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Effects of gender and test anxiety on student achievement in mobile based assessment

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Abstract

The aim of this research is to determine the impact of students' gender and test anxiety on their achievement in mobile based assessment. The research was conducted in the Computer Hardware and Microprocessors course, which supports technology enhanced learning. The two-factor within-subject design was used. Eight female and twelve male students undertook a mobile based test about computer hardware. The mobile based test was developed using MSSQL database, WML and PHP. The findings of the study revealed that there were no significant differences between the achievement level of the students regarding to gender and level of test anxiety. However, male students and the students who have a low level of test anxiety were more successful in the mobile based test.

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Keywords: Mobile based assessment, achievement, gender, test anxiety;

1. Introduction

The rapid development of computer science has led to integrate innovative methods and technologies such as Internet, Web 2.0 technologies, wireless and mobile learning (mLearning) in computer education. Since wireless devices such as mobile telephones, PDA, laptops and tablet computers facilitate the interaction of students with content, students with students, and students with teacher in any place and time, mLearning has become a new sector of education (Dye et al, 2003; Keegan, 2002; Lever-Duffy et al, 2003, p.395; Quinn, 2000; Cavus, 2009).

In technology enhanced education, the implementation of mLearning is accompanied by various practices such as delivering announcements, homework and exams; enhancing cooperation among students and participation in discussions using SMS or MMS; reading e-books; accessing to relevant resources; and assessing the achievement of students using mobile exercises and tests (Berger et al, 2003; Brown, 2003; Chen & Chen, 2009; Kim, Mims & Holmes, 2006; Motiwalla, 2007; Liu et al, 2003; Looi et al, 2009; Roberts et al, 2003; Seppälä & Alamäki, 2002; Sharples, Corlett & Westmancott, 2002; Smordal & Gregory, 2003; Tatar et al, 2003; Triantafillou, et al, 2008; Trifonova et al, 2004; Peck, B., Deans, C., & Stockhausen, L., 2010).

Berger (2001) claims that wireless technology is expected to realize a “shift from anywhere, anytime to everywhere, every time” approach in terms of teaching and learning. Although this approach seems as an attractive

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approach, there are some obstacles for comprehensive use of mobile device in technology enhanced learning. These obstacles include the slow pace of data communication, high costs for WAP, narrow memory capacity of mobile device, and insufficient screen dimensions for effective design of the course content (Attewell, 2005; McLean, 2003; Singh, 2003). However, mobile technology could be used effectively for assessment process since true/false, multiple choice, fill-in, audio-based or game-based tests could be designed according to mobile screen (Armatas, Holt & Rice, 2005; Kurbel & Hilker, 2002). Therefore, use of mobile based test systems with WAP or SMS through PDA, PALM, mobile phone or computer in higher education has been promoted because they support the learning process of the students, offer exercise media and provide opportunity to test the achievement level of the students (Dawabi, Wessner & Neuhold, 2003; Evans & Taylor, 2004; Lim & Lim, 2006; Mercier et al, 2004).

Scheele et al (2003) conducted a study to investigate the performance of the students on operating system and content analysis topics in a wireless test that included different question types, such as multiple-choice and fill-in, using handheld computers in an interactive lecture. The results of the study indicated that students who undertook wireless tests in the interactive lecture had higher scores than students in the traditional lecture, although there was no significant difference between performance of students in the interactive and traditional lectures. They also found that the students thought that this test type was useful and desirable and that the students were more careful and attentive while using such tools in the interactive lecture.

Dawabi et al (2003) integrated the mobile devices such as PDAs into face-to-face instruction to support interaction for the tests. Lim & Lim (2006) also used 10 true/false, multiple choice and fill-in questions for the tests to encourage students to mlearn in their daily lives. The research results showed that the mobile based tests were a good method to rehearse the knowledge at the end of each lesson.

Seppälä & Alamäki (2003) stated that innovative Internet and mobile solutions could be useful means for academic learning because they provide open learning environments. However, students' learning has to be self-directed in open learning media where these innovative technologies are used. Test anxiety is an important factor which negatively effects achievement of students in self-directed learning. Though test-anxious students may be equipped with the necessary cognitive skills, they cannot concentrate entirely on the test and thus they get lower scores, because they feel insecure about their own capabilities throughout the test (Cassady, 2004; Pintrich & De Groot, 1990; Pintrich, Smith, Garcia & McKeachie, 1993). Test anxiety could affect achievement in a negative way in technology enhanced learning as well as traditional learning environments. Students who achieve well in technology-based examinations are those with low levels of test anxiety (Shermis & Lombard, 1998; Solimeno et al, 2008). Still, the relationship between achievement and gender cannot be expressed so explicitly. Conflicting findings could be found when examining the levels of achievement in technology enhanced classes in terms of gender. Some research showed that there was a significant difference in terms of gender in technology-based examinations (Parshall, Kromrey, 1993; Riffell & Sibley, 2005; Volman, 1997) while some others suggested otherwise (Clariana & Wallace, 2002; Lu, Yu & Liu, 2003; Sim & Horton, 2005).

The results of researches regarding the students' achievement levels in quizzes and examinations in mLearning show that students achieve in mobile based tests at least as much as in traditional tests, and that their satisfaction level regarding such tests is high. However; there is as yet no research about the effects of gender and high or low test anxiety on students' achievement in mobile based tests. To meet this need, this research investigates the effects of gender and test anxiety on students' achievement levels in mobile based tests.

2. Research questions

This study aims to determine students' achievement level and the effects of gender and test anxiety on achievement in a mobile based test. Thus, the two research questions were:

- 1) What is the level of student achievement in the mobile based test?
- 2) Are there statistically significant differences between the mobile based test scores regarding to gender and test anxiety?

3. Method

Two-factor within-subject design was used in this research. The two factors were gender and level of test anxiety. The dependent variable of the research was student achievement scores obtained by the mobile based test.

3.1. Participants

Twenty volunteer sophomore students who were taking the course “Computer Hardware and Microprocessors” in the Department of Computer Education and Instructional Technologies participated in the research. Eight (40%) of the students were female and 12 (60%) were male. Participants undertook a mobile based test which contained 10 true/false questions about a computer hardware topic.

3.2. Instruments

3.2.1. Technology Enhanced Learning of the Course

A web site for the course was developed in order to support the instruction with Internet technologies. Course content for the semester and for each week, assessment criteria, lecture notes, announcements, links, and information about assignments such as their topics, content, and deadlines were delivered via the course web site. Students could upload their assignments and they had the opportunity to download the assignments of their friends. In addition, the students could upload the materials and reports they developed for the weekly technology follow-up seminars, and they could download the materials and reports of their friends.

3.2.2. Architecture of mobile based test infrastructure.

Figure 1 displays the system architecture developed for the research. The database contains the questions, correct answers and student ID numbers, passwords, answers to each questions given by the students, number of correct and incorrect answers, and student achievement scores. The question pages and the feedback page, which gave information about the number of correct and incorrect answers and scores to students, were broadcast on the WAP server. Students were able to reach the mobile based test from computers in the laboratory, from their laptops, or from their mobile phones.

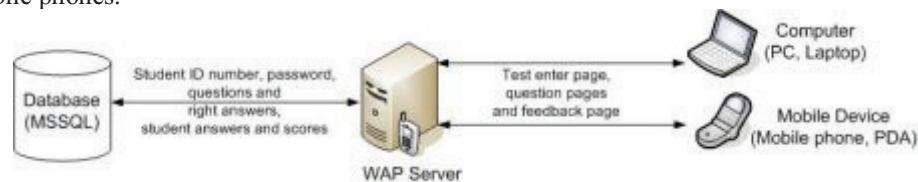


Figure 1. Architecture of mobile based test

3.2.3. Mobile based test

The test was consisted of 10 true/false questions. The test was reviewed by two instructors who have given courses on computer hardware in computer education departments. The answers of the students were calculated and recorded in the MSSQL database. Considering the screen size of mobile phones, the test question pages were designed with WML and PHP in such a way that only one question could appear on the screen. A feedback page presented the number of the correct and incorrect answers and students’ scores. However, this screen did not show which answers were true and which were false, because of limitations such as the speed of WAP and the size of the mobile screen.

3.2.4. Test Anxiety

The students’ level of test anxiety was obtained by The Motivated Strategies for Learning Questionnaire (MSLQ), which was developed by Pintrich et al (1993). Test anxiety is a factor of MSLQ and consists of 7-points Likert type items that measure the students’ worries and concerns on taking tests.

3.3. Procedure

The study was conducted on 20 students. The students entered the mobile based test system with their student ID numbers and passwords, and they had the right to use it only once. The students answered each question on the separate screen. Before the mobile based test ended, they had the opportunity to go back to the previous questions and change their answers. The feedback page informed the students about the number of correct and incorrect answers and their scores at the end of the test. The number of correct answers used to determine the achievement score and there was no time limitation.

3.4. Analysis

Descriptive statistics were used to interpret the achievement level of the students. Mann-Whitney U test was applied to find out whether there were significant differences between scores regarding to gender and test anxiety.

4. Findings

4.1. Achievement Level of the Students

The mean score for the mobile based test was 77.00 (sd = 14.90) which shows that the students' achievement level was high for the mobile based test.

4.2. Effects of Gender and Test Anxiety on Achievement

The second research question was formulated to determine the effects of gender and level of test anxiety on achievement. Table 1 summarizes the descriptive findings.

Table 1. Descriptive Statistics for Mobile Based Test Scores

Factor		N	\bar{X}	sd
Gender	Female	8	71.25	15.53
	Male	12	80.83	13.79
Test anxiety	Low	14	77.86	15.78
	High	6	75.00	13.78
Total		20	77.00	14.90

As seen from the table, the mean score for male students (\bar{X} = 80.83) was higher than for female students (\bar{X} = 71.25). Achievement scores of students who had a low level of test anxiety (\bar{X} = 77.86) were higher than those of students who had a high level of test anxiety (\bar{X} = 75.00). These findings showed that male students and the students who had low level of test anxiety were more successful in the mobile based.

Mann-Whitney U test was applied to find out whether there was a significant difference between the scores in relation to gender and test anxiety. Although male students' achievement scores were higher than those of female students, no significant difference was found between the achievement of the students regarding to gender (U=38.00, $p>.05$). In addition there was no significant difference between achievement scores in relation to test anxiety (U=30.50, $p>.05$) although achievement scores of students who had a low level of test anxiety were higher than those of students who had a high level of test anxiety.

5. Conclusion

In this study, a mobile based assessment was developed in the Computer Hardware and Microprocessors course to determine students' achievement. The results were examined to discover if the students' gender and level of test anxiety effect their achievement. Research findings showed that students had high achievement on the mobile based test. This finding suggests that employing ICT in assessment is advantageous for instructors as it will decrease the amount of time and effort that needed for paper-and-pen assessment. However, instructors' adaptation to new technologies is an important issue for technology integration. As Rogers (1995) expresses in a diffusion of innovation model, instructors must have knowledge about an innovation, must be convinced of the value and benefit of the innovation, and decide to make use of the innovation, evaluate the findings of the ICT application and subsequently confirm the innovation to integrate ICT successfully into the course. Certainly, there are many barriers that instructors might face. Shortcomings in infrastructure of the institution, shortage of necessary technical and motivational support, shortage of education and self-development, and lack of time can be listed as some of the barriers. Instructors should be supported when coping with these challenges.

The research also showed that the students' gender and level of test anxiety did not have significant effects on their achievement. However, the test scores of male students were found to be higher than those of female students. These findings could be interpreted as male students' tendency towards technology and willingness to learn about technology. At the same time, it was found that students with a lower level of test anxiety had higher scores than those with a higher level of test anxiety. However the sample size was consisted of 20 students, this finding could be evidence that test anxiety has a negative effect on student achievement in technology-based assessment as for traditional assessment. The future studies could investigate different types of questions (such as multiple choices, game-based, etc.) and various individual differences effects on student achievement in mobile based assessment.

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