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EFFECTIVENESS EVALUATION OF INTERACTIVE MOBILE LEARNING SYSTEM ON DRIVER'S PERFORMANCE IN RAILWAY

R. Sharifi[1*], G. Bazaee[2], H. Asadzadeh[3]

[1]Department of Information Technology management, Faculty of Management and Economy, Science and research Branch, Islamic Azad University, Tehran, Iran 2

[2]Department of Information Technology management, Faculty of Management, Central Tehran Branch, Islamic Azad University, Tehran, Iran

[3]Department of Educational Psychology, Faculty of Psychology & Education, Allameh Tabataba'i University, Tehran, Iran

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ABSTRACT

The improvement in employee performance has a direct co-relation to accessibility of learning, its availability in a format that learners find exciting, and its learnability or learning effectiveness.

This research determines the effectiveness of Interactive Mobile Learning System on the Driver's Individual performance in Railway. The method of research was semi-experimental, and the design was pre-test/post-test with a control group. The study population included Zanjan railway drivers (112 person). Thirty people were randomly selected and assigned to two groups of 15: one represented an experimental group with an IMLS training approach and the other was a control group. The experimental groups received eight sessions of 90 minutes of IMLS training. Effectiveness was measured after intervention. The data were analysed using covariance. The results showed that IMLS is effective in increasing the frequency and intensity of individual performance.

Keywords: Mobile Learning, Interaction, Effectiveness, individual performance.

Author Correspondence, e-mail: author@gmail.com

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1. INTRODUCTION

With the rapid development of network communication technologies, more and more wireless and mobile technology applications are integrated into classrooms to support teaching and learning. For example, the feature reducing the time for tedious work allows the trainer to readily select material and present or broadcast them to trainees, as well as mark and revise trainees' tasks through the use of mobile devices that enable numerous tedious tasks to be completed instantly. Another feature is engaging trainees in learning activities which indicates trainees engaging in learning activities such as exploring and organizing online course-related resources, as well as answering quizzes by means of group discussion using their mobile devices. In addition, trainees are not only able to discuss course work with each other face-to-face, but are also able to exchange personal materials through the mobile devices and the process of interaction can be recorded, thus facilitating group collaborative learning. Another feature is empowering the trainer to monitor trainees' learning progress which means a number-signal is provided to each mobile device that represents different statuses in using a mobile device such as disconnected to the server or request for help, therefore the trainer can monitor trainees' learning progress and determine how to implement the subsequent activities. Moreover, the recording teaching and learning processes as portfolios feature means the establishment of teaching records and learning portfolios and then promotes trainers' reflection on teaching as well as learners' portfolio assessment. Finally, the user-friendly interface by providing a handwriting function and the interactive classroom server effectively coordinate all system works to allow the trainer and trainees benefit from technology easily for implementing Mobile learning activities. In a Mobile Computer Supported Collaborative Learning activity, trainees engaged in collaborative learning through face-to-face communication on a social network with the support of handheld devices by a wireless network. Many studies have demonstrated successful experiments which help trainees exchange information through PDAs as well as providing opportunities to interact with each other by using the PDAs as handheld devices for supporting learning, for example: improving knowledge creation during experiential learning by mobile technologies (Sharifi, 2017).

1.1 Mobile Performance Support versus m-Learning

The value of mobility is not to be understand. It can, in fact, bring great value by making other kinds of Learning unnecessary. Used as an on-the-spot source of references material, such as a checklist or a video demonstration, it can make it unnecessary to memorize the same information through learning. The performer need only remember how to access the guidelines or job aids needed to perform to expectations. Even in this, the technology can

assist by using either or both global positioning data and photograph recognition to look up relevant resources.

This is, indeed, a change to the landscape and a welcome opportunity. But when mobile devices are used for various types of references access and performance support, these uses should not be called m-learning or any kind of learning. Something more like m-help or m-guidance would be more accurate. This is a different domain with its own challenges and opportunities and can be a welcome complement to instructional systems (Allen's, 2016).

Mobile devices have emerged as our daily companion whose applicability evolves as the day unfolds. One of such applications is in the area of learning, called mobile learning[1]. However, as with all new technologies, M-learning is faced with the issues of standard, content packaging, and deployment. And like other distributed applications on ubiquitous networks, M-learning is challenged with performance issues. This work shows the implementation and evaluation of a model for intelligent mobile learning system[2] using a multi-agent system[3] (Udanor, 2016).

On account of competence-led market demands, it is important that employees gain new knowledge efficiently. One solution is to set-up IT-based courses using interactive media for learning[4] so that employees can learn at their workplace and also learn as a part of their ordinary work. Choosing technology as a media for learning is not simply chosen for its own sake rather because it is more efficient for the task. However, for a number of reasons, it is becoming increasingly difficult to assess the efficient use of technology. Thus there are needs for processes to quality assure usability or even to create a process to certify usability. Before this is possible a number of issues have to be resolved. All issues are fundamental to assure usability (Brian Hunt, 2004) .Mobile and wireless communication technologies not only enable anytime and anywhere learning, but also provide the opportunity to develop learning environments that combine real-world and digital-world resources (Gwo-Jen Hwanga ,. P.-H.-R., 2011).

With the diffusion of easy-to-use Web 2.0 tools, such as podcasts, blogs and wikis, e-learning has become a popular mechanism for individual training. While individuals use these tools in the hope that their training will improve their performance, this relationship is not a given (Soheila Mohammadyari, 2015). The researches indicate that organizational support and management support significantly affected perceived usefulness and intention to use.

[1] - *M-learning*
[2] - *IMLS*
[3] - *MAS*
[4] - *IML*

Individuals' experience with computers and computer self-efficacy had significantly positive effects on perceived ease of use (Yi-Hsuan Leea, 2011)

Current endeavours to integrate competency-based learning approaches with e-learning systems designed for delivery of training to adult learners in the workplace are growing. However, academic efforts in examining learners' perceptions of, and reactions toward, this technology-delivered pedagogical innovation are limited (Bo Chenga, 2011) so that Mobile learning is a new form of learning utilizing the unique capabilities of mobile devices. Although mobile devices are ubiquitous on college campuses, student readiness for mobile learning (Jongpil Cheona, 2012). The advancement of mobile and wireless communication technologies has encouraged an increasing number of studies concerning mobile learning, in which learners or students are able to learn via mobile devices without being limited by space and time; in particular, the students can be situated in a real-world scenario associated with the learning content. Although such an approach seems interesting to the learner, researchers have emphasized the need for well-designed learning support in order to improve the learners' learning achievements. Therefore, it has become an important issue to develop methodologies or tools to assist the students to learn in a mobile learning environment (Gwo-Jen Hwanga, 2011).

With advanced developments in wireless technology, learners can utilize digital learning websites at anytime and anywhere. Mobile learning captures more and more attention in the wave of digital learning. Evolving use of knowledge management plays an important role to enhance problem solving skills. Recently, innovative approaches for integrating knowledge management into practical teaching activities have been ignored (Huang, 2010).

Mobile computers have gradually been introduced into educational contexts over the past 2 decades. Mobile technology has led to most people to carry their own individual small computers that contain exceptional computing power, such as laptops, personal digital assistants (PDAs), tablet personal computers (PCs), cell phones, and e-book readers. This large amount of computing power and portability, combined with the wireless communication and context sensitivity tools, makes one-to-one computing a learning tool of great potential in both traditional classrooms and outdoor informal learning (Yao-Ting Sunga, 2016)

Mobile devices have various distinctive features such as individualized interfaces, real-time access to information, context sensitivity, instant communication, and feedback. These features may be able enhance the effects of certain pedagogies, such as self-directed learning, inquiry learning, or formative assessment. However, it is note-worthy that the features of mobile devices are not sufficient conditions for positive learning effects.

Instructional strategies are important for effective learning with information technology (Min Liu, 2013). Learning that occurs when learners have access to information anytime and anywhere via mobile technologies to perform authentic activities in the context of their learning. Here and now mobile learning gives learner the opportunity to be in the context of their learning and have access to information that is related to what they are seeing and experiencing at the moment (Florence Martin, 2013)

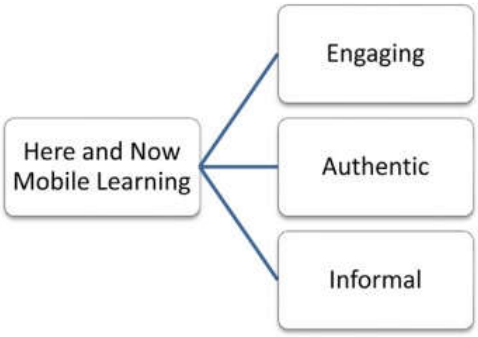

Fig.1. Here and now learning characteristics (Florence Martin, Here and now mobile learning: An experimental study on the use of mobile technology, 2013)

In here and now learning research studies, students have shown significantly improved post-test scores (Chen, 2012), improved learning outcomes (Wu, 2012), and significant positive results in terms of the students' learning in studies of here and now learning (Ju-Ling, 2010).

1.2 M-Learning Conceptual Model

In terms of technology, the Academy adopted the Modular Object-Oriented Dynamic Learning Environment (MOODLE) as the core Learning Management System (LMS) with customizations such as registration page. Sharifi design a conceptual model for implementation of m-learning in Iran railway. This model is shown in fig.2

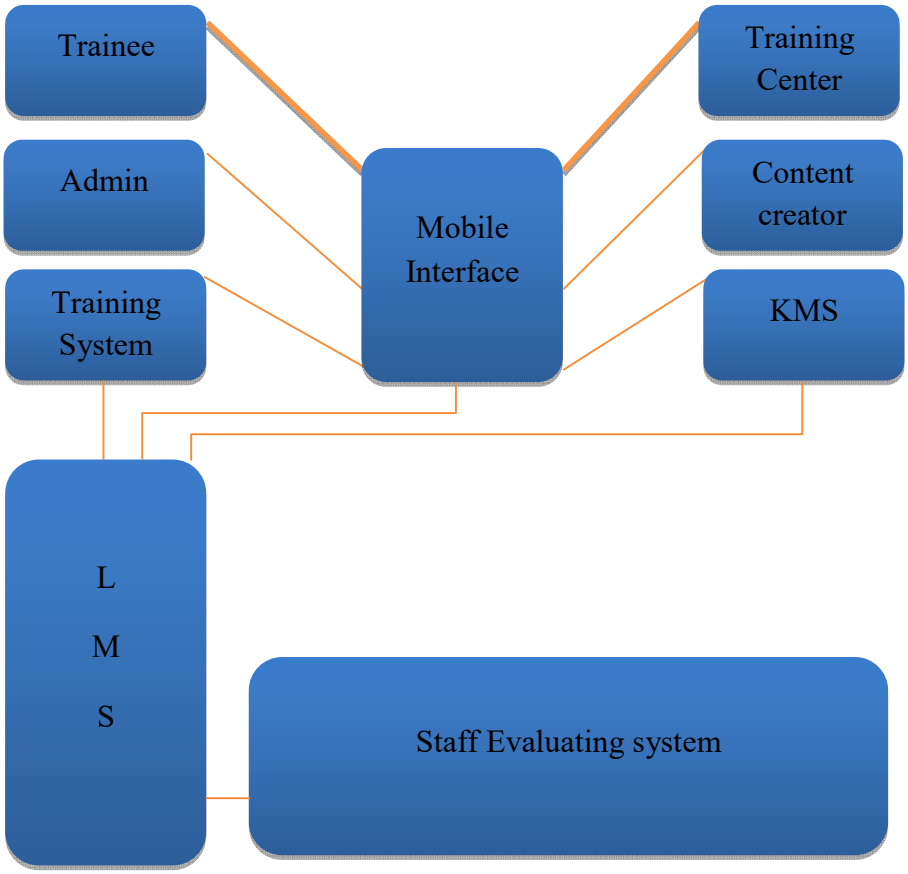

Fig.2. Iran Railway M-Learning Conceptual Model (Sharifi, 2017)

Fig.3. Screenshots of the login

The login module includes two functions: the login judgment and user information response functions. When the server receives a login request from a client, it checks the authorization for login to the system. If the authorization is approved, then user information containing the trainees' clues, group information, and IP address of the shared display will be transferred to

the client. The user information can be used for identifying groups for transmitting data among the server, clients and SDs.

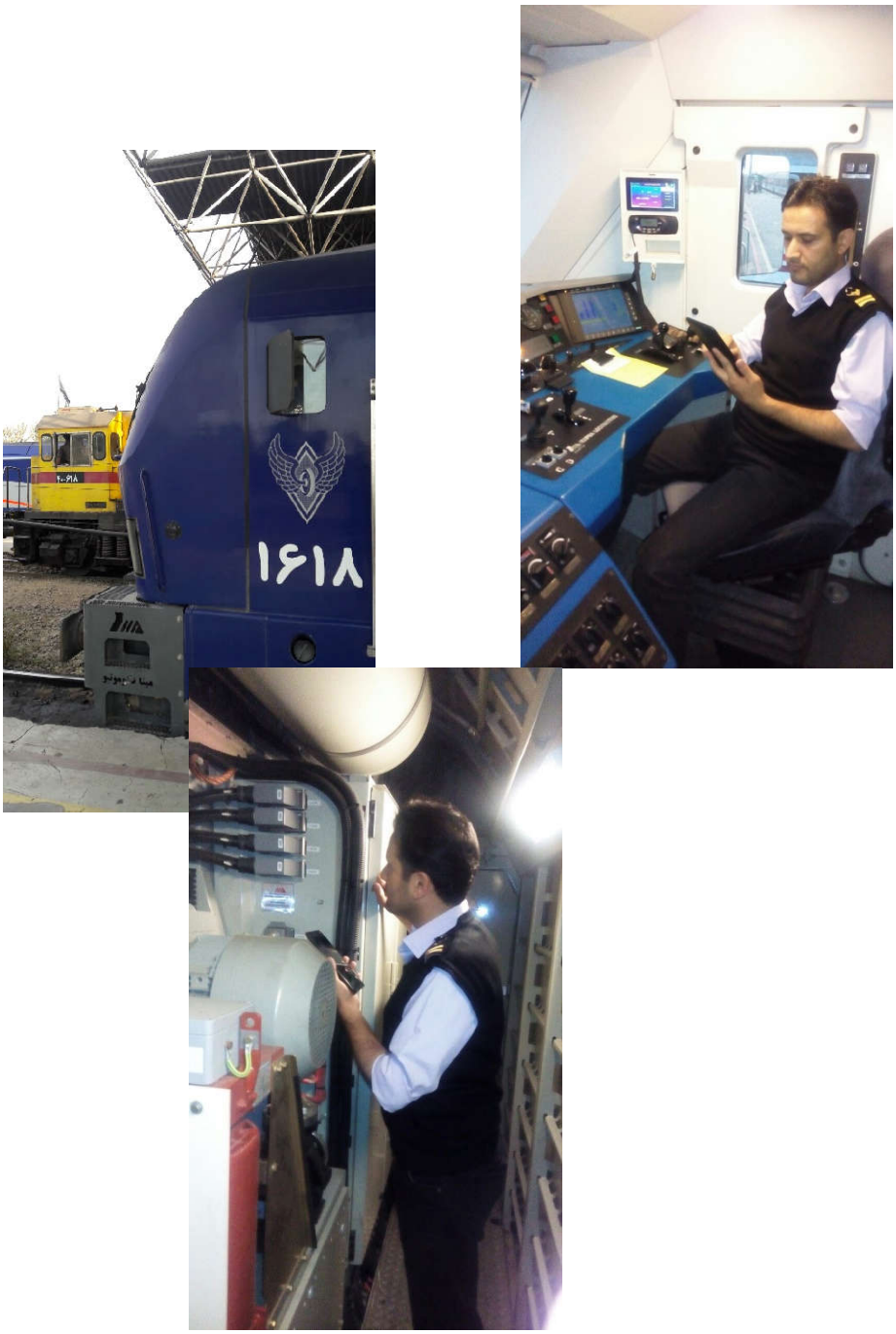

Fig.4. A driver in M-Learning Activity

2. RESEARCH METHOD

In this study, we used a quasi-experimental design. To enhance the accuracy of the results and control the threatening factors and internal validity of research results, we used pre-test / post-test with the control group. After choosing subjects randomly, they were assigned to experimental and control groups. The experimental group was trained with the IMLS

approach, and the control group received no intervention. The population was composed of employees of Zanjan Railway of Drivers. One hundred twelve employees in direct contact with clients and who were willing to participate in the study were selected, and questionnaires were administered. The questionnaire was distributed to the participants. After correcting the questionnaire, 30 people were selected with random sampling and were randomly divided into two groups of 15, a group of participants with an educational approach (IMLS) and a control group. In selecting the group, an education higher than a diploma and the age range of 25 to 50 years was considered. During the initial interviews, participants announced their desire to participate in the study; therefore, the study was conducted with 30 participants.

2.1 The instrument

To collect the data, this study used the questionnaire. The questionnaire assesses individual performance. There are twenty statements for concerning personal performance. Grading used the Likert method – 'never' is zero, 'very low' is one, 'low' is two, 'average' is three, 'high' is four, and 'very high' is five. The frequency of these feelings is assessed with grades from zero to six. low personal performance scores indicate incident.

The internal consistency with Cronbach's alpha coefficient is 0.78, with the test-retest coefficient it is 0.65. The internal reliability was as personal accomplishment r=0.76. The authors also assessed the validity of this test during investigations. The questionnaire internal consistency with Cronbach's alpha coefficient was 0.78, with the test-retest coefficient it is 0.65.

2.2 Methods

The questionnaire was first disseminated to staff with the necessary explanations. After collecting the questionnaires, those that scored higher than the 50th percentile in the test for performance were corrected and scored. Thirty people were selected randomly and assigned to two groups. The first group of 15 people received IMLS training and the second group of 15 was the control group. Initially, the content of the training sessions was tailored to IMLS to increase individual performance, and we studied the research literature associated with IMLS.

Then, meetings were prepared after studying the factors affecting job performance and its relation to basic concepts of IMLS with an emphasis on the growth approach to drivers performance. These factors included an emphasis on self-knowledge, data collection for recognition and career choices, discussing the importance of self-assessment and its role in continued employment (individual performance component), the notion of the self-concept and the factors affecting its formation, determining and guiding job style, and determining the course of jobs to attain perfection and overcome humiliation, and making and processing

good business decisions. Finally, consultants and supervisors with skills in the principle components established the curriculum for which the experimental group was trained for 8 sessions of 90 minutes. This program was taught to groups of participants through workshop task-based sessions. Before the intervention and after, participants were evaluated and deemed to be in good condition according to IMLS. The IMLS training is summarized as follows.

The summary of IMLS training session for increase performance:

First session: explanation of objectives, instruction on leading meetings and IMLS. Second session: the concept of performance and its components, the role of trainer in reducing incident. Session three: learning and its role in the choice of occupation and investigating the relationship between learning and occupation. Session four: job dynamics and the need to increase job and career knowledge with a purposeful exchange of views on achieving career goals. Session five: factors affecting self-concept, its role in causing job burnout symptoms, and strengthening positive self-concept. Session 6: evaluation of driver requirements, identifying needs and their impact on performance, prioritization of needs, and unsatisfied needs. Session seven: constituent elements and decision-making stages of groups in the fields of employment and training under creative thinking and critical thinking skills. Session 8: meeting conclusions, questions and answers, content introduction, and post-test completion.

2.3 Data analysis

To check whether the difference between the performance average scores in the groups measured in two stages is based on the teaching method or the result of sampling and measurement error, we used multivariate analysis of covariance (MANCOVA) by adjusting for the effect of pretesting. The most basic assumption of this test is the homogeneity of variances of dependent variables and error covariance matrices, and the Box`M test and ٥ verify this assumption.

3. THE FINDINGS

To answer the research question and hypothesis testing, the data collected were analysed using appropriate statistical methods. We attempted to ensure the same distribution of gender, education, employment history, and age in the participants in the experimental group trained with the IMLS approach and the control group.

The MBI indicates the status of each individual with respect to personal performance. Table 1 offers the mean and SD of the subscales in the experimental and control groups, separately, for the pre-test and post-test.

Table 1: Mean and standard deviation of the dependent variables in the pre-test and post-test of the groups

Variable	Group	Pre-test			Post-test		
		Frequency	Mean	SD	Frequency	Mean	SD
Frequency of personal performance	SMPVC	15	24.6	6.5	15	34.8	4.2
	CON.	15	25.7	4.2	15	25.4	5.2
Personal performance	SMPVC	15	32.2	7.4	15	41	6.1
	CON.	15	32.6	3.8	15	32.9	3.7

Table 1 shows the experimental and control groups' mean and SD for the pre-test and post-test positions for the dependent variables. The mean difference in the post-test of the experimental group shows a reduction in the dependent variables compared to the control group for the dimensions. To analyse significance difference in mean in the groups, we used the multivariate analysis of covariance (MANCOVA) by adjusting for the effect of the pre-test. Before running the test, we investigated the assumption of homogeneity of the covariance matrix and the similarity of variance of error of the dependent variables through M box and Levin tests and in all variables, these assumptions were established.

Table 2: Summary of the table of analysis of covariance (ANCOVA)

		MANCOVA			MANOVA		
Sources of change	Dependent variable	F	Sig	Eta	F	Sig	Eta
Group	Individual performance frequency	67.6	0.001	0.75	112.3	0.001	0.72
	Individual performance intensity	96.3	0.001	0.81	68.4	0.001	0.84

P<0. 001

Table 2 shows the results of multivariate analysis of covariance. According to the F obtained in post-test for all dependent variables, the difference between groups in the post-test at the error level of a<0.001 is significant. According to the ETA, the coefficients of variance of the

dependent variables in groups (intervention) are 70%, 68%, 56%, 65%, 22%, and 25%. According to the test results, training with the IMLS approach is effective in increasing the frequency and intensity of personal performance among the participants.

The results of the ANCOVA analysis are shown. According to the F obtained in the post-test for all dependent variables, the mean differences of all groups are significant at the a<0.001 level of error. According to the ETA coefficient, the variances of the dependent variables by group (intervention) were 67%, 70%, 51%, 70%, 22%, and 25%. According to the test results, instruction with IMLS method was effective in increasing the frequency and extent of personal accomplishment in the participants.

4. CONCLUSION

The results showed that there is a significant difference among the performance in the experimental and control groups after adjusting the score means and eliminating the effect of the pre-test. In other words, the average scores in the experimental group are higher than in the control group. Overall, the IMLS intervention approach had the desired effect on increasing the frequency and intensity of personal performance. Issues such as access control to such systems and the level of integration, plus modifying existing legacy applications to link them to m-learning and LMS need to be addressed. In terms of the kind of applications that can be put for m-learning, internal feasibility and acceptability again needs to be studied. This may vary from organization to organization.

5. REFERENCES

1. Bo Chenga, Minhong Wanga, Stephen J.H. Yangb, Kinshukc, Jun Penga, 2011, Acceptance of competency-based workplace e-learning systems: Effects of individual and peer learning support, , Computers & Education, Volume 57, Issue 1, August 2011, Pages 1317–1333
2. Brian Hunt, Patrik Burvall, Toni Ivergard , 2004, Interactive media for learning (IML): assuring usability in terms of a learning context, Interactive media for learning (IML): assuring usability in terms of a learning context, Education + Training, Vol. 46 Issue: 6/7, pp.361 – 369.
3. Chen, C. C., & Huang, T. C. (2012). Learning in a u-Museum: developing a context-aware ubiquitous learning environment. Computers & Education, 59(3), 873–883.
4. Chih-Ming Chen Ying-Chun Sun, 2012, Assessing the effects of different multimedia materials on emotions and learning performance for visual and verbal style learners, Computers & Education, Volume 59, Issue 4, December 2012, Pages 1273–1285.
5. Ewers, P; Bradshaw, T; McGovern, G; & Ewers, B. (2002). Does training in psychosocial interventions reduce burnout rates in forensic nurses? Journal of Advance Nursing, 37(5), 470-476.

6. Florence Martin, Jeffrey Ertzberger, 2013, Here and now mobile learning: An experimental study on the use of mobile technology, Computers & Education 68 (2013) 76–85.
7. Greer, T. (2009). Learning on the fourth screen: Innovations in location-based learning. Retrieved online from http://api.ning.com/files/Gs5aYnXmNwygskcA58tG5pfiH6qaILCnF1GHra2VE_/locationbasedlearning.pdf.
8. Gwo-Jen Hwanga, , Po-Han Wub, , Hui-Ru Kec , 2011, An interactive concept map approach to supporting mobile learning activities for natural science courses, , Computers & Education, Volume 57, Issue 4, December 2011, Pages 2272–2280.
9. Gwo-Jen Hwanga, Hsun-Fang Changb, 2011, A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students, Computers & Education, Volume 56, Issue 4, May 2011, Pages 1023–1031.
10. Hong-Ren Chen and Hui-Ling Huang, 2010, User Acceptance of Mobile Knowledge Management Learning System: Design and Analysis, Journal of Educational Technology & Society, Vol. 13, No. 3, pp. 70-77.
11. International Telecommunications Untion. (2012). Key global telecom indicators for the World Telecommunication Service Sector.
12. Jieun Kim, Ahreum Lee, Hokyoung Ryu, 2013, Personality and its effects on learning performance: Design guidelines for an adaptive e-learning system based on a user model, International Journal of Industrial Ergonomics, Volume 43, Issue, September 2013, Pages 450–461.
13. Jongpil Cheona, Sangno Leeb, Steven M.Crooksa, Jaeki Songb, 2012, An investigation of mobile learning readiness in higher education based on the theory of planned behavior, Computers & Education, Volume 59, Issue 3, November 2012, Pages 1054–1064.
14. Ju-Ling, S., Chien-Wen, C., & Gwo-Jen, H. (2010). An inquiry-based mobile learning approach to enhancing social science learning effectiveness. Journal of Educational Technology & Society, 13(4), 50–62.
15. Lin, Y. C., Liu, T. C., & Chu, C. C. (2011). Implementing clickers to assist learning in science lectures: the clicker-assisted conceptual change model. Australasian, Journal of Educational Technology, 27, 979e996.
16. Michael W.Allen, 2016, Michael Allen's Guide to E-Learning: Building Interactive, Fun, and Effective Learning Programs for Any Company, published by John Wiley & Sons, Inc., Hoboken, New Jersey. Second edition.
17. Mike Sharples and Jeremy Roschelle, 2010, Guest Editorial: Special Issue on Mobile a Ubiquitous Technologies for Learning, IEEE Transaction On Learning Technologies, Vol. 3, NO. 1, January-March 2010.
18. Nilgun Ozdamar Keskin, David Metcalf, 2011, The Current Perspectives, Theories And Practices of Mobile Learning, The Turkish Online Journal of Educational Technology – April 2011, volume 10 Issue 2.
19. Samii, F. Baghbanian, I. Abedi, M.R. Hosseinian, S. (2011). Theories of Counseling career path (the evolution of the job). Isfahan: Jihad Daneshgahi Publications, Isfahan.
20. Sharifi, Reza, Bazaee Ghasemali, Asadzadeh Hasan, 2017, Intelligent Modelling of Interaction Mobile learning in Railway, 4th UIC World Congress on Rail raining, Berlin/Potsdam.
21. Soa, W., & Konga, S. (2010). Interaction of students' academic background and support levels in a resource-based learning environment on Earth's movement. Interactive, Learning Environments, 18(2), 153–176

22. Soheila Mohammadyari, Harminder Singh, 2015, Understanding the effect of e-learning on individual performance: The role of digital literacy, , Computers & Education, Volume 82, March 2015, Pages 11–25.
23. Teimurinasab, A. Rashid, M.M; Saatchi, M, Kamkari, K. Mousavi Haftadar, M. Salimi, M. (2010). Studying job burnout in human resources organizational factors influencing National Iranian Drilling Company (1-26).
24. Udanor, Collins N.; Oparaku, O. U, 2016, A Performance Evaluation of a Multi-Agent Mobile Learning System, International Journal of Interactive Mobile Technologies, Vol. 10 Issue 2, p10-18. 9p. 10.
25. Wayne F. Cascio, 2014, Leveraging employer branding, performance management and human resource development to enhance employee retention, Pages 121-128.
26. Wu, P., Hwang, G., Su, L., & Huang, Y. (2012). A context-aware mobile learning system for supporting cognitive apprenticeships in nursing skills training. Journal of Educational Technology & Society, 15(1), 223–236
27. Yao-Ting Sunga, , Kuo-En Changb, , Tzu-Chien Liua, 2016, The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis, Computers & Education, Volume 94, March 2016, Pages 252–275.
28. Yi-Hsuan Leea, Yi-Chuan Hsiehb, Chun-Yuan Maa, 2011, A model of organizational employees' e-learning systems acceptance, , Knowledge-Based Systems, Volume 24, Issue 3, April 2011, Pages 355–366 .
29. Yueh-Min Huang, Tsung-Ho Liang, Yen-Ning Su, Nian-Shing Chen, 2012, Empowering personalized learning with an interactive e-book learning system for elementary school students, Educational Technology Research and Development, August 2012, Volume 60, Issue 4, pp 703–722.

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