An Investigation of a Mobile Learning System in a Digital Filter Course

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Abstract

In the field of mobile learning, very few studies focused on the interaction between varied types of instructional devices and different types of instructional messages. This study explored the effects of instructional devices (Desktop PC v.s. PDA) and instructional messages (text-only v.s. text with a simulation tool) on undergraduate Electronic Engineering students. Results showed that students expressed a significant higher intention to learn in a Desktop PC environment, not in the PDA ($F[1,21]=17.32$, $p<.05$). Results also indicated that students who used a MATLAB simulation tool performed significant better scores on their learning achievement test than those who did not use it ($F[1,21]=10.96$, $p<.05$). In addition, the students who used MATLAB expressed a significant higher intention to learn than those who did not use it ($F[1,21]=41.86$, $p<.05$).

1. Introduction

The presupposition of using mobile learning technologies in classrooms is that learners can access course materials and other course related applications at any time, and any place, thus it can produce positive effect on pedagogical change, such as communications between instructors and students [1]. However, those observations lack research evidences to support as Alamäki [2] alludes that there is no affirmative answer to the effect of WAP-assisted learning. Very few research studies are conducted to investigate whether the use of Mobile-learning technologies would produce positive student learning achievement. Therefore, this study is to explore whether different types of instructional messages (text only and text with a simulation tool: MATLAB) delivered via different types of instructional devices (Desktop PC and PDA) have effects on undergraduate students' learning achievements and on their attitudes. Based upon the

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purpose of the study, three research null hypotheses follow.

H0(1): There will be no statistically significant differences in student test achievement, intention, and satisfaction when students learn using different types of learning devices (PDA vs. PC).

H0(2): There will be no statistically significant differences in student test achievement, intention, and satisfaction when students are presented with different types of instructional messages (text only vs. text with simulation tool).

H0(3): There will be no statistically significant interaction in student test achievement, intention, and satisfaction between the two studied independent variables: learning device and instructional message.

2. Methods

28 students were recruited to participate in the study from the Electronic Engineering Department of National Kaohsiung University of Applied Sciences (KUAS) in Taiwan. One instructional unit in the course: Introduction to Digital Filter was used to conduct the experiment. It covered Finite Impulse Response Filter (FIR) and Infinite Impulse Response Filter (IIR).

Two independent variables were studied: (1) instructional device (PDA and Desktop PC) and (2) instructional message (text only and text with a simulation tool: MATLAB). Three dependent variables were measured in this study: (1) knowledge test, (2) intention to use devices, and (3) satisfaction about learning environments.

The research was a 2 x 2 randomized post-test design. The two independent variables were instructional device and instructional message. The dependent variables were one criterion knowledge test, and two affective measures collected from two questionnaires. A Multivariate Analysis of Variance (MANOVA) was performed to analyze the collected data. The main effects and the potential interaction of the two independent variables were examined.

3. Results

Table 1 shows that for the effect of interaction between Instructional Device (ID) and Instructional Message (IM), the value of Wilks' Lambda was .832, which was not significant at the p-value of .05. This result failed to reject null hypothesis 3 in the study.

However, a significant effect of IT Device was found (Lambda (3,19) = .449, p<. 05). A second significant effect of IM was also found (Lambda (3,19) = .218, p<. 05).

Table 1. Multivariate Tests

Effect	Wilk's Lambda	F	*P*
ID	.449	7.78	.001*
IM	.218	22.7	.000*
ID *IM	.832	1.28	.311

*Significant at 0.05 level
ID: Instructional Device
IM: Instructional Message

Table 2. Tests of Between-Subjects Effects

Source	DF	SS	F	*P*
Knowledge Test				
ID	1	330.90	1.83	.19
IM	1	1981.17	10.96	.003*
ID *IM	1	45.01	0.249	.623
Error	21	3795.56		
Intention				
ID	1	7.11	17.31	.000*
IM	1	17.19	41.86	.000*
ID *IM	1	1.022	2.49	.13
Error	21	8.623		
Satisfaction				
ID	1	0.442	0.454	.508
IM	1	0.864	0.887	.357
IT *IM	1	2.318	2.381	.138
Error	21	0.973		

* Significant at .05 level

The univariate analysis of variance resulted in an F-ratio that was used to determine whether variations in the performance on the dependent measures. Significant differences were found and shown in Table 2.

4. References

[1] Rochelle, J. & Pea, R. (2002). A walk on the WILD side: How wireless hand-helds may change CSCL. In Stahl, G. (ed.) Proceedings of the CSCL (Computer Supported Collaborative Learning). Hillsdale, NJ:Erlbaum.

[2] Alamäki, H. (2003). Mobile learning: From phenomenon to practice. In H. Kynäslahti & P. Seppälä (ed). Mobile learning (pp.91-96). Finland: Edita Publishing Inc.