitution and Section 63 to 69 of the National Education Act have paved the way for major action to be taken to promote the utilization of educational technologies as follows: (1) establishment of organizations; (2) development of policies and plans; (3) development of infrastructure and networking systems; (4) development of materials and other technologies for education; and (5) development of educational personnel and learners. These principles and guidelines for the provision and development were so stipulated in order to prepare all Thai people for a learning-oriented society in a knowledge-based economy.

Utilization of information technology and mobile phones has increased in the past two years, according to the National Statistical Office. The survey was carried out among 16 million households nationwide from April to June 2002. The Survey found 11.3 million people used a computer, 6.03 million had access to the Internet and 12.9 million owned a mobile phone. Of the total, Bangkok accounted for 45.6 % of mobile phone owners. ("Technology," Bangkok Post, Saturday, September 13, 2003, Page 2.) The evidence is overwhelming that mobile learning is beginning to take hold. Over 50 percent of all employees spend up to half of their time outside the office. The worldwide mobile commerce market will reach $200 billion by 2004. There will be more than 1 billion wireless Internet subscribers worldwide by 2005. Multi-purpose handheld devices (PDA and telephones) will outsell laptop/desktop computers combined by 2005. Most major US companies will either switch to or adopt wireless networks by 2008.

Presented at the International Conference on Making Educational Reform Happen: Learning from the Asian Experience and Comparative Perspectives, Sofitel Central Plaza Hotel, Bangkok, Thailand. 24 September, 2004

Mobile learning is the use of mobile or wireless devices for learning on the move. Insofar as students have traditionally used their time on public transport to catch up on required reading or last-minute revision, mobile learning has been with us for quite a while. However, today's information and communication technology has significantly extended the scope for learning on the move, and the term "m-learning" has gained serious currency in describing wireless-enabled learning strategies and processes across the entire gamut of instructional delivery. Current emphases appear to be in remote just-in-time applications, but there are also many instances of m-learning blended into traditional instruction.

Over 90 % of graduate students at King Mongkut's Institute of Technology North Bangkok (KMITNB) are mobile phone owners. In some classes, all students own a mobile phone. The mobile phone has been used for many purposes, but not for learning--especially testing. Thus, certain situational problems were raised as follows. How could testing be mediated by mobile phone technologies? Is there any difference when compared to traditional methods? What is the effective method for testing when using mobile phones?

Statement of the Problem

The problem of this study was to identify effective modalities in the use of mobile phones for testing at King Mongkut's Institute of Technology North Bangkok.

Purposes of the Study

The primary purpose of this study was to investigate the effects of mobile phones for use in testing. The second purpose was to compare the test scores of learners using either mobile phones or traditional methods. A final purpose was to make suggestions for the use of an effective mobile phone testing model.

The Objectives

1. To evaluate and compare the learning support models by using mobile phones for testing.
2. To compare the use of mobile phone and traditional testing methods.
3. To identify the effective mobile phone testing models.

Research Hypotheses

1. There was no significant difference between the testing scores in using the Audio-phone and Visual-phone models.
2. There was no significant difference between the testing scores in using mobile phones and traditional testing methods.
3. There was a correlation between the testing scores in using mobile phones and traditional testing methods.

Delimitation of the Study

During the course of this investigation, several limiting factors were encountered. These factors include the following:

1. This study was limited to graduate students of King Mongkut's Institute of Technology North Bangkok majoring in Technical Education Technology who had registered in the second semester of the academic year 2003 to the first semester of 2004.

2. The instrument used in this study was a test developed by the researcher.

3. Data that were not pertinent to indicating the results of the mobile phone testing system as presented in the hypotheses were not analyzed.

Basic Assumptions

This study was based on the following assumptions.

1. It was assumed that the Thai language instrument used in this study posted an acceptable level of validity and that translation did not change the meanings.

3. It was assumed that the students put forth their best learning effort used in evaluating their performance.

4. It was assumed that the sample size of this study was adequate to represent the population.

5. It was assumed that the research methodology was appropriate to find the solutions.

6. The simulation of mobile phone use in audio and visual models and deception in this study did not distort the results of this study.

Methodology

This study was designed to obtain data from students' performance when tested by using mobile phone and traditional methods. Experimental research seems ideally suited to this study; a test was the best instrument to obtain data. The samples were 56 graduate students of the Department of Technological Education, Faculty of Technical Education, King Mongkut's Institute of Technology North Bangkok who registered in the second semester of the academic year 2003 to the first semester of the academic year 2004. In order to eliminate the Hawthorne and John Henry effects, the students were deceived (Borg and Gall, 1983, p.214). They were not told to which group they were belonged, and that they were subjects of this study. All students received testing in a traditional method - pen and paper - and in the use of mobile phone testing methods which contained Audio-mobile and Visual-mobile testing models. The Visual-phone model was designed to simulate the SMS in which the questions were given in the message mode. However, in this study, the students read the questions on a projector screen in a classroom and used the message mode to send their answers via Short Message Service (SMS) to a given telephone number. This testing was administered in the second semester of academic year 2003. The Audio-mobile model was designed to simulate voice service in which the questions were given by phone. However, in this study, the questions were given by using a tape recorder to play the questions in a classroom. The students listened and answered by using the message mode and sent their answers via Short Message Service (SMS) to a given telephone number. This testing was administered in the first semester of academic year 2004. After data collection was finished, the students were randomly divided into two groups, control and experimental. Each group had three sets of scores from the three testing methods. There were 28 students in the control group and 28 students in the experimental group. The control

group used their scores from traditional methods. The experimental groups used their scores from mobile phone methods, Audio-phone and Visual-phone models.

Instrument and Data Collection

Three equivalent tests were used in this study. The four-choice test items were selected from a test bank in which were posted an acceptable value of difficulty, discrimination power, and reliability. They were grouped into three tests, Test A, B, and C, consisted of 40 items for each test in the subject of Educational Innovation for Technical Education. This subject is a major requirement of students in the Department of Technological Education. The tests were randomly assigned to the methods of testing. Test A was used for traditional testing method with pen and paper. It was administered to the registered students in the second semester of academic year 2003 and to newly enrolled students in the first semester of academic year 2004. Test B was used for the Audio-phone model of testing. It was also administered in the first semester of academic year 2004. The students listened to a question twice within 2 minutes for each question and answered by using a mobile phone in the message mode to write the answers and send them to the phone numbers given by the researcher. And Test C was used for the Visual-phone model of testing. It was administered to the students enrolled in the second semester of academic year 2003 and to newly enrolled students in the first semester of academic year 2004. The students read a question on a big projector screen presented by using the PowerPoint computer program. Each question was presented on a screen one by one, with automatic changing set at 2 minutes for one question as used in the Audio-phone model. Eighty minutes were allowed for each test. The scores of the three tests were gathered and analyzed by mean (M), standard deviation (S.D.), a t-test, and Pearson product moment correlation coefficient.

Findings

The experiments in this study were conducted in two consecutive semesters, the second semester of academic year 2003 and the first semester of academic year 2004. Data were analyzed by using a two-tail t-test for dependent and independent samples, and correlation coefficient. The scores from the use of Test A, traditional method, Test B, Audio-phone model, and Test C, Visual-phone model, were analyzed in Table 1 to 4.

Table 1: t-Test Analysis for Test Scores of Students in the Use of Audio-Phone and Visual-Phone Models

Audio-Phone Model		Visual-Phone Model		N	Degree of Freedom	t Value	Significant (p)
M	S.D.	M	S.D.				
31.5357	1.8355	31.7857	1.8926	28	27	-1.760	.090

Analysis of the t-test for dependent samples (paired samples), reported in Table 1, indicated that there was no significant difference in test scores between the use of Audio-phone and Visual-phone models for testing. 27 degrees of freedom at a t-value approximately equal to 2.052 is required for significance at the level of .05 (Ferguson, 1981, p. 521). With a t-test statistic of -1.760, the scores failed to reflect a significant difference at the .05 level ($p>.05$). The first null hypothesis was retained.

The mean scores of the use of traditional and Audio-phone testing are compared and analyzed by a t-test for independent samples in Table 2. 54 degrees of freedom at a t-value approximately equal to 2.00 is required for significance at the level of .05 (Ferguson, 1981, p. 521). With a t-test statistic of .436, the scores failed to reflect a significant difference at the .05 level ($p>.05$). There was no significant difference between the test scores by using Audio-phone and traditional testing.

In Table 3, the mean scores of the use of traditional and Visual-phone testing are compared and analyzed by a t-test for independent samples, with a t-test statistic of -.072, the scores failed to reflect a significant difference at the .05 level ($p>.05$). There was no significant difference between the test scores by using Visual-phone and traditional testing. According to the findings in Table 2 and 3, the second null hypothesis was retained.

Table 2 : t-Test Analysis for Test Scores of Students in the Use of Traditional Method and Audio-Phone Model

Traditional Method N=28		Audio-Phone Model N=28		Degree of Freedom	t Value	Significant (p)
M	S.D.	M	S.D.			
31.7500	1.8384	31.5357	1.8355	54	.436	.664

Table 3: t-Test Analysis for Test Scores of Students in the Use of Traditional Method and Visual-Phone Model

Traditional Method N=28		Visual-Phone Model N=28		Degree of Freedom	t Value	Significant (p)
M	S.D.	M	S.D.			
31.7500	1.8384	31.7857	1.8926	54	-.072	.943

Table 4: Correlation Analysis of Scores among the Use of Traditional and Mobile Phone Methods

Paired Sample Correlations	N	Correlation	Significant
Pair1 Audio & Visual	28	.919	.000
Pair 2 Audio & Traditional	56	.887	.000
Pair 3 Visual & Traditional	56	.910	.000

Correlation analysis was reported in Table 4. The correlation among the scores using traditional and mobile phone methods is significant. These findings yield the third hypothesis.

Conclusions and Discussions

There was no negative effect in the use of mobile phones for testing. The research hypotheses were accepted. The findings showed that the students' scores by using mobile phones were not different when compared with the traditional method. However, the correlation coefficient of Audio-phone model (.887) is lower than Visual-phone model (.910). This implied that the use of Visual-phone model had more relation to traditional methods than did the Audio-phone model. These are the solutions to the situational problems stated in the beginning. The most important finding in this study was the utilization of *valid technology* for education as stipulated in the National Education Act and education reform.

Presented at the International Conference on Making Educational Reform Happen: Learning from the Asian Experience and Comparative Perspectives, Sofitel Central Plaza Hotel, Bangkok, Thailand. 24 September, 2004

In spite of the plethora of research in the area of testing and the use of technology for testing, there is no testing designed to use mobile phones. Most of testing is based on abilities rather than the use of technology for testing. There is a need in the new educational system for valid technology that can be used easily and efficiently for educational purposes. Mobile phones were chosen because of their popularity in Thailand. It had been argues that this portable and affordable technology could be a viable option for enhancing the utilization of technology in education (Hennessy, 1997; Hennessy, 2000; Sharples,, 2000a) and for facilitating opportunities for lifelong learning (Sharples, 2000b). Furthermore, mobile phones can be used "anytime, anywhere," thus decreasing reliance upon classroom settings and using paper for testing. The findings will create theoretical models of future testing that will be new learning situations primarily by university students.

Suggestions

Results from this study explored the students' perceptions of the benefits and limitations of mobile phone for educational purposes. However, when reading electronic text on mobile phones with small screen displays, the amount of information that is visible at anytime is limited and users have to scroll through the text - sometime both vertically and horizontally – in order to read information and entry data. Small screen displays also mean that navigational aids available to users are limited. It may be difficult to have long lines of information that are too large to display effectively. Mobile technologies are designed to be compact and lightweight and this can often result in limitations on the way in which users can interact with the devices. Knowing whether users experience data input difficulties would have implications for the design of information accessed through mobile devices. The suggestions from this study are that the design of displays and data entry on mobile phone screens must be concise, short, and clear. For the use of testing models, the Visual-phone model is recommended and the Audio-phone model is used when the information does not require visibility.

References

Ferguson, George A. (1981). *Statistical Analysis on Psychology and Education*. New York: McGraw-Hill.

Borg, Walter R. and Gall, Meredith Damien. (1983). *Educational Research*. Fourth Edition, New York & London: Longman.

Hennessy, S. (1997). *Portable Technologies and Graphing Investigations: Review of the Literature*. (CALRG Technical Report 175). Milton Keynes: Institute of Educational Technology, The Open University.

Hennessy, S. (2000). "Graphing investigations using portable (palmtop) technology." *Journal of Computer Assisted Learning*, 16, 243-258.

National Statistical Office. (2003). Technology. *Bangkok Post*, Saturday, September 13, 2.

Sharples, M. (2000a). *Disruptive Devices: Personal Technologies and Education* (Educational Technology Research paper Series 11). Birmingham: The University of Birmingham.

Sharples, M. (2000b). "The design of personal mobile technologies for lifelong learning." *Computer & Education*, 34, 177-193.