

Causal Model to Explain the Students' Willingness to Use Cell Phone in Environmental Education

*Mohsen Zargham¹, Seyed Mohammad Shobeiri², Mohammad Reza Sarmadi³, Mohammad Hassan Seif⁴

¹Ph.D. candidate of distance education programming, Payam-e-noor University, Tehran, Iran

²Associate professor, Department of environmental education, Payam-e-noor University, Tehran, Iran

^{3,4}Associate professor, Department of education, Payam-e-noor University, Tehran, Iran

Received: January 6, 2015

Accepted: April 16, 2015

ABSTRACT

The main purpose of this research was to explore factors explaining the willingness to use cell phone learning technology in environmental education, as perceived by the students of the public universities of Tehran, using the correlation analysis of the variance-covariance matrix. The statistical population of the study was the bachelor, M.Sc., and Ph.D. students of public universities in Tehran (N = 142800). Using Cochran's formula, a statistical sample of 400 students was selected by applying the stratified cluster random sampling technique for the Tehran, Tarbiat Modares, Shahid Beheshti, Science and Technology, Amir Kabir, and Motahari Universities. The questionnaire was the main instrument to collect data. The reliability of the questionnaire, as assessed by Cronbach's alpha coefficient, was more than 0.70 for different parts of the measure. The content and face validity of the questionnaire were assessed by the consensus of a panel of experts. The main statistical method used in this research was structural equation modeling, using LISREL, 8.8. The results of the structural equation modeling showed that five factors including perceived ease of use, subjective norms, self-efficacy, attitude, and perceived usefulness play significant roles in the students' willingness to use the cell phone learning technology in environmental education. In this study, the mediating role of two variables, including perceived usefulness and ease of use, in the willingness to apply cell phone learning has been approved.

KEYWORDS: Cell phone learning, Environmental education, Technology, Willingness, Structural equation modeling.

INTRODUCTION

According to increasing population growth and enhancement of destructive activities by humans, environmental crises, which are the outcome of human activities, have disturbed the balance of the globe [1]. On the basis of a UN study (2007), man is the main factor for disturbing the balance; thus, developing awareness and knowledge to create environmental literacy and development of accountability is considered as an inevitable factor toward bettering citizenship behavior [2]. With regard to the rising environmental problems and issues in Iran, it is necessary that the educational system compiles and develops a comprehensive training program, such that all people be informed of the environmental problems and learn the skills to solve them. During the last two decades, most of the problems of educational systems, such as, in-person training, higher education institutes and universities facing a shortage of financial resources, the lack of flexibility in the educational system, and the lack of experienced educators have made specialists and planners innovate educational methods using information and communication technology, to cover a higher population of learners with a better educational quality [3]. Currently, significant advancements in mobile technologies have improved managerial and communicative processes of education. Mobile learning has been noted in recent years as an approach to electronic education throughout the world. It is a kind of learning that can be done through a mobile calculative set, which is able to display learning content and bilateral relationship between the learner and educator [4]. In this kind of equation, portable communication technologies and wireless are used. Using its peculiar features such as constant training possibility, presenting the content associated with learners' talents and needs, and training lots of them at lower costs, this educational system has provided potential capacities for equal accessibility of the societies to education. Also, depending on mobile tools such as the cell phone, the possibility of personalization of education, motivation for education, reaching education and learning associated with learners' location and condition, holding sessions on the learned content, digital conferences, sharing documents containing different types of data, and presenting facilities for implementing the communications is available. It also provides the learners with audio-visual resources [5,6]. However, mobile

*Corresponding Author: Mohsen Zargham, Ph.D. candidate of distance education programming, Payam-e-noor University, Tehran, Iran. Email: zarghammohsen@yahoo.com

learning inherits these advantages from electronic education; it increases the accessibility through the use of mobile technologies [7]. In spite of the fact that noting technical issues is one of the important factors in mobile learning, development of mobile learning courses need careful attention to human factors, users, and instruments [8]. Research on such areas lead to the development of various theories and models, with regard to the use and acceptance of technology by users in organizational environments, among which are, logical practice by [9], the technology acceptance model by [10], the planned behavior theory [11], technology acceptance model 2 by [12], and technology acceptance and use theorization by [13].

Research Theoretical foundation

Rational action theory

In the rational action theory, a person's behavior is determined by their intention to perform. Their behavior and decision to behave in a certain manner is specified by subjective norms, and the attitude toward that behavior is formed in the doer's mind before performance of the behavior [9]. The main relation of this theory is:

Subjective norm + attitude to the behavior = behavioral intention

One of the advantages of this theory includes subjective norms and considers the roles of these norms on some occasions. In this theory, subjective norms refer to the perceived social pressure on persons to continue to do or stop a behavior [14] and the attitude is defined as a positive or negative feeling on carrying out the behavior [15]. It is claimed that the behavior is controlled only by behavioral intention. Therefore, this theory is limited to intentional behaviors (behaviors needing only a decision and intention to be done). However, the behavior is influenced by skills, sources, and opportunities, which are not achievable easily and have not been considered in the practical capabilities of the theory [16].

Technology acceptance model

This theory, which is based on rational action, considers why a special technology is accepted by the users [17,18]. In this model, the main effective factors on technology acceptance include two groups; structures such as external variables, composed of variables such as internal motivation, previous use of computers, assessment of the organization's internal support from using the technology and education level; and the other structure deals with perceived usefulness and perceived facilitation, technology use, attitude toward technology use, intentional behavior, and actual technology use, which are influenced by external variables [19,20]. Davis [10] believed that the model that forms the base of technology acceptance is made up of two special images or beliefs, including, mental perception of usefulness and mental perception of convenience. These two factors influence people's attitude to use a technology and cause them to decide to use that technology, and finally use it in practice. During the last two decades, this model has been known as a strong model, as the users have accepted the technology [12]. External variables influence the perceived usefulness of the use technology and its perceived convenience both directly and indirectly [21,22]. Among these variables is computer self-efficacy, which is attributed to the users' belief in their ability to implement their special assignments, which shows a judgment of their ability to use the computer [23,24,25]. Many studies have used this model, investigating the effective factors on the use of new technologies; for example, Shaikh Shoaie [26] investigated this model and considered the effective factors on acceptance of information technology by librarians of the Faculty of Engineering in the State Universities of Tehran. The results showed that the variables of attitude toward use, convenience of use, and usefulness of use had the highest indirect effect on using information technology (IT). Atarodi & Saeedi Rezvani [27] investigated the relationship of personal and cultural variables with regard to the attitude toward using technology among students using the technology acceptance model. The results showed that perceived usefulness and convenience use had a positive and direct relationship with computer use. Also the perceived use convenience on the attitude toward computer through the perceived usefulness showed an indirect, positive and meaningful effect. In general, the model showed that among internal variables, perceived usefulness and convenience had the highest direct positive effect on the attitude toward computer use. Ahmadi Dehqotbadini *et al.* [28] investigated the effect of computer self-efficacy on the perceived pleasure and structure of the technology acceptance model. The results clearly showed the important role of computer self-efficacy and the perceived pleasure on the behavioral intention of persons in using a computer, considering the effect of these factors as one of the most important determining factors in the probability of using computer by users. The results showed that self-efficacy in using a computer had a direct relationship with the perceived convenience (0.23), but this effect was not meaningful for behavioral intention. The direct effect of perceived convenience on perceived usefulness (0.03) was meaningful at 0.01, but it was not meaningful for behavioral intention at 0.04. Jafari Trojani [29] in a study aiming to determine the role of the previous experience variables, self-efficacy and computer stress, on using and accepting the teachers based on the technology acceptance model, showed that the previous experience variables, the perceived usefulness, and computer stress influenced the

use of computer by teachers, directly and indirectly; and the behavioral intention variable had a direct relationship with the teacher's use of the computer. The perceived convenience variables and attitude also did not have a direct effect, but an indirect effect, and only self-efficacy had a direct effect on teachers using the computer. Al-Ghahtani [30] investigated the capability of using the technology acceptance model in cultures other than the American culture, and considered the factors that had an effect on IT acceptance. The sample was 324 of an IT-based system. The results verified the use of this model in England, showing that personal attitudes, perceived usefulness, and convenience were the most effective factors for accepting IT. Perceived usefulness had a significant and direct effect on IT acceptance. Sun [31], has analyzed an IT-acceptance model in 15 studies. He concludes that perceived convenience has a meaningful effect on perceived profitability. However, its direct relationship with the attitude toward the use, behavioral intention for using, and the real system of use have not been studied in most of the researches. Experience use has an intermediary effect on the relationship between perceived convenience and profitability. Perceived usefulness, as the most effective factor in relation to other contributing factors on user acceptance, has been emphasized. The results also show that attitude is a good predictor for the intention of technology use. Hu et al. [32] investigated IT acceptance by school teachers in a longitudinal study. The results showed that the attitude toward using computer and computer self-efficacy had a direct relationship with intention to use. Perceived usefulness also had a positive and meaningful effect on intention to use. The effect of use of convenience on the perceived usefulness was also verified, and seemed that it increased with the user's experience. Perceived convenience could meaningfully and indirectly influence the teachers' decision to accept. Computer self-efficacy also had a direct effect on perceived usefulness and convenience. Ramayah & Aafaqi [33] showed that the perceived convenience of IT was influenced positively by computer self-efficacy, using the computer, and acceptance of the technology. Ramayah et al. [34] studied the attitude of 192 Malaysian junior high school teachers, from 12 provinces, who were working with computers. The results showed that perceived convenience had a direct and meaningful effect on perceived usefulness (0.58) and the attitude to use (0.239). Perceived usefulness did not have a meaningful effect on the attitude to use (0.12), but had a direct positive effect on the behavioral intention to use (0.18). The attitude to use had a meaningful and direct effect on behavioral intention (0.53); and behavioral intention also had a direct and meaningful effect on use (0.68). The model fit was; GFI: 0.92, CFI: 0.93: RMSEA: 0.061. Teo et al. [35] in a study aiming to investigate the pre-service teachers' attitude toward computers and development of the technology acceptance model, with external variables of subjective norms and facilitating conditions came to the conclusion that perceived usefulness, use for convenience, and subjective norms were meaningful determiners of the users' attitude toward computer. Facilitating conditions were not directly effective on the attitude to use, but were effective on the perceived convenience. In another study, Teo [36] predicted the acceptance level of Singaporean teachers. In addition to the main variables of the IT acceptance model, other external variables such as complexity of technology, facilitating effects, and computer self-efficacy were added. The results showed that attitude to computers, perceived usefulness, and computer self-efficacy had a direct effect on the intention to use IT; while, technology complexity, perceived use convenience, and facilitating conditions, indirectly affected the intention to use. Computer self-efficacy also had a direct effect on perceived usefulness (0.90) and convenience of use (0.01).

With regard to the above discussions, the purpose of the present study is to explain the causative model of students' attitude to use of cell-phone for environmental education. The minor aims of the study are:

1. Identifying the effective components of media-use behaviour in mobile learning.
2. Identifying and investigating the relationship between the effective components in the willingness to use the mobile for education learning.
3. Presenting the causative model of the willingness to use mobile learning for environmental education.

The following is the theoretical model of the present study based on the literature review:

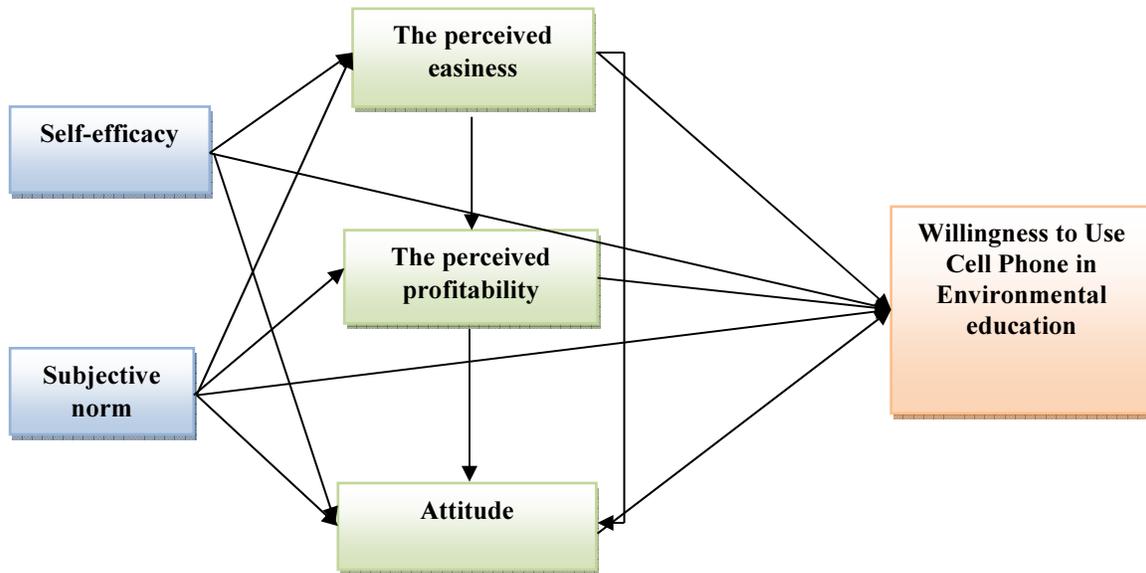


Figure 1. Research conceptual model

Research hypotheses

The following are the research hypotheses:

1. There is a direct relationship between self-efficacy and subjective norms in using cell-phones and the perception of convenience of using cell-phones in environmental education.
2. There is a direct relationship between self-efficacy and subjective norms and the perception of convenience of using cell-phones in environmental education and the attitude to mobile learning in environmental education.
3. There is a direct relationship between self-efficacy, the perception of convenience of using cell-phone, the perceived profitability, the subjective norms, and the attitude and subjective norms to use cell-phones in environmental education.
4. There is an indirect–direct relationship between self-efficacy and subjective norms in using cell-phones and the willingness to use cell-phones in environmental education through perceived convenience.
5. There is an indirect–direct relationship between perceived convenience and usefulness in using cell-phones and the willingness to use cell-phones and willingness to get environmental education through cell-phones.

RESEARCH METHOD

The present research is applied regarding the purpose which is done through causal-correlational method considered in Covariance-Variance Matrix. The population of the study comprises of 142,800 students of BA, MA, and Ph.D. levels from the Tehran State Universities (Department of Students' Affair of Science, Research and Technology Ministry). On the basis of the Cochran formula, the sample size was 383 and 5% was added to it, to increase the statistical power, which came up to 400 students. Cluster random sampling was used in Tehran, Tarbiat Modares, Shahid Beheshti, Science and Industry, Amir Kabir, and Motahari Universities. A two-part questionnaire (the demographic information part and the 24 compiled questions) was used to collect the data of students' willingness to use mobile learning. The attitude to use cell-phone in environmental education and self-efficacy were selected from Yang [37,38] was used to measure the intention of using cell-phone in environmental education, and to measure subjective norms, the questionnaire by [39] was used. A panel of experts verified the face validity of the questionnaire and 30 questionnaires filled in by the students of Tehran University were used to consider the reliability through the Cronbach alpha (Table 1). As shown, the value was more than 0.70, which was an acceptable level.

Table 1. Cronbach alpha level for the study variables

Cronbach alpha	Number of items	Predictive variables and criteria
0.71	10	Attitude
0.78	7	Self-efficacy
0.78	8	perceived convenience
0.76	8	perceived usefulness
0.77	4	Willingness to use
0.78	5	Subjective norms

The dependent variable is the willingness to use a cell-phone, which is measured by four items. The LISEREL software and search engine marketing (SEM) were used to investigate the role of effective components when using the cell-phone in a learning environment. The contents included external variables of self-efficacy and subjective norms, intervening variables of convenience perception, usefulness perception, and attitude.

Findings

The demographic information of the participants showed that 52.3% were female and 47.7% were male. Human science learners (43.2%) were the highest number of participants. With regard to the education level, most of the participants were MA (61.5). (Table2).

Table 2. Frequency distribution of participants’ demographic information

Percent	Frequency	Demographic information	
47.7	191	Male	Gender
52.3	209	Female	
100	400	Total	
43.2	173	Human sciences	Field of study
34.5	138	Engineering	
22.3	89	Basic sciences	
100	400	Total	
61.5	246	BA	Education level
30.2	121	MA	
8.3	33	Ph.D.	
100	400	Total	

Correlation matrix of the variables

On the basis of the calculated means, the students’ willingness to use a cell-phone in environmental education (4.31), the perceived level of usefulness from using cell-phone in learning environment issues (3.60), and the perceived level of convenience from using cell-phone in learning environment issues (3.80) were reported at high levels. The mean of subjective norms from using cell-phone in learning environment issues (3.35) was reported at the mid level and their attitude (2.64) was reported at a low level (Table 3).

Table 3. The mean and standard deviation of learning model components

SD	*Mean	Component
4.99	60.3	Perceived profitability
40.3	35.3	Subjective norms
14.3	60.3	Self-efficacy
81.3	64.2	attitude
60.3	80.3	The perceived ease of use
69.3	31.4	Tendency to use

Table 4 shows the correlation matrix of the effective components in the willingness to use education technology through cell-phone. As shown, there is a positive and meaningful relationship between perceived easiness, perceived profitability, attitude to use the cell-phone in environmental education, their subjective norms and tendency to use the cell-phone in learning environmental education issues. The highest correlation was between the usefulness of using cell-phone and the willingness to use it (0.57); and the lowest relationship was between the perceived easiness and willingness to use mobiles in environmental education.

Table 4. Correlation matrix of effective components in willingness to use education technology through cell-phone

Subjective norms	Attitude	Usefulness	Use easiness	Self-efficacy	Components
43.0**	56.0**	57.0**	36.0**	44.0**	Willingness to use cell-phone

Path analysis of the effect of contributing factors on the willingness to use learning technology through cell-phone

Table five shows the effect of the five contributing factors on students' willingness to use learning technology through cell-phones. It reports the direct and indirect effects, the total, and the variance of the variable. As shown, there is only a direct effect of perceived easiness on the willingness to learn through a cell-phone, which is not meaningful ($t = 0.85$) and all other variables have a positive and meaningful effect on using cell-phones in environmental education. Also, self-efficacy (0.10) and subjective norms (0.07), at $p \leq 0.05$ and perceived easiness (0.12) and perceived usefulness (0.09) at the $p \leq 0.01$ level have an indirect and meaningful effect on using this technology. According to Table 5, the total effect of self-efficacy is 0.21, which is meaningful with regard to the t-value (5.17), at $p \leq 0.01$. On the basis of the following table, the sum of the variance in willingness to use the cell-phone in environmental education is 0.45, which can be explained by two external variables (self-efficacy and subjective norms) and three intervening variables (perceived usefulness, easiness, and attitude). In other words, 45% of the change in scores of the tendency to use cell-phone in environmental education can be predicted by these five variables.

Table 5. Standardized coefficients estimation of direct, indirect, and the total effect and the variance of the model

Variance	Total effect	Indirect effect	Direct effect	Effect on	Variables
			24.0**	Perceived easiness	Self-efficacy
			24.0**		Subjective norms
			39.0**	Perceived usefulness	Perceived easiness
			27.0**		Subjective norms
			36.0**	Attitude	
			06.0		
					Self-efficacy
					Subjective norms
					Perceived easiness
					Perceived usefulness
			09.0		
			37.0**		
		45.0	21.0**	10.0*	11.0*
			29.0**	07.0*	21.0**
			16.0**	12.0**	04.0
			36.0**	09.0**	27.0**
			25.0**		25.0**
					Self-efficacy
					Subjective norms
					Perceived easiness
					Perceived usefulness

Considering research hypotheses

Now, the research hypotheses are considered based on Table 5.

Hypothesis one: There is a direct relationship between self-efficacy and subjective norms in using cell-phone and the perception of convenience of using cell-phone in environmental education.

The estimated value of the direct effect of self-efficacy on perceived easiness is 0.24 ($t = 4.28$) and the standardized parameter of the direct effect of subjective norms on the perceived easiness is 0.24 ($t = 4.87$), which are meaningful at the $p \leq 0.01$ level.

Hypothesis two: There is a direct relationship between self-efficacy and subjective norms and the perception of the convenience of using cell-phone in environmental education and the attitude to mobile learning in environmental education.

The estimation coefficient of the standardized parameter with respect to the direct effect of subjective norms on perceived usefulness is 0.27 ($t = 5.75$) and the direct effect of perceived easiness with perceived usefulness is 0.39 ($t = 8.73$), which are meaningful at the $p \leq 0.01$ level.

Hypothesis three: There is a direct relationship between self-efficacy, the perception of convenience of using a cell-phone, the perceived profitability, the subjective norms and attitudes, and the subjective norms to use a cell-phone, in environmental education.

The estimated value of the direct effect of self-efficacy on attitude is 0.36 ($t = 8.84$), subjective norms on attitude is 0.06 ($t = 1.47$), and that of perceived easiness is 0.09 ($t = 1.95$). Therefore, with regard to the t-value, the relationship of the subjective norm and the perceived easiness of using cell-phone in environmental education is not

meaningful, but the relationship between self-efficacy in using a cell-phone with the attitude to mobile learning in environmental education is meaningful at the $p \leq 0.01$ level.

Hypothesis four: There is an indirect-direct relationship between self-efficacy and subjective norms in using a cell-phone, with the willingness to use a cell-phone in environmental education through perceived convenience.

The estimated value in the direct effect of self-efficacy on attitude is 0.11 ($t = 2.46$), which is meaningful at the 0.05 level. The estimated value in the direct effect of the perceived easiness on attitude is 0.04 ($t = 0.85$), which is not meaningful at the 0.05 level. The standardized coefficient as a direct effect of perceived usefulness on attitude to mobile learning is 0.27 ($t = 5.14$), the subjective norm on attitude is 0.21 ($t = 4.66$), and the attitude toward the tendency to use cell-phone in environment learning is 0.25 ($t = 4.42$). These are meaningful at the $p \leq 0.01$ level.

Hypothesis five: There is an indirect relationship between the perceived convenience and usefulness in using cell-phone and the willingness to use cell-phone in environmental education through cell-phone.

The indirect relationship between perceived convenience and usefulness and attitude was considered.

The standardized coefficient for this effect is 0.01, which is meaningful at the 0.05 level, with regard to $t = 3.88$. The standardized parameter of the indirect effect of subjective norms on tendency, with intervention of perceived easiness and usefulness, is 0.07, which is meaningful at the 0.05 level, with regard to $t = 3.29$.

Hypothesis six: There is an indirect relationship between perceived convenience and usefulness in using cell-phone and the willingness to use cell-phone in environmental education.

The indirect relationship of perceived convenience and attitude is through intervention of perceived usefulness and attitude.

The standardized parameter for this effect is 0.12, which is meaningful at the 0.05 level, with regard to $t = 4.17$. The standardized parameter of the indirect effect of perceived usefulness on tendency with intervention of attitude is 0.09, which is meaningful at the 0.05 level, with regard to $t = 3.39$. Table 6 shows the values of the acceptable proportion and fit of the final model with the data.

Table 6. The indices of the final model fit of the tendency to use cell-phone in environmental education

Result	Acceptable range	value	index
Model fitting	≤ 05.0	0001.0	RMSEA
Model fitting			
Model fitting			
Model fitting			
	≥ 95.0	96.0	NFI
	≥ 9.0	96.0	CFI
	≥ 9.0	97.0	GFI

DISCUSSION

The purpose of the present study was to explain the causal model of the willingness to use cell-phone in environmental education. The results clearly showed that the important and direct roles of self-efficacy, subjective norms, perceived usefulness, and attitude on students' behavioral intentions in using cell-phones for environmental education, were verified. These findings generalized the results of the previous research in the area of technology acceptance, by creating bonds between the motivational, socio-psychological, and important variables of the acceptance model, which were, perceived easiness of using the computer and perceived usefulness of computer use and its experiential verification. The results of the study showed the meaningful and direct effect of self-efficacy on the perceived easiness of using a cell-phone in environmental education, which was according with the researches of Ramayah & Afaghi [33] and Teo [36] on computer self-efficacy and computer-perceived easiness. Also, there was a direct relationship between self-efficacy and attitude and a direct and indirect relationship between self-efficacy and the willingness to use education technology through cell-phone, which were verified by the studies of Ahmadi Dehqotbadini [28], Jafari Trojani [29], Hu et al. [32], Ramayah & Afaghi [33] and Teo [36]. Shaikh Shoai [26], Sun [31], Hue et al. [32], Jafari Trojani [29], Ramayah et al. [34], Al-Ghahtani [30] found a direct and indirect relationship between perceived usefulness and the tendency to use education technology through cell-phone. The study by Ahmadi Dehqotbadini [28] did not verify this relationship. The results of the study showed a direct and meaningful relationship between perceived easiness in using the cell-phone and the tendency to use it in environmental education, which was in accordance with Shaikh Shoai [26], Hue et al. [32]. It showed that when students' perception of their ability and self-efficacy to use this technology was more, the probability of accepting it would increase. When the learners believed that they had enough ability to use the educational hardware and software through a cell-phone, they would accept it more quickly and use it. Therefore, it was suggested that training courses be held on how to use this technology in environmental education. Also, compiling strategies to facilitate

using the software and hardware and planning the education system through cell-phone would have an effect on the learners' willingness to learn. With regard to a direct and meaningful relationship between perceived easiness and usefulness, such a belief made a positive perception of the usefulness of this technology increasing the performance and effectiveness of learning. It should be noted that Ahmadi Dehqotbadini [28] and Ramayah et al. [34] found a meaningful relationship between these two variables. Al-Ghahtani [30] and Sun [31] did not find a direct relationship between these two variables. A direct and meaningful relationship was verified between the attitude to use a cell-phone in environmental education and the willingness to use it, in the previous studies of Shaikh Shoai [26] and Hue et al. [32]. However, Sun [31] and Ramayah & Afaghi [33] did not verify such a relationship. Thus, considering policies to create a positive attitude toward mobile learning through a cell-phone would be effective on the facilitation of its acceptance.

CONCLUSION

In total, with regard to the appropriateness of the indices of the model fit and to commensurate the experiential data with the conceptual framework of the present study, it is concluded that mixing technology acceptance and logical action is a valid and proper model for successful acceptance of education technology through cell-phones in environmental education by students of the State Universities of Tehran.

REFERENCES

- [1] Parhizkar, L., Shabiri, M., Sarmadi, M.R. (2012). Investigating Tehran teachers' attitude to environment course contents in primary education. *Environmental education and sustainable development*, 1(2), 43-53.
- [2] Babazadeh, A. Qahremani, M. Akbari, M. (2012). The learner institutes: the context of environmental education. *Environmental education and sustainable development*, 1(2), 69-78.
- [3] Marsei, S. (2011). Investigating the role of learning system in educational communications of agriculture corporations. *Education technology*, 6(2), 142-158.
- [4] Dye, A., Solstad, B.E. & Aloka, K.J. (2003). Mobile education- A glance at the future. *A report of Norwegian School of Information Technology and part of NKI Distance Education for Leonardo Davinchi II program of the European Union, Norway*. Retrieved 11 May 2014 from: http://www.dye.no/articles.a_glance_at_the_future.introduction.html
- [5] Mac Callum, K. (2008). Mobile technology in collaboration: Evaluation of a web-based discussion board. *International Journal of Mobile Learning and Organization*, 2, 318 - 328.
- [6] Sharma, S.K., Kitchens, F.L. (2004). Web services architecture for m-learning. *Electronic Journal on e-Learning*, 2 (1) (2004), 203-216.
- [7] Chris, E. (2008). The effectiveness of m-learning in the form of podcast revision lectures in higher education, *Computer and Education*, 50 (2), 491-498.
- [8] Insap Santos, P. (2003). *Applying flow theory and technology acceptance model to improve student performance in a Web-based course: A conceptual framework*. Retrieved on September 11, 2013 from: web.rp.sg.santosa.PDF.mICTE2003-Final.pdf
- [9] Ajzen, I., Fishbein, M. (1975). *Understanding attitudes and predicting social behavior* Englewood Cliffs, NJ: Prentice-Hall.
- [10] Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13 (3), 319-340.
- [11] Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50 (2), 179-211.
- [12] Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46 (2), 186-204.
- [13] Venkatesh, V., & Viswanath, M.G. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425-478.
- [14] Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research*, 2 (3), 173-191.
- [15] Morris, M. & Dillon, A. (1997). How user perceptions influence software use. *IEEE Software*, 14(4), 58-65.
- [16] Conner, M., & Armitage, C.J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology*, 28(15), 1429-1464.
- [17] Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems*, 8 (4), 244-254.

- [18] Hernandez, B., Jimenez, J. & Jose-Martin, M. (2008). Extending the technology acceptance model to include the IT decision-maker: A study of business management software. *Technovation*, 28(1), 112-121.
- [19] Vainio, H.M. (2006). *Factors influencing corporate customers' acceptance of internet banking: Case of Scandinavian trade finance customer*. Retrieved on May 18, 2014 from: www.pafis.shh.fi/graduates/hanvai03.pdf.
- [20] Karami, M. (2006). *Factor influencing adoption of online ticketing*. Retrieved on September 21, 2013 from: epubl.ltu.se/1653-0187.2006.45.index-en.html.
- [21] Saadé, R. G. & Kira, D. (2006). The emotional state of technology acceptance. *Informing Science and Information Technology*, 3, 229-239.
- [22] Vin-Cent Chang, P. (2004). *The validity of an extended Technology Acceptance Model (TAM) for predicting internet portal usage*. Retrieved on June 1, 2014 from: etd.ils.unc.edu/8080.dspace.bitstream.1901.78.1.draft25.pdf.
- [23] Tsai, M. H., (2004). *The effects of four different strategies of information presentation in software training*. Retrieved on September 21, 2013 from: www.purl.fcla.edu/fcla.etd.CFE0000260.
- [24] Ambrose, P.J. (2007). Metacognition and software developer competency: Construct development and empirical validation. *Information Systems*, 8(2), 273-279.
- [25] McGill, T., & Bax, S. (2007). From beliefs to success: Utilizing an expanded TAM to predict Web Page development success. *International Journal of Technology and Human Interaction*, 3(3), 36-53.
- [26] Sheikh Shoai, F (2006). Investigating the effective factors on IT acceptance by librarians of Tehran state universities engineering faculties: the ability of using technology acceptance model. M.A thesis. *Tehran University*, Tehran, Iran.
- [27] Atarodi, M., Saeedi Rezvani, M. (2011). Explaining the effective factors on the attitude to computer among students Mashhad Ferdowsi University. *ICT in educational sciences*, 1, 41-58.
- [28] Ahmadi Dehqotbadini, M., Moshkani, M. & Mohamakhani, A. (2010). The effect of computer self-efficacy and computer stress on the structures of Davis technology acceptance model: new perspectives of social psychology. *Psychological research*, 25, 51-72.
- [29] Jafari Trojani, S. (2011). The role of the previous experience, teachers' computer self-efficacy and stress based on technology acceptance model. MA thesis: *Psychology and educational sciences*. *Tehran University*, Tehran, Iran.
- [30] Al-Ghahtani, M. (2001). The applicability of TAM outside North America; an 16 empirical test in the United Kingdom. *Information Resources Management Journal*, 3(4), 37-46.
- [31] Sun, H. (2003). An integrative analysis of ATM. Toward a deeper understanding of technology acceptance model. *Proceedings of the 9th American Conference on Information Systems*, 6-8 Sep., Tampa, HL.
- [32] Hu, P. J., Clark, T. K. & Ma, W.W. (2003). Examining technology acceptance by school teachers: A longitudinal study. *Information and Management*, 41(2), 227-241.
- [33] Ramayah, T., & Afaqi, B. (2004). Role of self-efficacy in e-learning usage among students of a public university in Malaysia. *Malaysian Journal of Library & Information Science*, 9 (1) 39-57.
- [34] Ramayah, T., Sawaridass, A., Imad, Z., Roy, M.H. and Zafar, U.A. (2007). Critical success factors for successful implementation of enterprise resource planning (ERP) systems in manufacturing organizations. *International Journal of Business Information Systems*, 2(3), 276-297.
- [35] Teo, T., Lee, C. B. & Chai, C.S. (2007). Understanding pre-service teachers' computer attitude: applying and extending the technology acceptance model. *Journal of Computer Assisted learning*, 24, 128-143.
- [36] Teo, T. (2009). Modeling technology acceptance in education: A study of pre-service teacher. *Computer & Education*, 52, 302-312.
- [37] Yang, S. H. (2012). Exploring College Students' Attitudes and Self-Efficacy of Mobile Learning. *The Turkish Online Journal of Educational Technology*, 11(4), 148-154.
- [38] Chatzoglou, P.D., Sarigiannidis, L., Vraimaki, E., & Diamantidis, A. (2009). Investigating Greek employees' intention to use web-based training. *Journal of Computers & Education*, 53, 877-889.
- [39] Ajjan, H., Hartshorn, R. (2008). Investigating Faculty Decisions to Adopt Web 2.0 Technologies Theory and Empirical Tests. *Internet and Higher Education*, 11, 71-80.