Cognitive and Affective Aspects of SMS based Learning at the University Level

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Mobile learning delivery platforms include cell phone based SMS technologies that provide access to learning materials without being limited by space or time. Sophisticated technological advances in the domain of pedagogical delivery have led to flexible, motivated, user-friendly, controlled and adaptive learning using cell phone based delivery platforms. In the present study 296 first year college students who studied academic Hebrew language in a mandatory 28 week long (yearly) 'Introduction to Academic Hebrew' course were divided into two comparison groups and exposed to two different modes of vocabulary delivery. The first group of students received weekly lists of academic Hebrew vocabulary definitions sent via SMS messages to their cell-phones and the second group received weekly lists of academic Hebrew vocabulary definitions sent via email messages to their personal computer email inboxes. The academic Hebrew vocabulary lists studied by the students and provided via SMS and email delivery platforms were identical and the students received weekly lists 20 words and their exact definitions (total of 560 words) for the 28 week period of the course. At the end of the course the students in the two groups were tested on a standardized Academic Hebrew Vocabulary Achievement Test (AHVAT) and responded to a questionnaire that examined their levels of learner self-esteem, learner attribution and learner technological efficacy. Results of the study indicate that there were no significant differences between the achievement scores on the standardized Academic Hebrew Vocabulary Achievement Test attained by students in the SMS delivery group and students in the email delivery group. However, there were significant differences between the students in the two different delivery groups regarding their levels of learner self-esteem, learner attribution and learner technological efficacy. The students who received academic Hebrew vocabulary definitions via SMS messages indicated significantly higher levels of learner self-esteem, learner attribution and learner technological efficacy than their counterparts who received academic Hebrew vocabulary definitions via email messages. The results of the study indicate the potential evident in SMS based learning delivery platforms regarding enhancement of students' attitudes such as learner self-esteem, learner attribution and learner technological

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efficacy in academic vocabulary learning. It is proposed that SMS learning delivery platforms can become a viable technological mobile delivery system in the university learning process and serve as a routine alternative platform for the delivery of relevant learning materials to students.

Introduction

Among the latest developments within mobile learning has been the introduction of the use of the cell-phone as a learning delivery system (Attewell & Savill-Smith, 2004; Prensky, 2005). It should be noted that the use of cell-phones is multi-dimensional and cell-phone technology now provides technological possibilities including voice, text, still-camera, video-camera, paging and geo-positioning capabilities. These tools provide a rich variety of platforms that potentially enhance the learning process. Moreover, learning is not bound by space or time and students can choose to engage in learning without almost any limitations (Dieterle & Dede, 2006).

Mobile phones are varied in size, design and model and Attewell (2005) concluded that the varied designs are meant to cater for varied customer tastes. This implies that applications designed for use on cell-phones must take cognizance of user preferences. In teaching and learning, the application should be designed to cater to the specific needs of the learner (Conole, 2004).

In a number of countries students already use cell-phones as learning tools. Thornton & Houser (2002; 2003) described projects using cell-phones to teach English at a Japanese university. Cell-phone based learning projects managed by several universities worldwide have indicated the positive outcomes of cell-phone based learning delivery (Divitini, Haugalokken & Norevik, 2002; Garner, Francis & Wales, 2002; Seppälä, 2002; Stone & Briggs, 2002).

Ismail, Idrus & Johari (2010) and Rosli et al (2010) confirmed that university students in Malaysia perceived that SMS messaging contributed to the effectiveness of their learning and is felt by them to be an effective and useful learning methodology. Thornton & Houser (2005), Thatcher & Mooney (2008) and Cavus & Ibrahim (2009) concluded that cell phone SMS technology has the potential to be strongly welcomed at the tertiary educational level as a valuable learning delivery platform. Katz & Yablon (2009; 2011) as well as Katz & Katz (2011) and Katz (2013) confirmed that cell-phone based SMS learning delivery platforms has become an accepted and integral part of mobile learning, most especially at the university level.

Affective Factors Related to Mobile Learning

Recent studies have been conducted in order to investigate the relationship between different factors and the outcome of the learning process. It is clear that affective factors have a strong relationship with successful learning both in

traditional classrooms as well as in ICT based learning (Katz & Yablon, 2003). Warschauer & Healey (1998) conducted a research study that sought to identify those affective factors related to successful ICT based learning. They reported that learner motivation, learner autonomy, learner control of the learning process, learning flexibility and ICT user friendliness are some of the major factors contributing to enhanced learning through the medium of ICT methodologies. Mainemelis, Boyatzis & Kolb (2002), Zurita & Bruce (2005), Cavus & Ibrahim (2009) as well as Katz & Yablon (2009) confirmed the association of some or all of the above factors with effective ICT based learning.

Learner autonomy is a major contributor to effective learning enhanced by ICT strategies. Tijdens & Steijn (2005) found that autonomy of the learner when engaging in ICT based learning is one of the key factors contributing to the ability of the learner to master learning material. Granic, Cukusic & Walker (2009) confirmed that learner autonomy is a key factor in effective learning when SMS messaging is the delivery platform being used.

Learner control of the learning process has also been identified as an important affective factor that positively contributes to ICT based learning. Shin, Schallert, & Savenye (1994) and Boekaerts (1997) indicated that control of the learning process allows students the freedom to learn more comprehensively especially when learning is delivered via a digital platform. Control of learning has also been identified by Katz & Yablon (2009; 2011) and by Katz (2013) as an important variable that positively contributes to ICT based learning and particularly in the domain of learning via mobile technologies.

Mainemelis, Boyatzis & Kolb (2002) indicated that learning strategies that enhance greater flexibility in responding to different learning contexts promote higher levels of learning performance. On the basis of their study Mainemelis, Boyatzis & Kolb suggest that learning flexibility, evident in learning situations offered in ICT based digital learning, is predictive of highly integrated and complex levels of learning,

Another key factor found to be significant in the mobile learning process is that of user friendliness. Scholars, such as Zurita & Bruce (2005), have confirmed that user friendliness is an important factor necessary for effective learning and mastery of any particular digital learning methodology. Katz & Yablon (2009) confirmed that user friendliness of the digital system is a central factor related to successful cell-phone learning, such as via SMS learning delivery platforms.

Katz & Yablon (2009; 2011; 2012) indicated the centrality of students' attitudes including learner motivation, learner autonomy, learning flexibility, learner curiosity, learner self-efficacy, learner technological self-confidence and user friendliness of the technology strategy toward cell-phone learning at the university level in Israel and indicated positive relationships between the above factors and effective attitudes toward the use of SMS based delivery of learning

The above factors have been shown in a number of recent research studies to have a clear and significantly positive relationship with mobile learning strategies and delivery systems in general and more especially cell-phone based SMS learning delivery platforms (Katz, 2013).

The current study, in addition to examining the relationship between different digital learning delivery platforms and academic achievement, pays particular attention to three additional factors thought to be related to effective learning by cell-phone based SMS learning delivery, namely, learner self-esteem, learner attribution and learner technological efficacy..

Regarding the relationship between self-esteem and academic achievement as well as between self-esteem and attitudes toward digital learning delivery platforms, it is typically assumed that self-esteem is a central social variable that leads to increased academic achievement and most studies are conducted with this theoretical assumption in mind (DeBerard, Spielmans & Julka, 2004). However Baumeister et al (2003) point out that research findings increasingly indicate self-esteem is an outcome, rather than an antecedent of academic achievement and positive attitudes toward learning and thus will be further elaborated in this study.

When addressing the relationship between learner attribution and academic achievement and attitudes toward ICT based learning delivery platforms there seems to be consensus that students who attribute their academic achievement to their ability and effort expended (Boruchovitch, 2004; Sweeney, Moreland & Gruber, 2005), are those who attain significantly higher levels of achievement and as a result potentially develop positive attitudes toward different types of digital learning delivery platforms. This attitudinal possibility will be examined in this study.

With reference to the relationship between learner technological self-efficacy and academic achievement and attitudes toward learning delivery platforms, Alsafran & Brown (2012) indicated that in a study conducted in Singapore, students who were technologically efficient attained higher levels of academic achievement which contributed to the development of positive attitudes toward digital learning delivery platforms. Balci, & Demirbas (2012) similarly found that students who efficiently used technology in the learning situation seemed to develop positive attitudes toward their learning irrespective of the delivery platform. Thus the connection between learner technological efficacy and digital learning platforms will be further examined in this study.

In summary, in the present study, the comparative effectiveness of two different delivery platforms for academic Hebrew vocabulary proficiency was investigated at the university level. The effectiveness of SMS or email learning delivery platforms were those investigated in the study regarding their comparative relationships with academic achievement. In addition the relationship between learner self-esteem, learner attribution and learner technological efficacy and the two different learning delivery platforms was examined.

Method

Research Participants

A total of 296 first year university students enrolled at one of the seven chartered universities in Israel participated in the present study. All students at this particular university are required to successfully pass a standardized achievement test on a pool of 560 basic academic Hebrew vocabulary definitions as a mandatory condition for being awarded their bachelor's degree. The 560 vocabulary definitions formed the basis of knowledge imparted to students in the year-long 'Introduction to Academic Hebrew' course. The students were registered in the mandatory course and were randomly assigned to two comparison groups, each of which was provided with 560 identically worded Hebrew vocabulary definitions. 133 students received their vocabulary lists via cell-phone based SMS messages and 163 students were sent their vocabulary lists via email messages to their personal computers. Both groups received the vocabulary lists on a weekly basis during the 28 weeks of the duration of the course.

Research Instruments

Two research instruments were administered to the students in this research study. The first research instrument was a standardized Academic Hebrew Vocabulary Achievement Test (AHVAT), administered on culmination of the year-long 'Introduction to Academic Hebrew' course. The test used in the present study consisted of 100 items which tested for students' level of proficiency in academic Hebrew vocabulary. The test scoring scale ranged from 0-100, the higher grades indicating higher levels of achievement. The second instrument was a composite 35 item Likert Scale (scale of 1-5, where 1=totally disagree and 5=totally agree) type attitude questionnaire designed to examine students' levels of learner self-esteem, learner attribution and learner technological efficacy. The first factor, learner self-esteem, contained 12 items (Cronbach α = .81), the second factor, learner attribution, consisted of 10 items (Cronbach α = .78) and the third factor, learner technological efficacy, was made up of 13 items, (Cronbach α = .76).

Procedure

The 296 participating students were randomly assigned to the two learning delivery groups. The 133 students in the first group received the vocabulary definitions via weekly cell-phone based SMS messages and the 163 students in the second group were provided with the weekly vocabulary definitions via email messages. The learning material consisted of a pool of 560 academic vocabulary definitions on which the students were tested after a study period of 28 weeks. The definitions were taken from the 'Sage Dictionary of Social Research Methods' (Jupp, 2006) and translated into Hebrew by experts in social research methods. The students in the SMS delivery group received 20 weekly vocabulary definitions sent as SMS messages to their personal cell-phones through a group delivery system. The students in the email delivery group were sent the 20 weekly vocabulary definitions to their personal

computers identified in advance by their computers' IPs. Thus, during the 28 week period of the course, all students received all 560 vocabulary definitions on which they were later examined using the standardized AHVAT achievement test.

At the end of the year-long course the students completed the 100 item multiple choice standardized AHVAT achievement test after which they were administered the 35 item attitude questionnaire in order to ascertain their scores on the three affective research factors, namely learner self-esteem, learner attribution and learner technological efficacy.

Results

The main aim of this study was to examine the efficiency and effectiveness of two different learning delivery platforms. Two research questions were posed: the first dealt with acquisition by students of academic Hebrew vocabulary definitions and the second dealt with students' attitudes toward the particular learning delivery system they experienced as related to the three affective variables, namely learner self-esteem, learner attribution and learner technological efficacy. Means and standard deviations of students' scores on the achievement test as well as on the affective research factors are presented in Table 1.

Table 1. *Mean Scores and Standard Deviations for Achievement; Learner Self-Esteem; Learner Attribution; and Learner Technological Efficiency*

Factor	SMS Delivery Platform (N=133)		Email Delivery Platform (N=163)	
Academic Achievement	M=89.27	S.D.=7.23	M=88.70	S.D.=8.52
Learner Self Esteem	M=3.83	S.D.=0.44	M=3.44	S.D.=0.50
Learner Attribution	M=3.48	S.D.=0.60	M=3.32	S.D.=0.50
Learner Technological Efficacy	M=4.00	S.D.=0.66	M=3.30	S.D.=073

Four one-way ANOVA tests were used in order to compare students' academic achievement and levels of affect as related to the two delivery strategies. The ANOVA analyses for possible differences between the SMS and email delivery platforms indicated no significant difference between the two groups on achievement scores, with students from the two groups achieving similar grades on the standardized Academic Hebrew Vocabulary Achievement Test (AHVAT). However significant differences were found between the two groups for learner self-esteem [$F(1,292) = 37.00$; $p<.001$; $\eta^2=.11$], for learner attribution [$F(1,292) = 5.36$; $p<.05$; $\eta^2=.02$], and for learner technological efficacy [$F(1,292) = 55.26$; $p<.001$; $\eta^2=.16$]. In all cases

members of the SMS delivery group indicated significantly higher scores on the three affective variables than members of the email delivery group.

Discussion

From the results of the statistical analyses of the data obtained from the two comparison groups in this study it is clear that neither of the two delivery platforms held any advantage regarding academic achievement of students on the standardized Academic Hebrew Vocabulary Achievement Test (AHVAT). Students, who participated in the year-long 'Introduction to Academic Hebrew' course, studied basic academic vocabulary definitions via SMS messages sent to their cell phones or by email messages sent to their personal computers, attained similar grades on the standardized vocabulary definitions test. Thus it appears that two different delivery platforms are not related to differential academic achievement. This result confirms similar results presented in earlier studies which have indicated that academic achievement is not conditional to specific learning delivery platforms used in the learning process (Katz & Yablon, 2009; 2011; Gano, 2011; Katz & Katz, 2011; Katz, 2013).

However, the findings of the study indicate that the different delivery platforms employed in the present study to provide weekly lists of academic Hebrew vocabulary definitions to the students are associated with significantly differential levels of learner self-esteem, learner attribution and learner technological efficacy. Scores attained by students on the attitudinal research factors, after receiving lists of vocabulary definitions delivered via the two delivery platforms, confirm that SMS messages to cell-phones is associated more significantly with students' learner self-esteem, learner attribution and learner technological efficacy than email messages sent to personal computers. It appears that SMS messages to students' cell-phones have a more significant impact on learner self-esteem, learner attribution and learner technological efficacy than lists of vocabulary definitions sent to students via email.

The results of the present study indicate the potential of SMS messaging of relevant subject matter as a positive delivery platform that enhances affective variables such as learner self-esteem, learner attribution and learner technological efficacy. It should be noted that the significant attitudinal findings do not correlate with higher academic achievement when the two delivery platforms are compared. Further studies need to be conducted so as to further explore the possible relationship between academic achievement and students' attitudes toward learner self-esteem, learner attribution and learner technological efficacy.

Caution is to be exercised regarding the understanding of the essence of the independent and dependent variables studied in the present research. Do the two digital learning delivery platforms contribute to higher levels of learner self-esteem, learner attribution and learner technological efficacy or perhaps students characterized by higher levels of learner self-esteem, learner

attribution and learner technological efficacy prefer the SMS based learning delivery platform to the email based learning delivery platform. Further research needs to be conducted in order to fully clarify whether the digital learning delivery platforms are in fact independent or dependent variables in their relationship with learner self-esteem, learner attribution and learner technological efficacy.

Conclusion

In conclusion it may be stated that the results of the present study indicate that, while the two delivery platforms used in the study to provide students with weekly lists of academic Hebrew vocabulary definitions were most similar in their relationship with the promotion of students' academic achievement, the relationship between the cell-phone based SMS delivery platform and learner self-esteem, learner attribution and learner technological efficacy of students was significantly stronger than the link between the email delivery platform and the three affective research variables. The results of the present study regarding the relationship between the delivery of subject matter at the university level via SMS messages sent to students' cell-phones and students' levels of learner self-esteem, learner attribution and learner technological efficacy add to the findings of other research studies that previously indicated the highly significant relationship between the SMS based learning delivery platform and students' levels of learner motivation, learner autonomy, learner control of the learning process, learning flexibility and user friendliness of the technology methodology, learner self-efficacy and learner curiosity (following Divitini et all, 2002; Garner et al, 2002; Seppala, 2002; Stone & Briggs, 2002; Thornton & Houser, 2002; 2003; Katz & Yablon, 2009; 2011; 2012; Katz, 2013).

University educational systems in all societies, whatever their technological infrastructure, can profit immeasurably from the use of an SMS based learning delivery platform in relevant university subjects and courses. Enhanced and sophisticated technology and improved pedagogy need to be developed in order to enhance the use of an SMS delivery platform in routine learning at the university level but it appears that the mass incorporation of an SMS based learning delivery platform in institutions of tertiary education is a distinct possibility in the foreseeable future.

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