

SMS and Emails as Class Reminders to Assist Subject Learning

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Abstract. Preview and review played such important roles in the field of subject learning, but students seldom performed it actively. Therefore, the propose research took great advantages on both class email and short message service (SMS) to assist preview as well as review activities. Furthermore, this paper also examined the effect of different genders and above two technologies on learning achievement, students' acceptance, and learning achievement. The participants were 82 university students who were divided into SMS ($N=41$) and Email ($N=41$) groups. The results showed that there is no difference on learning achievement and technology acceptance for both groups, but distinct treatments and genders placed significant influence on their leaning behaviors.

Keywords: SMS, Email, reminder, technology acceptance, gender

1 Introduction

1.1 Research Background and Motivation

In the subject learning arena, preview and review can enhance learners' learning achievement [1], [2], [3]. Nevertheless, learners seldom performed preview and review. Hence, it is essential to obtain additional assistance or reminder for better learning achievement.

Mobile phones and computers are indispensable nowadays. A survey found that there were about 29,500,000 mobile phones in Taiwan in 2012 (http://www.ncc.gov.tw/chinese/show_file.aspx?table_name=news&file_sn=39675), that is, the average mobile phone owner had more than one phones. According to the reports [4], [5], more than 80% college students use SMS to stay connected through mobile phones every day. Besides, according to Pew Research Center's report in 2011, 92% Americans use emails (<http://www.pewinternet.org/Reports/2011/Search-and-email/~media/182850DA89874D9B8CD26DD2DD5312A0.pdf>). Therefore, both SMS and emails are widely used for college students.

With the popularity, acceptability and instantaneity, emails and SMS may suit for delivering learning materials and reminders. The research aimed to examine if learners showed their different learning achievement, learning behaviors and acceptance toward these two technologies. Moreover, gender differences have been found in the technology usage [6], [7], [8]. Meanwhile, people with different genders have different SMS usage purposes, too [9]. Therefore, the current research was also to investigate if there is difference between genders on SMS and Email usages.

1.2 Research Questions

The aim of this research was to evaluate whether class SMS and Email reminders influence participants' learning achievement, learning behaviors and technology acceptance. Furthermore, it is to analyze the effect of gender on learning. The research questions are listed below.

- a. Are there differences on learning achievement between SMS and Email groups by receiving class reminders?
- b. Are there differences on learning behaviors between SMS and Email groups by receiving class reminders?

- c. Are there differences on technology acceptance between SMS and Email groups by receiving class reminders?
- d. Are there gender differences on learning achievement between SMS and Email groups by receiving class reminders?
- e. Are there gender differences on learning behaviors between SMS and Email groups by receiving class reminders?
- f. Are there gender differences on technology acceptance between SMS and Email groups by receiving class reminders?

2 Literature Review

2.1 SMS and Email Assisted Learning

SMS and email provide asynchronized learning which can reduce students' socio-emotional pressure since they do not need to post real time responses as in their traditional classrooms [10], [11] and they can take learning at their own learning pace which is comparatively student-centered or personal-centered [12], [13]. In Lim et al's research [14] on prevention of sexually transmitted disease, the results confirmed the learning effectiveness of Email and SMS delivery. Previous researches were done using SMS to notify students the exam time, venue and scope [15] or to offer undergraduate students perceive immediate, convenient, and personal help [16]. Nadire and Dogan [17] used SMS to help freshmen learn vocabulary while Chuang and Tsao [18] used SMS to assist students learn medication knowledge in Nursing.

Though SMS and Emails are mainly text-based, and considered relatively low in information richness, their strong communication contexts satisfy the purpose of question-answer communication. When they are used to augment rather than substitute face-to-face communication, lean media can be more favored. Apart from that, though SMS system has better real time effects than email system, however, emails win their richness in text delivery.

2.2 Technology Acceptance Model

Developed by Davis in the 80s, technology acceptance model (TAM) is to predict user's acceptance of Information Technology (IT) which focuses on the attitude explanations of intention to use a specific technology or service. The model is one of the most influential extensions of Ajzen and Fishbein's [19] theory of reasoned action (TRA) in the literature to explain behaviors with reasoned action planning. Davis [20] conceived that TAM's belief-attitude-intention-behavior relationship predicts user acceptance of IT. Technology acceptance model which deals with perceptions as opposed to real usage, suggests that when users are presented with a new technology, perceived ease-of-use (PEOU) and perceived usefulness (PU), influence their decision about attitudes toward use and behavioral intention to use [20]. Davis [20] defined perceived ease-of-use as the degree to which a person believes that using a particular system would be free from effort and perceived usefulness as the degree to which a person believes that using a particular system would enhance his or her job performance. The higher the degrees suggest the more confidence they have to the new system.

3 Methods

The platform used in this research was Moodle along with the class SMS and Email reminder systems to see if there is a learning outcome difference between SMS and Emails groups.

3.1 Participants

The participants were 82 English majors (two classes, 41 each) who were divided into SMS and Email groups receiving the same learning materials (see Table 1). The class instructor was the same.

Table 1. Distribution of participants

Group	Males	Females	Total
SMS group	11 (26.82%)	30 (73.17%)	41 (100%)
Email group	20 (48.78%)	21 (51.21%)	41 (100%)
Total	31 (37.80%)	51 (62.19%)	82 (100%)

3.2 Procedure

There was a face-to-face class every week. All the class materials were uploaded to Moodle and taught in class. Class SMS and Emails preview were sent to the participants two days before the class and review were sent to the participants two days after the class. Contents of preview include literary terms and knowledge, and contents of review include class notes and questions. The delivery time was set at 9 o'clock in the evening (see Figures 1 & 2). It was hoped that the participants would preview and review the class through Moodle right after they got their reminders.

A pretest and two posttests on the subject knowledge and a survey on technology acceptance were done to understand if there is a learning outcome difference and if their technology acceptance on both systems influences their learning behaviors. SMS and Email reminders were continuously sent for 8 weeks in the first semester and were sent for 16 weeks in the second semester. The technology acceptance questionnaire was administered in the 18th week in the second semester.

3.3 Measures

The pretest and posttest were designed by the subject instructor. The pretest contained 50 questions (2 points each, full score is 100 points) on subject terms and knowledge that the participants need to learn at the end of the experiment. The posttests contained selected questions from the pretest and those questions were merged into the final exams of two semesters.

The 34-item questionnaire was modified from Davis's [20] technology acceptance questionnaire which has a five-point Likert scale, ranging from five points (strongly agree) to one point (strongly disagree). Though the technology acceptance questionnaire has its academic validity, the revised technology acceptance questionnaire used in this research was validity and reliability tested before the major study was launched. 208 students who took English related subjects from general education got their class SMS and Emails reminders for one month before they answered the technology acceptance questionnaire. 207 questionnaires were returned (return rate = 99.5%) and 202 questionnaires were valid (valid rate = 97.6%). The Cronbach's Alphas on perceived usefulness, perceived ease of use, toward use, and behavioral intention to us were 0.96, 0.92, 0.94, and 0.92 respectively, therefore, the questionnaire has a good internal consistency.



Fig 1. Snapshot of delivering learning material from SMS

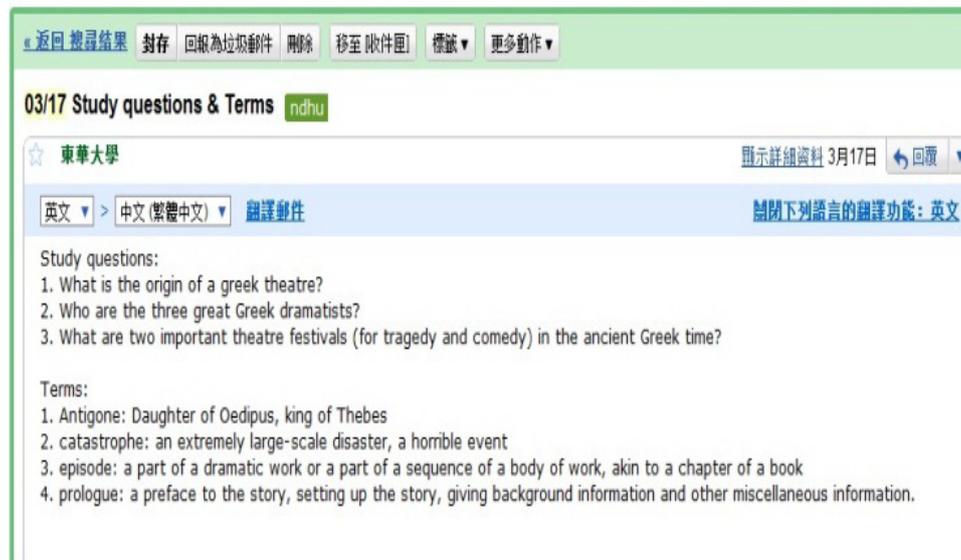


Fig 2. Snapshot of delivering learning material from SMS

4 Results & Discussions

4.1 Effects of SMS vs Email on Learning Achievement

To examine whether students who received learning material through SMS and students who received learning material through Email had different learning outcomes, analysis of covariance (ANCOVA) was calculated. The independent variable is delivering tool (including SMS and Email), the covariate is pretest score, and the dependent variable is posttest. The descriptive statistics is shown in Table 2. The results of first experiment from the ANCOVA (shown in Table 3) revealed that no significant difference was found between the SMS group (adjusted $M = 68.15$) and Email group (adjusted $M = 64.44$), $F = 1.75$, $p = .19$, indicating there is no significant difference between two groups.

Table 2. Pre- and first posttest mean scores and standard deviations

Source	N	Pretest		Posttest		Adjusted Mean
		M	SD	M	SD	
SMS	41	27.34	11.33	67.66	10.76	68.15
Email	41	36.10	17.68	64.93	13.54	64.44
Total	82	31.72	15.40	66.29	12.30	

Table 3. Analysis of covariance of SMS and email groups

Source	Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1851.70	2	925.85	3.72	.02
Group	259.37	1	259.37	1.75	.19
Error	11738.87	79	148.95		

4.2 Effect of SMS and Email on learning activity

An independent-sample t-test was computed to examine whether there is a different learning behaviors between SMS and Email groups. The results (see Table 4) revealed that a significant difference was found between the SMS group and the Email group ($t = -2.60$, $p < .05$). The participants in the SMS group ($M=250.80$) studied more via Moodle than those in the Email group ($M=187.05$).

The SMS reminders served as learning alerts, therefore, the participants were forced to read the preview or review notes of the subject and reminded to study via Moodle after they got the text messages.

However, due to the Email checking habits, the participants would not be forced to read the class preview or review notes. The participants' choice of reading or not reading the class reminders resulted in their lesser study frequencies on Moodle. 63% (SMS group) and 39% (Email group) participants said they would study after receiving reminders (technology acceptance question 1) which also explains the difference.

Table 4. Group differences for log-in times between SMS and email groups

	group	N	M	SD	t-value
times of log- in	E-mail	41	187.05	82.64	-2.60*
	SMS	41	250.80	133.35	

* $p < .05$

4.3 Effect of SMS and Email on Students' Acceptance

Participants' acceptance degrees of perceived usefulness, perceived ease of use, attitude toward use, and behavioral intention to use were examined by an independent-sample t-test (see Table 5).

Both groups considered the SMS and Email reminders were useful for them ($M > 3.7$) though there is no significant difference between two groups ($t = 0.144$, $p = .799 > .05$). Similar result was found on their perceived ease of use of two systems. Both groups considered the systems were easy to use ($M > 3.5$) though there is no significant difference between groups ($t = 0.13$, $p = .28 > .05$). Again, both groups' attitude toward use and behavioral intention to use the two systems were more than average ($M > 3.7$ and $M > 3.6$) respectively though there were no significant differences between two groups whose t values are $t = 0.13$, $p = .81 > .05$ and $t = 0.12$, $p = .79 > .05$ respectively.

According to the data discussed above, all the factors of technology acceptance, perceived usefulness, perceived ease of use, attitude toward use, and behavioral intention to use, have no significant differences between SMS and Email groups. However, with a mean more than 3.5 for all factors, it is to say most participants considered the class reminders were useful and easy to use; therefore, they had positive attitude to use both systems and were willing to use them. The results echo to Nyiri's findings [21].

Table 5. Group differences for technology acceptance between SMS and email groups

	Group	N	M	SD	t-value
PU	E-mail	41	3.74	0.89	0.14
	SMS	41	3.79	0.95	
PEOU	E-mail	41	3.57	0.78	0.12
	SMS	41	3.78	0.95	
Attitude	E-mail	41	3.82	0.81	0.13
	SMS	41	3.78	0.95	
Intention	E-mail	41	3.74	0.74	0.12
	SMS	41	3.69	0.87	

4.4 Effect of Gender and Technology on Learning Achievement

To compare whether males and females had different learning outcomes in SMS and Email group respectively, ANCOVA (analysis of covariance) was calculated. The independent variable is gender, the covariate is pretest score, and the dependent variable is the posttest. The descriptive statistics of both the SMS and Email group is shown in Table 5. The results from the ANCOVA (shown in Table 6) revealed that a significant difference was

found ($F = 13.98$, $p = .001$) between the males (adjusted $M = 64.72$) and the females (adjusted $M = 59.63$) in the SMS group. That is, with the assistance of SMS, female students performed better than male students. However, the results of the Email group revealed that there is no significant difference on learning achievement between males and females ($F = 3.37$, $p = .074$), indicating that males' learning outcome may be similar to that of females through assistance of Email.

Table 6. Pre- and posttest mean scores and standard deviations of males and females

Group	Source	N	Pretest		posttest		Adjusted Mean
			M	SD	M	SD	
SMS	Male	11	23.45	11.90	58.27	9.63	60.91
	Female	30	28.77	10.98	71.10	9.05	68.76
	Total	41	27.34	11.33	67.66	10.76	
Email	Male	20	40.70	21.04	61.60	15.59	60.91
	Female	21	31.71	12.78	68.10	10.69	68.76
	Total	41	36.10	17.68	64.93	13.54	

Table 7. Analysis of covariance of SMS and Email

Group	Source	Sum of Squares	df	Mean Square	F	Sig.
SMS	Gender	1209.56	1	1209.56	13.98	.001
	Error	3288.44	38	83.54		
Email	gender	589.23	1	589.23	3.37	.074
	error	6635.88	38	174.63		

4.5 Effect of Gender and Technology on Learning Activity

An independent-sample t-test was run to see if there is a significant difference of study frequencies on Moodle between male and female participants (see Table 8). In the SMS group, female participants' study frequencies ($M=277.70$) were higher than male participants ($M=177.45$). In the Email group, the study frequencies show no significant difference between male ($M=182.50$) and female participants ($M=191.38$).

Table 8. Gender differences for times of log-in in the SMS group

	gender	N	M	SD	t-value
Times of log-in	Male	11	177.45	75.02	-2.23*
	Female	30	277.70	140.71	

* $p < .05$

Table 9. Gender differences for log-in times in the email group

	Gender	N	M	SD	t-value
Times of log-in	Male	20	182.50	87.85	-.34
	Female	21	191.38	79.28	

4.6 Effect of Gender and Technology on Students' Acceptance

Table 10 explains the technology acceptance of SMS group in terms of perceived usefulness, perceived ease of use, attitude toward use, and behavioral intention to use. Though the means of these four factors are more than 3.6, there are no significant differences between genders. Therefore, the gender is not the issue to influence the degrees of acceptance of getting technological learning reminders. Most participants show their positive willingness to get the study help from the system.

Similar to the SMS group, the participants in the Email group also have positive attitude toward using the system with means more than 3.4 from the four factors. Gender does not affect their willingness to use the Email reminders for subject learning.

Table 10. Gender differences for technology acceptance in the SMS group

	Gender	N	M	SD	t-value
PU	Male	11	3.83	1.00	0.15
	Female	30	3.78	0.94	
PEOU	Male	11	3.79	0.95	0.02
	Female	30	3.78	0.96	
Attitude	Male	11	3.66	1.09	0.42
	Female	30	3.81	0.92	
Intention	Male	11	3.61	0.86	0.34
	Female	30	3.72	0.88	

Table 11. Gender differences for technology acceptance in the SMS group

	Gender	N	M	SD	t-value
PU	Male	20	3.52	1.01	-1.01
	Female	21	3.81	0.67	
PEOU	Male	20	3.47	0.75	-0.14
	Female	21	3.51	0.71	
Attitude	Male	20	3.56	0.88	-1.58
	Female	21	3.96	0.62	
Intention	Male	20	3.58	0.84	-0.77
	Female	21	3.76	0.54	

5 Conclusions

The study compared the learning outcomes, learning behaviors and technology acceptance between genders of SMS and Email groups in learning professional subject in the department of English. The results showed that there were no significant differences on learning outcome between two groups, but there was a significant difference on study frequencies via Moodle between two groups. The study frequencies of the participants in the SMS group were higher than those in the Email group.

In the domain of technology use, participants agreed that they would study the subject after they got the class preview or review reminders. The reminders not only concluded the class materials but also offered some discussion questions which motivated the participants to learn the subject since the way to learn the subject was fun and convenient. Those who in the SMS group showed they were highly motivated to learn the subject because the reminders made the discussion off class interesting and handy.

In terms of learning outcomes, though both groups showed they were willing to use the systems for assisting learning, female participants in the SMS group showed they got more beneficial effects from the reminders. They also showed a learning behavior change on Moodle, the learning frequencies went higher after they got the SMS reminders. Students can get more benefits from SMS reminders.

It is to conclude that students will choose the best tool to assist learning in all subjects for their own good. As the result showed in the current study, SMS is one of the beneficial tools and if there are more SMS applications

developed for educational purposes, the future studies on similar perspectives may have better results on learning tools.

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