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SMS-BASED LEARNING IN TERTIARY EDUCATION: ACHIEVEMENT AND ATTITUDINAL OUTCOMES

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ABSTRACT

SMS delivery platforms are being increasingly used at the university level to enhance student achievement as well as traits and attitudes related to the learning process. SMS delivery provides access to learning materials without being limited by space or time and sophisticated technological advances in SMS delivery have led to enhanced learner motivation, learner curiosity, learner autonomy, learner self-efficacy, learner technological self-confidence when learning language, vocabulary and concepts. In addition SMS delivery of learning materials has been shown to lead to flexible, user-friendly, controlled and adaptive learning as reported by university students in various research studies. The present study is another in a series of research studies designed to examine the relationship between SMS delivery and cognitive and affective aspects of university level learning. In the present study two groups of first year university students who studied cultural concepts in an elective 14 week long (semester) course were exposed to two different modes of concept delivery. The first group of students received weekly lists of cultural concepts sent via SMS messages to their cell-phones and the second group received weekly lists of cultural concepts sent via hardcopy snail mail messages to their homes. The definitions of cultural concepts studied by SMS and hardcopy delivery strategies were identical and the students received 25 cultural concept definitions on a weekly basis for a period of 14 weeks. At the end of this period the students in the two groups were tested on a standardized cultural concepts learner achievement test and responded to a questionnaire that examined the levels of learner creativity, learner flexibility and learner self-image as perceived by the students' in the two groups. Results of the study indicate that there were no significant differences between students in the SMS delivery group and those in the hardcopy delivery group on the standardized cultural concepts achievement test. However, there were significant differences between the students in the two delivery groups regarding their levels of learner creativity, learner flexibility and learner self-image. The students who received cultural concepts via SMS delivery were characterized by significantly higher levels of learner creativity, learner flexibility and learner self-image than their counterparts who received lists of cultural concepts via hardcopy messages. It appears that SMS delivery of cultural concepts enhances traits and attitudinal variables such as learner creativity, learner flexibility and learner self-image which have a positive effect on the learning experience Thus SMS delivery of learning materials can in fact become a viable technological mobile delivery system in the university learning process and should be considered as a valid pedagogical tool in the university learning process.

KEYWORDS

SMS delivery; hardcopy delivery; learner achievement; learner creativity; learner flexibility; learner self-image

1. INTRODUCTION

Distance learning has developed over the years to overcome the limitations of traditional face-to-face learning which necessitates the presence of the student in a formal classroom setting. Since its inception when distance learning was confined to the delivery of learning material via snail mail, landline telephone and radio broadcasts, it has progressed through delivery systems such as television broadcasts, videoconferencing and email, and at present focuses on digital delivery systems such as internet and mobile learning platforms. It should be noted that almost all of the above distance learning delivery platforms are still in use in different educational systems throughout the world (Katz & Yablon, 2003).

After the development of sophisticated third generation distance learning systems which include interactive video, internet, and mobile learning technologies, learning activity through the medium of these distance learning has been redefined to include and focus on student self-learning (Trentin, 1997). Mobile learning offers tuition that is not bound by space or time and is especially characterized by flexibility. In

addition mobile learning allow tutors to modify, reinforce and even model educational processes, thereby fulfilling the cognitive as well as affective needs and requirements of students (Wilson & Whitelock, 1997).

Some research studies (Katz & Yablon, 2009; 2011; 2012) have indicated that third generation distance learning is especially suited to higher education mainly because of increased flexibility due to the mobile learning systems that are increasingly used at present. Other studies have emphasized the importance of student activity provided for by current distance learning systems and have indicated that the student activity variable contributes significantly to improved student achievement (Trentin, 1997).

Mobile learning in general and SMS based learning in particular have advanced steadily over recent years and have become potential learning platforms at the university level. In certain areas, such as the learning of vocabulary (Katz & Yablon, 2009; 2011; 2012) and concept learning (Katz & Katz, 2011) SMS-based learning has advanced rapidly and is becoming an integral part of the learning process in many universities throughout the world. Research studies have indicated that the use of SMS as a delivery system for university learning is suitable for both cognitive and affective aims (Divitini, Haugalokken & Norevik, 2002; Garner, Francis & Wales, 2002; Prensky, 2005).

In the present study learner achievement and the traits and attitudes of students toward SMS delivery of learning content are to be examined. More specifically, the study will investigate the academic grades achieved by students in cultural concept acquisition as well as some of their traits and attitudes, namely learner creativity, learner flexibility and learner self-image, towards SMS-based delivery of learning material at the university level.

2. SMS DELIVERY AND THE LEARNING PROCESS

Katz & Yablon (2009) found that technology based learning in general and, more specifically, SMS-based learning, offers a learning environment that is especially characterized by flexibility offered to the learner. In addition SMS learning technology offers possibilities that include sophisticated text capabilities that 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).

SMS delivery of learning materials has become a focus of research in recent years. Learning projects based on SMS delivery of learning material and initiated by several universities worldwide have indicated positive outcomes (Divitini, Haugalokken & Norevik, 2002; Garner, Francis & Wales., 2002; Seppala, 2002). Stone & Briggs (2002) indicated how exercises were efficiently delivered to students via SMS based messages and positively contributed to effective learning. Thomas, Orthober & Schultz (2009) pinpointed the benefits gained by high school students in their language learning after receiving language related learning materials via SMS messages sent to them by their teachers. Additional studies have described how vocabulary transmitted by SMS in a spaced and scheduled pattern of delivery contributed to student proficiency in English or other languages. (Kiernan & Aizawa, 2004; Katz & Yablon, 2009; 2011; 2012). Katz & Katz (2011) indicated how SMS based delivery of learning content is closely connected to effective concept learning.

2.1 SMS Delivery and Students' Traits and Attitudes

In recent studies researchers (Cavus & Ibrahim, 2009; Thatcher & Mooney, 2008; Thornton & Houser, 2008) concluded that mobile technology including SMS-based delivery of learning materials is increasingly welcomed and accepted at the tertiary educational level as a valuable teaching tool. Ismail, Idrus & Johari (2010), Katz & Katz (2011), Katz & Yablon (2009, 2011; 2012), Moos & Azavedo (2009), Rosli et al (2010) as well as Song (2008) have confirmed the existence of a positive and significant relationship between SMS delivery of learning material and students' traits and attitudes at the university level.

Additional research studies have investigated the relationship between SMS delivery of learning material in the course of the learning process and students' specific traits and attitudes. Learner motivation, learner autonomy, learner control of the learning process, learner curiosity, learner self-efficacy, learner technological self-confidence, and user friendliness have been found to have a positive significant relationship with SMS delivery of learning content (Cavus & Ibrahim, 2009; Katz & Yablon, 2009; 2011; 2012; Mainemelis, Boyatzis & Kolb, 2002).

As academic achievement (Perveen, 2010; Weng, Cheong & Cheong, 2010), learner creativity (McWilliam & Dawson, 2008; Tillander, 2011), learner flexibility (Greener, 2010; Mainemelis, Boyatzis & Kolb, 2002) and learner self-image (Offir & Aflalo, 2008; Renes & Strange, 2011) are issues, traits and attitudes considered important in the learning process, the present study examines the issue of learner achievement attained by students when using SMS delivery for concept learning. In addition the research pays particular attention to the examination of the relationship between learner creativity, learner flexibility and learner self-image of students on the one hand and SMS delivery of cultural concepts on the other.

2.2 SMS Delivery and Academic Achievement

A number of researchers have addressed the issue of technology based learning and academic achievement. Guzeller (2012 indicated that senior high school students who utilized technology based learning strategies achieved higher academic scores in tests that assessed language learning than their counterparts who studied language without technology-based facilitators. Efendioglu (2012) investigated the use of technology in a pre-service teachers' training course and its relationship with academic achievement of the teacher trainees. Results of the study indicated that technology-based instruction facilitates a higher level of academic achievement than more traditional instructional strategies. Huffman & Huffman (2012) indicated that use of technology in the instruction of college students enhanced their academic success and grades. On the other hand Katz & Yablon (2009; 2011; 2012) found no significant differences between the academic achievement attained by first-year university students who utilized technology in the learning process and that attained by their counterparts who studied without technology-based instructional strategies. Although the relationship between technology-based instruction and academic achievement is not quite clear, this study will investigate the potential link between SMS-based delivery of learning content and academic achievement as the confirmation of such a relationship could have major implications for university learning

2.3 SMS Delivery and Learner Creativity

Black & Browning (2011) reported that the use of technology in education leads to an increase of learner creativity. Hope (2010) indicated that creative learning is enhanced by innovative learning environments as found in technology-based learning. Lussier & Achua (2004) indicated that a major goal necessary in the process of strengthening a learning organization is the promotion of creative thinking which can be facilitated by the use of technology. Antonenko & Thompson (2009) contended that the use of technology in the learning process significantly contributes to the promotion of learner creativity. Eaglestone et al (2007) stated that the use of technology in learning can enhance creativity in the cognitive process and facilitate knowledge acquisition as ell as affective well-being. Akinwamide & Adedara (2012) confirmed that technology based learning platforms contribute significantly to the enhancement of learner creativity, mainly because of the facilitation of self-discovery and autonomy inherent in the new digitalized pedagogy. Because of the confirmed importance attached to creativity in the technology-based learning process, this study will examine the relationship between SMS-based delivery of concept learning and learner creativity.

2.4 SMS Delivery and Learner Flexibility

Osborne & Oberski (2004) as well as Jeffries (2005) contended that the multidimensional nature of technology can effectively enhance student flexibility in the learning process. Luppicini (2006) indicated that students who studied in a technology based environment adapt to the environment and enhance their learning flexibility so as to increase the quality of their learning. Lee (2007) concluded that technology based learning sensitizes the students ' awareness of others in their learning environment and facilitates their ability to react flexibly in the class or group learning process. Sweeny (2010) postulated that technology used in current learning situations promotes learning flexibility among students. This learner flexibility encourages students to utilize various and appropriate technologies in their learning processes. In view of the relationship between technology and learner flexibility indicated in the abovementioned studies, this research will test the connection between the reception of learning material through the medium of SMS messaging and learner flexibility of the student recipients.

2.5 SMS Delivery and Learner Self-Image

Sami & Pangannaiah (2006) investigated the relationship between the use of technology in the learning process and the self-image of learners. They indicated that students who used technology efficiently in the library during their learning process acquired a more positive learner self-image than those who were less able to make efficient use of technology during the time they spent learning in the library. Tabata & Johnsrud (2008) confirmed that students who used technology more effectively in their learning developed a more positive self-image of themselves as learners than those less able to constructively utilize technology in their learning processes. Nicolle & Lou (2008) confirmed that using innovative technological innovations in learning enhances students' perceptions of their learning as well as their learner self-image. In light of the above research findings this study will investigate the link between learning delivered to students via SMS messages and their learner self-image.

The research model depicting the independent and dependent variables are presented in Figure 1.

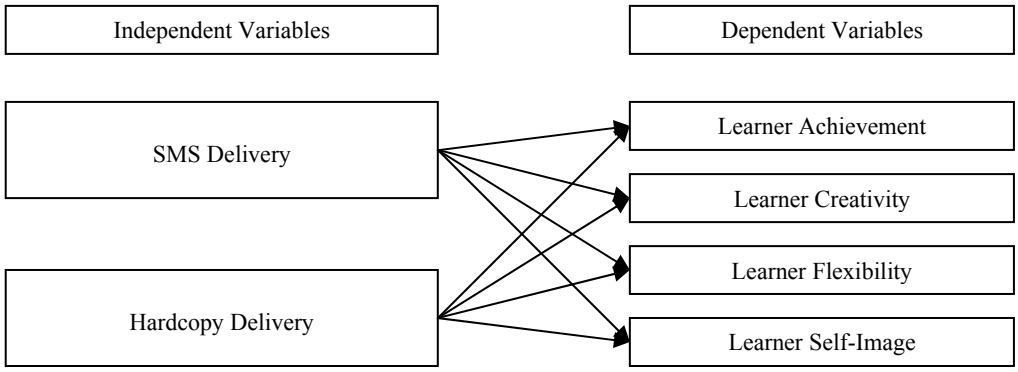

Figure 1. Graphic Illustration of the Research Model

3. METHOD

3.1 Sample

The research sample consisted of 296 first year students enrolled in a 14 week semester-long cultural concepts foundation course offered at one of the seven chartered universities in Israel. Students came from similar socio-economic backgrounds and all were accepted to the Faculty of Social Sciences at the university after attaining the university acceptance criteria of a mean matriculation grade of at least 80% as well as a mean psychometric university entrance score of 600. The students were randomly assigned to the two different research groups in which they were provided with lists of definitions of cultural concepts via two alternative learning content delivery methods. The first group of 163 students received their cultural concepts via SMS delivery to their personal cell-phones and the second group of 133 students received their cultural concepts in hardcopy format by way of regular snail mail.

3.2 Instruments

Two research questionnaires were administered to the students in this research study. A standardized cultural concepts learner achievement test was administered to the participants in order to assess students' mastery of definitions of cultural concepts relating to Israeli culture. The test scale ranged from 0-100, the higher grades indicating higher levels of achievement on the cultural concepts test. The second instrument administered was a 30 item Likert type scale response questionnaire (students responded to a five point scale with 1=totally disagree and 5=totally agree) designed to examine the students' perceptions of the trait and attitudinal research factors as follows: The first factor, learner creativity, contained ten items (Cronbach α=0.79), the second factor, learner flexibility, consisted of eleven items (Cronbach α=0:83) and the third factor, learner self-image, was made up of nine items (Cronbach α=0.78).

3.3 Procedure

Students who studied in the Faculty of Social Sciences, and were enrolled in the elective cultural concepts foundations course and possessed personal cell-phones with texting capacity were eligible for participation in this study. Following the selection of the students who met the above criteria, they were randomly assigned to the two delivery platform groups. Students in the first group received cultural concepts via SMS messages sent to their personal cell-phones and those in the second group received cultural concepts in hardcopy format via snail mail. The students in the two groups were sent weekly lists that contained concise definitions of the cultural concepts studied in the course, each weekly list contained definitions of 25 new cultural concepts delivered via the respective learning strategies. Thus each of the students received definitions of 350 cultural concepts during the 14 week long course. On completion of the course the students in the two groups were administered a standardized cultural concepts learner achievement test in order to asses their level of knowledge of the 350 cultural concepts taught in the course. In addition they were administered the 30-item trait and attitudinal questionnaire which examined their scores on the three attitudinal research factors, namely learner creativity, learner flexibility and learner self-image.

4. RESULTS AND DISCUSSION

The main aim of this study was to examine the efficiency and effectiveness of two different learning delivery platforms, namely SMS based delivery and hardcopy delivery. Two research questions were posed: the first examined the acquisition by students of knowledge focusing on cultural concepts and the second investigated students' attitudes connected to the two delivery strategies. The mean scores of each of the attitudinal factors were standardized in order to allow for a comparison between the factor scores. Standardized means and standard deviations of students' scores on the achievement test and on the attitudinal factors are presented below.

Table 1. Mean Scores and Standard Deviations for Students in SMS and Hardcopy Delivery Groups for Learner Achievement, Learner Creativity, Learner Flexibility and Learner Self-Image

Research Variables	SMS Delivery (N=163)		Hardcopy Delivery (N=133)	
	Mean	S.D	Mean	S.D.
Learner Achievement	84.67	8.64	85.32	9.31
Learner Creativity	3.83	0.44	3.44	0.50
Learner Flexibility	3.48	0.50	3.32	0.60
Learner Self-Image	4.00	0.66	3.30	0.73

One-way analyses of variance (ANOVA) were conducted in order to investigate intergroup differences on the four research variables. No significant differences were found between students in the SMS and hardcopy delivery groups on grades attained on the standardized learner achievement test. On the other hand significant differences between the two delivery groups were yielded for learner creativity [$F(1,292)=37$, $p<0.001$, $\eta^2=11.2\%$]; for learner flexibility [$F(1,292)=5.36$, $p<0.05$, $\eta^2=1.8\%$]; and for learner self-image [$F(1,292)=55.26$, $p<0.001$, $\eta^2=16\%$]. Post-hoc Scheffe tests, conducted to ascertain specific inter-group

differences for the three affective variables, indicated that students in the SMS delivery group attained higher scores on the three trait and attitudinal variables than students in the hardcopy delivery group

A discriminant function analysis was conducted in order to check the significance of the results obtained in the one-way analyses of variance and post-hoc Scheffe tests. The results of the discriminant function analysis, indicated that for the three attitudinal variables, namely learner creativity, learner flexibility and learner self-image, an average of 64.33% of the students were correctly classified as members of their respective learning groups, thus affirming the significant differences indicated between the SMS and hardcopy learning content delivery groups regarding the traits and attitudes characterizing group members.

The research findings of this study indicate that neither the SMS nor the hardcopy delivery strategies held any advantage regarding learner achievement on the standardized cultural concepts achievement test. Students who studied the 350 cultural concepts via SMS delivery of concepts sent to their personal cell phones or by concepts delivered to them by hardcopy via snail mail attained similar grades on the standardized learner achievement test. Thus it seems that different learning content delivery strategies do not necessarily lead to differential academic achievement. Although this result contradicts evidence presented by Guzeller (2012 and Efendioglu (2012), it confirms similar results which have indicated that academic achievement is not conditional to type of learning strategies or delivery platforms used to facilitate the learning process (Bohlen & Ferratt, 1993; Dyer & Osborne, 1996; Katz & Yablon, 2009; 2011; 2012).

Additional research results clearly indicate that the two different content delivery strategies employed in the present study are related to significantly differential levels of learner creativity, learner flexibility and learner self-image. Scores attained by students in the SMS-based learning content delivery group on the three trait and attitudinal factors were significantly higher than those of students in the hardcopy learning content delivery group. It appears from the nature of these results that SMS-based delivery of learning material is linked to higher levels of learner creativity. This finding confirms similar indications regarding the unique advantages of technology in enhancing learner creativity as reported by current researchers including Akinwamide & Adedara (2012), Antonenko & Thompson (2009) and Black & Browning (2011). Similarly the research result that indicates that SMS delivery of learning content appears to be more significantly related to learner flexibility than delivery by hardcopy via snail mail confirms the findings of Lee (2007), Luppicini (2006) and Sweeny (2010) who suggested that technology has the potential to enhance learner flexibility. In addition the finding of the present study that SMS delivery of learning content is more significantly connected to learner self-image than hardcopy delivery strengthens the findings of Nicolle & Lou (2008), Sami & Pangannaiah (2006) and Tabata & Johnsrud (2008) who reported that research studies conducted by themselves indicated that technology based learning leads to an enhancement of learner self-image.

5. CONCLUSION

The results of the present study indicate the potential of SMS messaging of relevant subject matter as a positive delivery platform significantly related to trait and attitudinal variables such as learner creativity, learner flexibility and learner self-image. It should be noted that no relationship was found between the two delivery platforms and learner achievement. Further studies need to be conducted so as to further explore the possible relationship between delivery SMS and other technology based learning content delivery platforms and learner achievement. However, even if no significant relationship is found between the delivery platforms and learner achievement, the fact that a significant relationship exists between SMS delivery and trait and attitudinal variables such as learner creativity, learner flexibility and learner self-image as well other similar attitudinal variables as reported in earlier studies indicates the potential of SMS delivery for the university learning process.. From a pedagogical point of view it appears that cell-phone-based SMS learning content delivery leads to positive attitudes of students as previously indicated, among others, by Katz & Yablon (2009; 2011; 2012) and Song (2008) and should be universally considered as a legitimate and positive learning strategy at the university level.

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