

A Comparison of Group and Individualized Motivational Messages sent by SMS and E-mail to Improve Student Achievement

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For many years, it has been generally accepted that communication and motivation affect students' learning. Properly designed communication can enhance the students' motivation to learn. This paper describes a study to determine whether a personalized Motivational Message System (MMS) is more effective than a group MMS, at the School of Computing and Information Technology situated on the campus of the University of Technology, Jamaica. A specific course (Business Information Management Systems) was selected to test whether the above statement is, in fact, true.

Forty-four students were randomly selected and divided into two groups. All the students were part time, undergraduate, final (4th) year students.

Two methods were used to deliver the MMS to students. Those methods were text messages on mobile phones (SMS) and e-mail. E-mail was used to deliver the messages only when length of the message was more than 160 characters or the messages contained graphics. Keller's (1983) ARCS model of motivation was used to design the MMS.

The students' grades for four measures were used as the motivational levels of students. Tests were spread from the middle to the end of the semester. No significant difference was found in averaged course grades between two groups (Table-1). However, there was a significant difference

between the two groups in attendance. Contrary to hypothesis, the group who received the group messages had a higher level of attendance than the group who received the personalized messages. This may have been because the students who are evening-part time have limited time. Hence, if their grades are better, they may tend not to attend the classes and utilize that time for something else they find important. Another explanation may be that students who received the personalized messages may have thought that they received personalized attention from the lecturer whether they came to classes or not, resulting in poor attendance.

Table 1. Group mean values for four measures

	Test 1: MCQ	Final : MCQ only (60)	Final : Essay only (30)	Attend-ance	Final Course grade
Personalized messages n=22	60.5	38.3	18.8	57.9	65.2
Group messages n=21*	55.1	34.7	16.2	81.9	62.4

**Group: one student was absent from the final exam. Hence he was not considered.*

Background

Jamaica is an English-speaking country of 2.5 million in the western Caribbean and forms part of the West Indies. There are three universities whose mission is to provide the infrastructure for research and development while educating the citizens of the Caribbean. The technology penetration is reasonably high compared to other third-world countries. The government gives tax benefits to people and companies who want to purchase computers. In 1996, the penetration level of telephones (landlines) was 14 telephones for every 100 people, and mobile phones was 2% (Central Intelligence Agency, 2003). Broadband communication and technologies such as Integrated Services Digital Network and Asymmetric Digital Subscriber Line are also available in Kingston and most of the major cities around the country. There are presently over 1.5 million cellular customers, the majority of whom are teenagers and young adults. The research was conducted in the school of computing at a university in Jamaica that originated as Jamaica Institute of Technology in 1958 with 50 students and four programs (University of Technology, Jamaica, 1997). Now, the enrollment is more than 7,500, and more than 300 academic staff serve the following five faculties: Built Environment, Business and Management, Education and Liberal Studies, Engineering and Computing, and Health and Applied Sciences. This university offers diploma programs, undergraduate degree programs, and a few postgraduate degree programs. The research degrees are at a very minimum level, but the university administration promotes them. All the academic staff have master's degrees, but only a few have doctorates. This university encourages its academic staff to acquire their doctoral degrees and necessary teaching skills and qualifications. As an example, the university provides funds to purchase a laptop

computer for every lecturer. This university offers many facilities, including 14 computer labs and other smaller facilities for students' use.

The faculty of engineering and computing has two schools: the School of Engineering, and the School of Computing and Information Technology (SCIT). The SCIT offers three types of degree programs in addition to various certificate and diploma programs. These degree programs are full-time day, full-time afternoon (starting at 3:00 p.m.), and part-time evening (starting at 6:00 p.m.). All of the programs are delivered by face-to-face instructional activities such as lectures, labs, and tutorials. Most of the full-time afternoon and part-time evening students are working persons. Many complain about their unmanageable study work load (according to the program director's status report). More than 7% of the students are regional students from other English speaking Caribbean countries. Attendance varies considerably among these groups. Full-time student attendance is generally high (approximately 88%), but student attendance of the afternoon and evening groups is generally low. Some class records show that less than 10% of these students are attending the face-to-face lectures. The students' grade sheets indicate that there is a direct relationship between their grades and attendance.

Participants

Subjects of this study were the students from the School of Computing and Information Technology. Two groups (classes) were selected from the SCIT for the study. The groups were selected from the part-time students who were doing their bachelor degrees and were in the final year of their four-year program. Participants were taught by a single teacher who was also the researcher. This was to achieve a more controllable environment so that the

treatment was consistent (Gall, Borg, & Gall, 1996).

Subjects included eight male and thirty-five female students. Most students were Jamaican, their race categorized as Black, multiracial, or Indian. They ranged in age from 18 to 30 years. The participants were of different social backgrounds from middle to upper class, the majority being middle class. Some students were working full-time or part-time. The evening full-time and part-time students were occupied with their full-time or part-time jobs. Each group (class) consisted of an average 15-20 students.

Procedure

The *personal* group was sent personalized motivational messages and the *nonpersonal* group received group motivational messages. Only one course was used to reduce confounding variables. The research was conducted during the tutorial sessions. Motivational messages were communicated using e-mail and SMS. The method of communication (whether e-mail or SMS) depended on the size (SMS has a limitation of 160 characters per message), type, timing of the message, and to which motivational aspects of the ARCS model the message belongs. The last message, Message 11, was a good example to explain why the timing was important in deciding the communication method. The impact of seeing the message on a student's cellular phone just a few minutes before the final exam cannot be compared with seeing the same message a day before on their computer screen or seeing it when the student came home after the exam.

SMS messages were sent to cellular phones from a computer that was configured to keep a record of all incoming and outgoing messages to and from participants' e-mail addresses and SMS (from mobile phones). E-mails were sent to participants' e-mail addresses and were viewed on their

computers.

Instruments

The research design consisted of a treatment (personalized motivational messages or group motivational messages) and four posttests. The posttests measured the students' achievement.

The final exam was utilized as one of the posttests. It was a two-hour test consisting of 65 multiple-choice questions and the choice of two essay questions. For the purposes of the study the scores for the multiple-choice questions were considered separately, to reduce the subjectivity of the test scores. The multiple-choice questions, which were drawn from a databank, had been used several times by other teachers who taught this course. This enhanced the reliability of this posttest. Although some questions had been used before in previous test papers, this final exam paper, as a whole paper, had never been used before. Other posttests scores were, mid-semester test (multiple-choice questions only) grades, case presentation grades, and attendance grades.

The student grades (after the treatment) were obtained from the lecturers' grades sheets. The e-mail and SMS communications between the researcher and students, including the students' feedback for the motivational messages, were recorded. That feedback was utilized to design the motivational messages that were yet to be sent.

Research Construct

This study was an experimental research design. A hypothesis was addressed by the research. A hypothesis was used as a map to gain a clear view and flow of the direction the study was taking.

Hypothesis. The effectiveness of the personalized messages is greater than that of the group messages in motivating students.

Variables. There was one dependent variable and one independent variable. The dependent variable is the achievement that was measured using the posttest. The independent variable was the type of treatment; that is, a two-level manipulated variable.

Test Results

This study investigated whether personalized motivational messages are more effective than the group motivational messages in motivating students.

A total of 44 students participated in the study, but only 43 completed all the tests. One participant did not sit for the final exam and was removed from the data. Because the dropout was only 1 participant out of 44, the effects of dropout on the final results were negligible. Hence, the further analysis of dropouts versus participants was omitted.

Test 1--Midsemester multiple-choice test grades. Table 2 shows the mean values and standard deviations for the midsemester test (MCQ) results. Because the hypothesis was directional, a one-tailed *t*-test was conducted. According to the results, although mean values for the PMM (60.45) were higher than that of GMM (55.14), there was no significant difference between the groups. Hence, the hypothesis was rejected.

Test 2--Case presentation grades. Table 3 shows the mean values and standard deviations for the case presentation grades. According to the results, although mean values for the PMM ($M = 77.61$) were higher than that of GMM ($M = 74.40$), there was no significant difference between the groups. Hence, the hypothesis was rejected.

Table 2. Means and Standard Deviations for Midsemester Test Grades of Personalized Motivational Messages Group and Group Motivational Messages Group

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>P</i> (one-tailed)
PMM	22	60.45	13.00	0.09
GMM	21	55.14	12.53	0.09

Note. $P > 0.05$.

Table 3. Means and Standard Deviations for Case Presentation Grades of Personalized Motivational Messages Group and Group Motivational Messages Group

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>P</i> (one-tailed)
PMM	22	77.61	6.78	0.09
GMM	21	74.40	8.34	0.09

Note. $P > 0.05$.

Table 4. Means and Standard Deviations for Final Exam MCQ Grades of Personalized Motivational Messages Group and Group Motivational Messages Group

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>P</i> (one-tailed)
PMM	22	38.27	5.42	0.01
GMM	21	34.71	4.82	0.01

Note. $P > 0.05$.

Table 5. Means and Standard Deviations for Final Exam Essay Grades of PMM Group and GMM Group

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>P</i> (one-tailed)
PMM	22	18.82	6.83	0.08
GMM	21	16.19	5.03	0.08

Note. $P > 0.05$.

Table 6. Means and Standard Deviations for Total Grades of PMM Group and GMM Group

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>P</i> (one-tailed)
PMM	22	65.15	8.99	0.13
GMM	21	62.40	6.86	0.13

Note. $P > 0.05$.

Test 3--Final exam multiple-choice grades. Table 4 shows the mean values and standard deviations for the final exam: MCQ grades. According to the results, mean values for the PMM ($M = 38.27$) were higher than that of GMM ($M = 34.71$), and there was a significant difference between the groups ($p < 0.05$). Hence, the hypothesis was accepted.

Test 4--Final exam essay grades. Table 5 shows the mean values and standard deviations for the final exam essay grades. According to the results, although mean values for the PMM ($M = 18.82$) were higher than that of GMM ($M = 16.19$), there was no significant difference between the groups ($p > 0.05$). Hence, the hypothesis was rejected.

Test 5--Total grades. Table 6 shows the mean values and standard deviations for the total grades. According to the results, although mean values for the PMM ($M = 65.15$) were higher than that of GMM ($M = 62.40$), there was no significant difference between the groups ($p > 0.05$). Hence, the hypothesis was rejected (total grade = $20\% \times$ Test1 + $20\% \times$ case presentation + $10\% \times$ attendance + $50\% \times$ final exam).

Additional Test Results

Two additional *t*-tests were conducted for two more sets of data. Those were the test grades for students' attendance and the total final exam grade (= [Final-MCQ + Final-Essay] \times 100/90). Test 6 was conducted because final MCQ grades showed that the hypothesis was accepted,

whereas the final essay grades showed that the hypothesis was rejected.

Table 7. Means and Standard Deviations for Attendance Grades of PMM Group and GMM Group

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>P</i> (one-tailed)
PMM	22	57.95	23.02	0.0008
GMM	21	81.90	23.48	0.0008

Note. $P > 0.05$.

Table 8. Means and Standard Deviations for Total Final Exam Grades of PMM Group and GMM Group

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>P</i> (one-tailed)
PMM	22	63.49	11.52	0.02
GMM	21	56.61	8.52	0.02

Note. $P > 0.05$.

Test 6--Attendance grades. Table 7 shows the mean values and standard deviations for the attendance grades. According to the results, mean values for the PMM ($M = 57.95$) were lower than that of GMM ($M = 81.90$), and there was a significant difference between the groups ($p < 0.05$). The direction of the results was contrary the hypothesis.

Test 7--Total final exam grades. Table 8 shows the mean values and standard deviations for the total final exam grades. According to the results, mean values for the PMM ($M = 63.49$) were higher than that of GMM ($M = 56.61$), and there was a significant difference between the groups ($p < 0.05$). Hence, the hypothesis was accepted (Final Exam Grade = [Final MCQ + Final Essay] \times 100/90).

Of seven *t*-tests conducted, two tests (final MCQ grades and final exam grades)

supported the hypothesis, that the effectiveness of personalized messages is greater than that of group messages in motivating students, whereas four tests (mid-semester grades, case presentation grades, final essay grades, and total grades) rejected the hypothesis. A seventh test (attendance grades) also rejected the hypothesis; however, it indicated that there was a significant difference between two groups' grades. The following chapter discusses these results and makes conclusions that may be drawn from them.

Discussion of Results--The Research Question Against Five Tests

Test 1--(Mid-semester multiple-choice quiz. The directional hypothesis was the effectiveness of personalized messages is greater than that of group messages in motivating students. This study found no significant difference between the mid-semester test grades of students who received PMM and those who received GMM. This finding is consistent with the literature of the MMS developed using ARCS model. L. Visser (1998) and L. Visser et al. (2002) found that the PMM and GMM equally motivated the distance learning students.

In this study, students had received only four motivational messages before the mid-semester test. Hence, the lack of significant difference between the groups may be due to the fact that the number of messages was too small to make a significant difference in motivating students.

Test 2--Case presentation. This study found no significant difference between the case presentation grades of students who received PMM and those who received GMM. This finding is consistent with the literature of the MMS developed using the ARCS model. In this study, students received 10 messages out of 12 messages before they did the case presentation.

Although the case presentation grading has the potential to be highly subjective (depending on who grades them), the students in this study were graded by only one tutor who used a standard rubric for grading.

Test 3--Final exam multiple-choice test. As hypothesized, this study found a significant difference between the final exam multiple-choice test grades of students who received PMM and those who received GMM. Students received all the 12 messages before they sat for the final exam MCQ test, and the test consisted of only multiple-choice questions. The higher test scores of those receiving PMM may be explained in three ways. First, the number of messages sent to students before they took the test (students received all 12 messages before the test) possibly affected the highest level of motivation. Second, the nature of the test itself (the multiple-choice tests were highly objective as they were marked by the computer) caused subjectivity to be eliminated. Third, the timing of the last message ("Peter, good luck in your final exam. Damith") was sent to students' mobile phones a few minutes before the final exam started. This was the most effective message (according to students' e-mail feedback after the final exam) as it was received at a time when they were very nervous and psychologically down.

Test 4--Final exam essay test. This study found no significant difference between the final exam essay grades of students who received PMM and those who received GMM, and the hypothesis was rejected. Although this finding was consistent with the literature of the MMS developed using ARCS model, the nature of the test (subjectivity) might have had effects on these results that were different from those of the final exam MCQ part. The final exam MCQ test found significant difference between the two groups (this result was counter to or inconsistent with the results

found with final exam MCQ test).

Test 5--Total grade. This study found no significant difference between the total (full course) grades of students who received PMM and those who received GMM. The total grade is the final average consisting of all the course work grades (three tests) and final exam (two tests) grades.

Because the coursework was done throughout the semester, students had not received all the messages before they started the coursework tests. Only the final exam grades indicated the full effects of all the messages. This finding was consistent with the literature of the MMS developed using ARCS model (L. Visser, 1998; L. Visser et al., 2002).

Discussion of Results--Additional Analysis Using Two Tests

In an attempt to better understand apparent differences in the performance of the two groups of students in this study, additional analysis was conducted on students' attendance and their combined score on the final exam.

Test 6--Attendance. This study found a significant difference between the attendance grades of students who received PMM and those who received GMM. Quite unexpectedly, students who received personalized messages did not attend as many classes as those who received group messages, with a significant difference in their attendance. This difference may be explained by the fact that the students who participated in this study were part-time, evening students who had their full-time jobs during the day. When considering these circumstances, if the students received personalized attention from the tutor (using e-mail or SMS), they may have thought that attending regular tutorial classes was unnecessary, resulting in poor attendance grades.

Test 7--Total final exam. This study

found no significant difference between the total final exam (total of final essay and MCQ) grades of students who received PMM and those who received GMM. Hence, the hypothesis was rejected. This finding was consistent with the literature of the MMS developed using the ARCS model. This test was conducted because the multiple-choice portion of the final exam grades showed a significant difference, whereas the other part (the final exam essay) grades showed no significant difference between PMM and GMM.

Limitations of the Study

There were at least five limitations in this study. Those were:

1. No pilot testing of messages.
2. The researcher's expectations.
3. Students' possible bias.
4. Nature of the instruments.
5. No posttreatment measures.

No pilot testing of messages. The treatment (the motivational messages system) was not piloted to measure the validity of the messages. Pilot testing of the messages could have eliminated the design flaws and, finally, the effectiveness of the MMS.

The researcher's expectations. The researcher's expectations could have been a contaminating influence in the findings. The researcher was the tutor for both groups and might have had a biased attitude toward the research and possibly "worked" toward a positive outcome of this study.

Students' possible bias. Although students were not told that there were two groups receiving two different treatments, students became aware of the differences in the middle of the course. Hence, knowing that one set of students was receiving personalized messages from the tutor, students in the personalized message group may have led students to work harder to get

better grades than others.

Nature of the instruments. Five instruments were used to measure the students' achievement (grades): mid-semester MCQ test, case presentation, attendance, final exam MCQ, and final exam essay that indirectly measured the motivation levels. Except for the mid-semester MCQ and final exam MCQ, all the other tests were highly subjective, depending on who evaluated the students. In the case presentation, the same tutor (researcher) evaluated all the participants in both groups, thereby minimizing subjectivity. But the final exam essay test was marked by five different tutors assigned randomly. Hence, high subjectivity on these test grades might have threatened the validity of the instrument, but the use of the same rubric (model answers) by all the tutors likely reduced the effect.

No posttreatment measures. No effort was made in this study to see whether students really read their SMS and e-mails, or, if they did, what percentage of students actually read them. Posttreatment fact-finding procedures such as focus group discussion could have added useful qualitative data to improve the validity of the findings.

Suggestions for Further Research

Further research is justified for two reasons: first, because of the unexpected findings of better attendance among group MMS recipients and, second, because of the limitations listed above.

The first suggestion is to repeat the same study with a posttreatment focus group discussion to determine whether students really read the SMS and e-mail and if they were (or were not) motivated by the messages. If the students did not read the messages, it would be useful to determine why they did not.

The second suggestion is to conduct this study with full-time, day students to see whether attendance grades would differ from the results of this research (this study found significant difference between the two groups, and the personalized MMS group's attendance was poorer than that of the MMS group). This should lead to a further, interesting study to find if MMS can encourage the students to do self-study (without attending classes), given the guarantee that they can have access to their tutor on a personal basis. Although this is not the real situation (students do not communicate with the tutor much), they perceive (due to PMM) that they can do so.

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