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THE EFFECT OF INTERACTION BETWEEN TEST TYPE AND ANXIETY ON ACHIEVEMENT AND TIME

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ABSTRACT: *The purpose of this study is to investigate the effect of interaction between the test type and test anxiety level on achievement and performance time. The experimental design according to the independent variables is 3x2 factorial design. The test was delivered through three types; paper (Paper Based Testing-PBT), computers (Computer Based Testing-CBT) and mobile devices (Mobile Based Testing-MBT). Seventy two participants of the third secondary students were randomly assigned into six experimental groups. To classify the sample according to test anxiety level (low/ high), an adapted version of the Westside test anxiety scale was used. Data analyses were conducted to test the hypotheses derived from research questions. The research instrument was an achievement test on the first unit of the third secondary curriculum. Two-way ANOVA test was used to investigate the main effects of the independent variables on dependent ones. Findings revealed the effect of test anxiety on achievement and performance time in favor of low anxiety level students. There were no significant differences on achievement and performance time due to the main effect of test type. Also, there were no significant differences on achievement and performance time due to interaction between test type and test anxiety level.*

KEYWORDS: Computer-Based Test, Mobile-Based Test, Mobile Learning, Paper-Based Test, Test Anxiety Level.

INTRODUCTION

Assessment is a fundamental activity in the learning process because it does not only evaluate learners' knowledge, understanding, abilities and skills but also it can be used to evaluate the learning outcome itself, advancing through appropriate feedback mechanisms the learning procedure.

PBT is the conventional method of writing exams. CBT is an assessment that is administered by computer in either stand-alone or dedicated network. MBT is an assessment that is administered by mobile phones, PDAs, palmtops, smartphones or tablets (Oduntan, 2015).

With the rapid growth of mobile technology, devices such as mobile phones, PDAs, palmtops, smartphones and tablets are becoming an important part of student life as communication, entertainment and multiple purpose information processing tools. The integration of mobile devices in learning leads to a new learning mode called mobile learning. Mobile devices with their pervasive and ubiquitous characteristics can also facilitate the assessment procedure, leading in an innovative assessment mode, called MBT. The impact of test takers' characteristics, on his/her performance on CBT or MBT, should be considered by educators and test developers before replacing PBT with equivalent CBT or MBT versions. (Nikou & Economides, 2013)

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Test anxiety is an intense fear of performing poorly on assessments. It is characterized by feelings of nervousness and discomfort paired with cognitive difficulties (Columbus, 2008). The introduction of high-stakes tests has served to increase the occurrence of test anxiety. The implications of test anxiety are more detrimental now than ever before. Poor performance on assessments due to test anxiety also affects school districts. Schools must meet adequate yearly progress or face penalties and the possibility of being taken over by the state department of education. Considering the impact of assessment results on the lives of students and schools, it is extremely important for research to be conducted in an effort to find ways to decrease the prevalence of test anxiety. (Hasson & Von der Embse, 2012)

Anxiety is a normal human emotion; everyone feels anxiety at some time in their life. A test is one of the most things that causes anxiety for students, it can affect negatively on students' mental health and their academic performance.

Chronic test anxiety can lead to overall poor educational performance, lowered self-esteem, and a loss of motivation. Many students equate computer use with fun which may lead to decreased anxiety when using the computer for an assessment, a situation that may otherwise cause stress (Grubb, 2013).

This study examines the impact of test type (PBT/ CBT/ MBT) on secondary students' test anxiety symptoms through their scores on achievement and performance time.

LITERATURE REVIEW

There is a great transformation from the traditional mode of assessment to the modern method of the use of CBT. CBT is gaining popularity over the traditional PPT due to many advantages that CBT provides. Meanwhile, more educators and researchers have shown interest in investigating the factors that influence students' CBT performance. There are many factors related to student characteristics, which includes student demographic attributes, learning style, computer familiarity and test anxiety. (Oduntan, 2015)

Some early researchers have pointed out that CBT produced lower students' scores than PBT (Mazzeo & Harvey, 1988). Students had more confidence with paper than with computers. It was the early times of using computer technology in assessment. Performance differences due to computer unfamiliarity have been decreased over time because of the widespread adoption of computers in everyday life activities. Noyes & Garland (2008) focused on equivalency issues between the two test types and argued that greater equivalence between CBT and PBT is being achieved today (especially in standardized and closed tasks e.g. multiple choice questions) than at the early times of computers. Researches of Akdemir & Aguz (2008); Bodmann, & Robinson (2004); Campton (2004) found students' performance to be comparable across test types. Equivalent performance with marginal differences between the two test types have been found also in Macedo-Rouet, Ney, Charles & Lallich-Boidin (2009) and Kim & Huynh (2007).

On the other hand, many studies, in a variety of settings, have revealed that there is a significant difference between the two testing types (PBT and CBT) in favor of CBT. Bugbee and Bernt (1990) discussed the use of computer administered test from 1982 to 1988, found that students' performance was better on CBT than on PBT. Computerized versions of vocabulary tests produced higher scores (due to the higher response speed associated with use

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of a mouse to record responses in contrast to a pencil and answer sheet) than the PBT (Pomplun, Frey & Becker, 2002). Studies in secondary education settings as research Coniam (2006) demonstrated that students performed better on CBT than on PBT.

The interest in developing and using MBT in assessment in educational institutions has been increased in recent years. A MBT may be a simple transfer of the paper format onto the screen of the mobile device. Many studies implement nowadays adaptive personalized approaches to mobile learning exploiting learner, location and other contextual information adaptations (Hwang & Chang, 2011; Hwang, Wu, Zhuang & Huang, 2011; Shih, Chuang & Hwang, 2010). However, there are not enough studies that evaluate the use of mobile devices for testing compared to CBT, WBT or PBT and inconclusive results have been reported regarding examinee performance.

Table 1. shows a summary of comparability results among PBT,CBT and MBT(WBT)

Table 1. Summary of comparability results among PBT,CBT and MBT

Test Modes	Support evidence
PBT > CBT	Bridgeman, Lennon, & Jackenthal (2003); Choi & Tinkler, (2002); Grubb (2013); Keng, McClarty & Davis (2006); Pommerich, (2004)
PBT = CBT	Noyes & Garland (2008); Akdemir & Aguz, (2008); Macedo-Rouet, Ney, Charles, & Lallich-Boidin, (2009); Kim & Huynh (2007)
CBT > PBT	Chen & Yen, (2010); Clarianna & Wallace (2002); Coniam (2006); Oduntan, Ojuawo & Oduntan (2015)
MBT = PBT & MBT = CBT	Kingston (2009); Segal , Doolen & Porter (2005); Treadwell (2006); Shroeders & Wilhelm (2010)
MBT > PBT & MBT > CBT	Wu & Zhang, (2010); Masri (2012); Muhanna (2011); Nikou & Economides (2013)

There are two aspects to test anxiety: The first is the physiological aspect which includes elevated heart rate, dizziness, and nausea; The second is the worry aspect which includes worrying about possible failure, reduced self-efficacy, feeling unprepared, loss of self-worth and fixation on the test (Cassady, 2010). Older research on test anxiety focuses on the test taking experience while recent research shows that test anxiety affects students' overall cognitive processing by impairing encoding, storage and retrieval of information (Cassady, 2004). In other words, a student with test anxiety is suffering in all aspects of his/her education.

There are some studies that revealed that high test anxiety affected negatively on students' performance such as Bennet & Stowell, (2010); Cassady, (2004); Chen (2004); Segool (2009); Zeidner (2001) while other studies revealed that there was no significant difference between high test anxiety level and students' performance such as Perkins (1995); Revuleta, Ximenez & Olea (2003); Schault & McIntosh (2004).

Whereas the conclusions of the previous researches are inconsistent regarding the performance of test taker related to test type and the interaction between test types and test taker variables, this inconsistency is somehow expected due to the fact that there have been

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so many studies to different groups of examinees with different designs and data collection techniques in a wide range of content areas and a variety of item formats.

Research Problem

Institutions across the globe are directing toward the use of CBT to test students' knowledge. The advantages of using computer technology for educational assessment in a global sense have been recognized and these include lower administrative cost, time saving and less demand upon teachers among others.

There has been much research done on test anxiety, but few studies focus on interaction between test type (PBT, CBT and MBT), particularly comparing between CBT and MBT, and secondary students test anxiety to reach the best test type that can reduce secondary students test anxiety.

Research Questions

This study attempts to answer the following questions:

1. Are the test scores and performance time of secondary students different among PBT, CBT and MBT?

2. Are the test scores and performance time of low anxiety secondary students different among PBT, CBT and MBT?

3. Are the test scores and performance time of high anxiety secondary students different among PBT, CBT and MBT?

METHODOLOGY

This research belongs to the quasi-experimental researches to measure the effect of independent variables on some dependent variables.

Research Design:

The experimental design according to the independent variables is 3x2 factorial design, which has six experimental groups. Figure (1) shows the experimental design of the study:

Test type / Anxiety level	PBT	CBT	MBT
Low	Group (1)	Group (2)	Group (3)
High	Group (4)	Group (5)	Group (6)

Figure (1): The Study design of the research

Research Participants

The participants in this study were 72 third-year secondary students, 36 high anxieties and 36 low anxieties. It deserves to mention that the secondary stage and particularly grade 3 is very

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critical because it defines the students' future careers so most students suffer from high level of anxiety. Two weeks in advance a preliminary questionnaire among students showed a high percentage of smartphone possession and a high willingness to use them in the forthcoming assessment. The participants were randomly assigned into six groups according to the test type: paper, computer/web and mobile- based.

Data Collection

The assessment had 30 multiple choice questions. Multiple choice quizzes are suitable for assessing a learner's factual knowledge and lately gained large popularity due to their efficiency and objectivity. Also, they can easily be transferred from the paper version to the computer or smart phone screen. The CBT group used the computers of the school computer lab. The MBT group had to use the mobiles to go on the test. The user first had to log into the system. Each page had a question, four possible answers and the "next" button. The student had only to choose the right answer and then he/she had to push the "next" button to go to the next question. The text was in English and the assessment's duration was 30 min. The maximum score, if all questions were answered correctly was 30. The interface was kept as simple as possible to avoid possible destructions. The assessment's interface through a sample question in CBT is available at: www.malnagar.com/aet/.

Westside test anxiety scale is used to classify the students of the experiment to high and low levels. There were 72 third-year secondary students, 36 high anxieties and 36 low anxieties.

Data Analysis

Students' correct answers of all three modes of tests and relevant data imported in the statistical package SPSS 19 for processing. Two-way analysis of variance (ANOVA), with a significant level of ≤ 0.05, was used. ANOVA assumptions were satisfied.

RESULTS

Achievement

Tables 2 and 3 show the means, standard deviations, and 2-way ANOVA for the six treatment groups in achievement.

Table 2 Means and Standard Deviations of the Six Treatment Groups' Achievement

Achievement		Test type			Total
		PBT	**CBT**	**MBT**	
Test Anxiety level	**low**	M= 24.83 SD= 1.33 N= 12	M= 24.50 SD= 1.08 N= 12	M= 23.08 SD= 2.06 N= 12	M= 24.13 SD= 1.69 N= 36
	high	M= 21.91 SD= 2.19 N= 12	M= 21.66 SD= 2.30 N= 12	M= 22 SD= 2.17 N= 12	M= 21.86 SD= 2.16 N= 36
Total		M= 23.37 SD= 2.31 N= 24	M= 23.08 SD= 2.28 N= 24	M= 22.54 SD= 2.14 N= 24	M= 23 SD= 2.24 N= 72

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Table 3: 2-way ANOVA with Achievement as A Dependent Variable

Source of variance	SS	Df	MS	F	Sig.
Anxiety level (AL)	93.389	1	93.389	25.347	.000**
Test type (TT)	8.583	2	4.292	1.165	0.318
AL * TT	12.861	2	6.431	1.745	.183
Error	243.167	66	3.684		
Total	38446	72			

Note: ** p < .05

To test our hypotheses, achievement was analyzed using two-way ANOVA, showing the main effect of test anxiety level [F=25.347, p<0.05]. Thus, there is a significant difference in achievement scores due to the main effect of test anxiety level in favor of low test anxiety students. But, the main effect of test type [F=1.165, p>0.05]. Thus, there is no significant difference in achievement scores due to the main effect of test type. Also, the data showed no significant interactions between test anxiety and test type [F=1.745, p>0.05].

Performance time:

Tables 4 and 5 show the means, standard deviations, and 2-way ANOVA for the six treatment groups in performance time.

Table 4 Means and Standard Deviations of the Six Treatment Groups' performance time

Performance Time		**Test type**			Total
		PBT	**CBT**	**MBT**	
Test anxiety level	**low**	M= 12.66 SD= 1.50 N= 12	M=12.52 SD= 1.52 N= 12	M=12.99 SD= 1.21 N= 12	M= 12.73 SD= 1.39 N= 36
	high	M= 12.16 SD= 1.41 N= 12	M= 12.11 SD= 1.36 N= 12	M=11.42 SD= 1.09 N= 12	M= 11.90 SD= 1.30 N= 36
Total		M= 12.41 SD= 1.45 N= 24	M=12.31 SD= 1.43 N= 24	M= 12.21 SD= 1.38 N= 24	M= 12.31 SD= 1.40 N= 72

Table 5: 2-way ANOVA with in Performance Time as A Dependent Variable

Source of variance	SS	Df	MS	F	Sig.
Anxiety level (AL)	12.384	1	12.384	6.661	.012**
Test type (TT)	.505	2	.252	.136	.873
AL * TT	4.982	2	2.491	1.340	.269
Error	122.695	66	1.859		
Total	11061.507	72			

Note: ** p < .05

Analysis showed the main effect of test anxiety level in Performance time [F=6.661, p<0.05]. Thus, there is a significant difference in performance time due to the main effect of test anxiety level in favor of low test anxiety students. But, the main effect of test type [F=.136,

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p>0.05]. Thus, there is no significant difference in performance time due to the main effect of test type. Also, the data showed no significant interactions between test anxiety and test type [F=1.340, p>0.05].

DISCUSSION

The results related to test anxiety level were consistent with some studies that revealed that high test anxiety level affected negatively on students' performance such as Bennet & Stowell, (2010); Cassady, (2004); Chen (2004); Segool (2009); Zeidner (2001) while other studies revealed that there was no significant difference between high test anxiety level and students' performance such as Perkins (1995); Revuleta, Ximenez & Olea (2003); Schault & McIntosh (2004).

Students with low test anxiety performed better than students with high test anxiety. Students with low test anxiety achieved scores greater than students with high test anxiety in the achievement test. Although students with low test anxiety performed the tests in more time than students with high test anxiety, most of their answers were correct. While students with high test anxiety took less time, but most of their answers were incorrect.

This result revealed that high test anxiety level affects negatively on students' performance in their exams because high test anxiety causes stress, nervousness and discomfort paired with cognitive difficulties in restoring information.

Findings also revealed that there were no significant differences on achievement and performance time due to the main effect of test type. These results are due to using a type of question, multiple choices, which does not need much time in tests whether PBT, CBT or MBT.

CONCLUSION

Economic issues may prevent testing using an electronic type, but even an online CBT/ MBT should result in decreased anxiety. A finding that CBTs may lessen test anxiety would make not only the students' lives easier, but also teachers' jobs. Research has shown that there is a clear connection between test anxiety and achievement (Segool, 2009). The author studied test anxiety and student's achievement found that students who self-reported a low level of test anxiety did significantly better on high-stakes tests than students who indicated they experienced a moderate or high level of test anxiety (2009).

Although results revealed that there were no significant differences on achievement and performance time due to the main effect of test type PBT, CBT and MBT, it is recommended to use CBT and MBT in tests because they offers several potential advantages such as immediate scoring and reporting of results, more flexible test scheduling, the opportunity to include innovative item formats that are made possible by the use of technology, and reduced costs of test production, administration and scoring.

The procedures used in the present study can be applied to other testing situations involving comparison of examinees' performance across different groups taking the same test in paper and pencil versus computer or Internet.

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It is recommended to do many researches on the effect of test type on achievement and performance using different subjects to determine what subject matter is best suited to CBT/ MBT and to reduce test anxiety and maximize students' scores particularly the students of the secondary third grade.

REFERENCES

Akdemir, O. & Aguz, A. (2008). Computer-based testing: An alternative for the assessment of Turkish undergraduate students. Computers & Education, 51,1198–1204.

Bennett, D., & Stowell, J. (2010). Effects of Online Testing on Student Exam Performance and Test Anxiety, *Journal of Educational Computing Research, 24 (2). http//: baywood.metapress.com/link.asp?target= contribution &id=4776200L6L1018Q5, (Accessed on August 27, 2017)*

Bodmann, S., M. & Robinson, D., H. (2004). Speed and Performance Differences Among computer-based and paper-pencil tests. Journal of Educational Computing Research, 31(1), 51-60.

Bridgeman, B., Lennon, M. L. & Jackenthal, A. (2003). Effects of screen size, screen resolution, and display rate on computer-based test performance. Applied Measurement in Education, 16, 191-205.

Bugbee, Jr., A. C. & Bernt, F. M. (1990). Testing by computer: Findings in six years of use 1982-1988. Journal of Research on Computing in Education, 23, 87-101.

Campton, P. (2004). A Comparative Analysis of Online and Paper-Based Assessment Methods: A University Case Study. ACEC 2004, Conference Proceedings.

Cassady, J. (2004). The impact of cognitive test anxiety on text comprehension and recall in the absence of external evaluative pressure. Applied Cognitive Psychology, 18, 311-325. doi: 10.1002/acp.968

Cassady, J. (2010) Anxiety in schools: The causes, consequences, and solutions for academic anxieties. New York, NY: Peter Lang Publishing.

Chen, J. (2004). Effects of Test Anxiety, Time Pressure, Ability And Gender On Response Appearance, Ph.D. Thesis, the Graduate School of The Ohio State University. http://etd.ohiolink.edu/send_pdf.cgi/acc_num=osu 1092840837. (*(Accessed on August 17, 2017)*)

Chen, L.-J., Ho, R.-G., & Yen, Y.-C. (2010). Marking Strategies in Metacognition-Evaluated Computer-Based Testing. Educational Technology & Society, 13 (1), 246–259.

Choi, S. W., & Tinkler, T. (2002). Evaluating comparability of paper-and-pencil and computer based assessment in a K-12 setting. New Orleans, LA: Paper presented at the annual meeting of *the National Council on Measurement in Education.*

Clariana R, Wallace P (2002). Paper-based versus computer-based assessment: key factors associated with the test mode effect, *British Journal of Educational Technology*, *33*(5), pp: 593-602.

Columbus, A.M. (2008). Advances in psychology research. New York, NY: Nova Science Publishers.

Coniam, D., (2006). Evaluating computer-based and paper-based versions of an English-language listening test. ReCALL, 18, 193-211.

ISSN 2054-0957 (Print), ISSN 2054-0965 (Online)

Grubb, G., (2013). Does the Use of Computer-based Assessments Produce Less Text Anxiety Symptoms than Traditional Paper and Pencil Assessments?, Master's Research Project Presented to The Faculty of the College of Education Ohio University, *Intervention Specialist Mild-Moderate, April 2013*, p: 4.

Hasson, R., & Von der Embse, N. (2012). Test anxiety and high-stakes test performance between school settings: implications for educators. *Preventing School Failure: Alternative Education for Children and Youth, 56*(3), pp: 180-187.

Hwang, G.J., & Chang. H., F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students, *Computers & Education, 56*, pp: 1023–1031.

Hwang, G.J., Wu, P.H., Zhuang, Y.Y., & Huang , Y.M. (2011). Effects of the inquiry-based mobile learning model on the cognitive load and learning achievement of students. *Interactive Learning Environments*, pp: 1–17.

Keng, L., McClarty, K. L. & Davis, L. L. (2006). Item-level comparative analysis of online and paper administrations of the Texas Assessment of Knowledge and Skills. Paper presented at the *Annual Meeting of the National Council on Measurement in Education, San Francisco, CA*.

Kim, D.H., & Huynh, H. (2007). Comparability of Computer and Paper-and-Pencil Versions of Algebra and Biology Assessments. *Journal of Technology, Learning, and Assessment, 6*(4).

Kingston N. M. (2009). Comparability of computer- and paper-administered multiple-choice tests for K-12 populations: A synthesis. *Applied Measurement in Education, 22*(1), pp: 22-37.

Macedo-Rouet, M., Ney, M., Charles, S., & Lallich-Boidin, G. (2009). Students' performance and satisfaction with Web vs. paper-based practice quizzes and lecture notes, *Computers & Education 53*, pp: 375–384.

Masri, A.A. (2012). Using Mobile Phone For Assessing University Students in English Literature in Jordan. Paper presented in 2012 *Orlando International Academic Conference*, Orlando, FL, USA.

Mazzeo, J., & Harvey, A. I. (1988). The Equivalence of Scores from Automated and Conventional Educational and Psychological Tests. *College Board Report, 88-8*, NY: College Entrance Examination Board.

Muhanna, W. (2011). The Impact of Using Cell Phone Assessment on Jordanian University Students' Achievement in National Education, *European Journal of Social Sciences , 20*(1).

Nikou, S. A. & Economides, A. A. (2013). Student achievement in paper, computer/web and mobile based assessment,

Noyes, J. M., & Garland, J. K. (2008). Computer- vs. paper-based tasks: Are they equivalent? *Ergonomics*, *51*(9), pp: 1352–1375.

Oduntan O. E, Ojuawo O. O., & Oduntan E. A. (2015). A Comparative Analysis of Students Performance in Paper Pencil Test (PPT) and Computer Based Test (CBT) Examination System, *Research Journal of Educational Studies and Review, 1* (1), pp: 24-29, April, http://pearlresearchjournals.org/journals/rjesr/index/html, *(Accessed on August 7, 2017)*

Perkins, R. F. (1995). Using hypermedia programs to administer tests: Effects on anxiety and performance. *Journal of Research on Computing in Education, 28*, pp: 209-220. Retrieved from http://search.ebscohost.com.proxy.library.ohiou.edu/login.aspx?direct=true&db=ehh&AN=9602291843&site=ehost-live, *(Accessed on July 15, 2017)*

ISSN 2054-0957 (Print), ISSN 2054-0965 (Online)

Pommerich, M. (2004). Developing computerized versions of paper-and-pencil tests: Mode effects for passage-based tests. *Journal of Technology, Learning, and Assessment, 2*(6).

Pomplun, M., Frey, S., & Becker, D. F. (2002). The score equivalence of paper-and-pencil and computerized versions of a speeded test of reading comprehension. *Educational and Psychological Measurement, 62*, pp: 337-354.

Revuelta, J., Ximenez, M., Carmen, A., & Olea, J. (2003). Psychometric and psychological effects of item selection and review on computerized testing. *Educational & Psychological Measurement, 63*(5), 791-808. Retrieved from http://search.ebscohost.com.proxy.library.ohiou.edu/login.aspx?direct=true&db=ehh&AN=11266583&site=ehost-live, *(Accessed on July 4, 2017)*

Schroeders, U. & Wilhelm, O. (2010). Testing Reasoning Ability with Handheld Computers, Notebooks, and Paper and Pencil, *European Journal of Psychological Assessment, 26*(4) .

Segall, N., Toni, L., Doolen, J., & Porter, D. (2005). A usability comparison of PDA-based quizzes and paper-and-pencil quizzes. *Computers & Education, 45*(4), pp: 417–432.

Segool, N. (2009). Test anxiety associated with high-stakes testing among elementary school children: prevalence, predictors, and relationship to student performance. *ProQuest LLC*, *68*(5), 177. Retrieved from http://gateway.proquest.com.proxy.library.ohiou.edu/openurl?url_ver=Z39.882004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&res_dat=xri:pqdiss&rft_dat=xri:pqdiss:3381350, *(Accessed on July 25, 2017)*

Shault, C. A., & McIntosh, J. L. (2004). Employing computer-administered exams in general psychology: Student anxiety and expectations. *Teaching of Psychology, 31*(3), pp: 209-211. Retrieved from http://search.ebscohost.com.proxy.library.ohiou.edu/login.aspx?direct=true&db=ehh&AN=13959214&site=ehost-live, *(Accessed on June 15, 2017)*

Shih, J.-L., Chuang, C.-W., & Hwang, G.-J. (2010). An Inquiry-based Mobile Learning Approach to Enhancing Social Science Learning Effectiveness. *Educational Technology & Society, 13 (4)*, pp: 50–62.

Treadwell, (2006). The usability of personal digital assistants (PDAs) for assessment of practical performance. *Medical Education, 40* (9), pp: 855–861.

Wu , J., & Zhang, Y. (2010). Examining potentialities of handheld technology in students' academic attainments, *Educational Media International, 47*(1), pp: 57–67.

Zeidner, M. (2001). Sex, ethnic, and social differences in test anxiety among Israeli adolescents. *Journal of Genetic Psychology, 150*(2), pp: 175 –185.

ISSN 2054-0957 (Print), ISSN 2054-0965 (Online)