Types of Mobile Phone Technologies Available to Science Students and Lecturers to Enhance Academic Performance in Selected Ghanaian Public Universities

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***Abstract* - The study was designed to examine the types of mobile phone technologies available to support science teaching and learning in selected Ghanaian public universities. The study considered mobile phone technologies availability for science lecturers and students in supporting teaching and learning. Descriptive survey was employed. Both purposive and convenience sampling techniques were used in selecting the sample size. The target population for the study was students and lecturers in three selected public universities in Ghana. Data was analyzed using both descriptive and inferential statistics. Validity and reliability were ensured through expert judgment and piloting. The findings revealed that the mobile phone had great potential as a learning tool and it could positively influence learning in universities. Conclusions were drawn and findings interpreted in the form of table and figures.**

Keywords: Mobile phone technology, mobile learning, academic performance

INTRODUCTION

Science can be quite difficult and demanding, since it is mainly about abstract concepts, complex theories, laws and models which generally involved teaching not only a body of knowledge but also the processes and activities of scientific work (Flick & Bell, 2000). Therefore, there is a need to involve collaboration and co-construction of knowledege and ideas, which demands change in educational practices to allow students to learn how to utilize mobile learning devices, particularly mobile phones. Since, these technologies can support learning by increasing the possibilities for student participation and collaboration in the learning process (Khoo et al, 2012).

Technology is changing science teaching and learning and therefore lecturers and students need to change with it. According to Shuler (2009), he remarked that, lecturers must change their perception about these devices and rather try to understand how these mobile phones would best help their students in learning. Mobile learning is impacting how students learn and how educators teach.

Mobile phone technologies promote learning that is anywhere and at anytime, improve 21st century interactions, easily fit with learning environments and encourage a more personalized learning experience (Shuler, 2009). As a result, electronic books (e-books) are digitized versions of books that can be read on mobile phones. They have been eagerly suggested as educational tools since they present a less expensive access to textual materials, availability of more updated information, and provide a more interactive experience with content (Savill-Smith & Kent, 2003). McConatha and colleagues (2008) conducted a study on 112 university student and find out that reading on mobile phones more productive than reading on paper for student while preparing for exam. Public Universities in Ghana have integrated ICT tools into education and are steadily shifting from lecture notes and textbooks only to electronic resources (Afari-Kumah & Tanye, 2009). In addition, there was a study where teachers were offered strategies on how they could easily convert learning materials into eBooks, multimedia resources or interactive exercises that can be used on a variety of mobile phones (Lam et al, 2011). Mobile phones have surfaced as an enhanced means for learning and collecting information thus can also be used to support learning outside the classroom environment which provides greater accessibility and convenience (Goundar, 2011).

One of the most prevalent features of the mobile phone is Short message service (SMS). Although SMS has been around since 1992, its use for educational purposes has been limited. SMS is also an application available on mobile phones that can be intentionally used for science learning. Brown (2005) further observed that SMS offered information that was "in mass and almost immediate." He went further to explain that there was a decrease in cost of distributing relevant important information and provided just-in-time information by using messaging services. However, observations have shown that this is not the case in many developing countries, including Ghana. Therefore, if lecturers want to get important messages to their students instantaneously, they can do so using the Brown's way.

Through text messaging there can be feedback on lectures, ideas or projects as well as alerting of key dates, homework, preparation, deadlines and cancelled/rescheduled classes, quizzes, exams or even overdue library books and updates on marking or assignments available for collection and lecturers can ask their students questions or share views or information with their students (Lomine, 2009).

Multimedia messaging service (MMS) is the latest means of mobile messaging application. Consequently, fewer institutions in higher education have begun to experiment MMS as a prospective means of teaching and learning. MMS basically provides automatic and instant delivery of personal messages in the form of text messages, sound, images, and video messages, which has the potential to improve teaching and learning in the near future (Trifonova, 2006). Both SMS and MMS are inexpensive means of getting essential information to others immediately and efficiently. Unfortunately, Ghanaian students do not really use SMS or MMS for educational purposes.

Additionally, Sharples (2003) suggests that instead of perceiving mobile phones as technologies that disrupt and disturb when used in education, lecturers ought to seek to take the advantage of the potentials of these devices and find ways to put them into good use to support teaching and learning, since students bring them to class with them anyways. Students are already discovering ways to use their mobile phones in learning, hence it is vital for science lecturers to also find out how to deliver educational activities in a way that fits into their students' mobile phones and also enhance students' digital lives (Sharples, 2003). Even though mobile phone technologies have vast potentials in education, unless lecturers upgrade their teaching by learning how to utilize these technologies, there will be no transformation in the present generation of lecturers and students (Groundar, 2011). It was observed that lecturers still had a negative attitude towards the use of mobile phone technologies during class.

Therefore, Ghana must endeavor to make more efforts to enter and play a part in the fourth wave that involves using mobile communication technologies in education (Pownell & Bailey, 2001). Since, lecturers play a very significant role in the learning process; they need to explore how learning can be positively transformed by using mobile phones in teaching and learning so this will also encourage students to also use them to enhance their educational experiences. Today's generation of students are digital natives and have to insist on a media-rich environment in order to support their learning and lecturers need to provide this or they will be at a disadvantage (Maag, 2006). However, mobile phone use in education globally is still low, especially in Africa. Therefore, it is very necessary for lecturers to take a clearer look at their instructional methods and think about supplementing it with mobile phone technologies in order to support students' learning experiences.

STATEMENT OF THE PROBLEM

In Ghana, the mobile phone currently is the most accessible electronic device that the majority of students possess. Science is considered to be a difficult and demanding discipline as compared to other areas, especially since it is mainly about abstract concepts, complex concept theories, complicated laws and models. Science educationists are becoming more aware that mobile phone technologies can have enormous prospects in science learning. It is therefore necessary to look at technologies that would make science more interactive and easier to understand. Therefore, it is appropriate to look at the types of mobile phone technologies available in supporting science teaching and learning.

OBJECTIVES OF THE STUDY

This study has the following objectives:

a. Examine the type of mobile phone technologies available for science university students and their difference among universities, gender and age groups as well as its influence on academic performance
b. Examine the type of mobile phone technologies available for lecturers to support teaching and their difference among universities, experience and qualification

METHODS

The research design adopted for this study was a descriptive survey. Descriptive surveys were conducted so as to assist in finding areas for more research as well as presenting informal diagnostic information (Creswell, 2008). The design allows for both qualitative and quantitative techniques to be collected and data analyzed for this study. This was considered appropriate by the researcher to give a wider information and systematic description of the influence mobile phone technology on academic performance of university science students in Ghana. The population of interest in this study was generalized to all fourth year science university students as well as lecturers from selected departments in three public universities. Convenience sampling was the technique selected for both student and lecturer sample size, since it was deemed as the most appropriate method as it involved randomly selecting those people from a population that are the easiest to obtain for the researcher's sample.

RESULTS AND DISCUSSION

The completed questionnaires were serially numbered, coded and tabulated with the aid of SPSS-version 17 computer programme. Descriptive statistics through computing of frequencies, percentages, cross tabulation, means and standard deviation. The data was synthesized and transformed into tabular form and histograms to illustrate the relative proportions where applicable. Content analysis of all open-ended questionnaires provided qualitative support to data. The data was transformed into tabular form

to illustrate the relative proportions where applicable.

Types of mobile phone technologies used by students

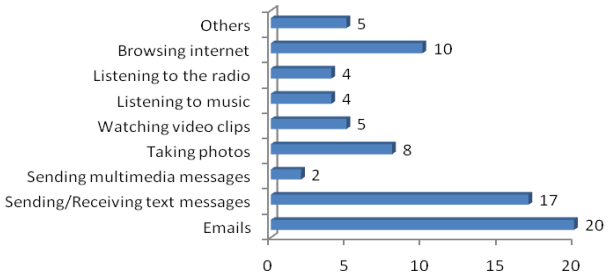

Figure 1: Activities students use with their phones

It is clear from the data placed in Figure 1 that the majority of respondents 20 (26.7%) sent and received emails and only a few of students 2 (2.7%) send multimedia messages. A few students 17 (22.7%) sent and received text messages while other students 10 (13.3%) used their phones for regular browsing. Other students 5 (6.7%) indicated alarm, reminders, calculator, dictionary and stopwatch were the features they used most on their phones.

Figure 2: The use of mobile phones in learning science

The data presented in Figure 2 indicated that a substantial number of respondents 20 (26.7%) use mobile phones in science learning by browsing/research and reading scientific information online. A few students 4 (5.3%) used mobile phone to watch science videos on YouTube and social network collaboration. The remaining students 8 (10.7%) had used their phones for calculating figures, downloading information, office applications, conference calling via Skype and capturing information through 'screen munches to read information anytime.'

Types of mobile phone technologies being used at the university students

One of the study's interests, objective one, was find out the kind of mobile phone technologies available for students. A 5-point Likert scale was used which included very often, often, occasionally, rarely and never. Students were asked to indicate how often they used these mobile phones in learning. The results are presented in Table 1.

Table 1: Mobile phone technologies available to students

	Mobile Technology used by students	Frequently		Occasional		Rarely or Not at all	
		Freq	%	Freq	%	Freq	%
1	Text Messaging	418	83.1	72	14.3	13	2.6
2	Audio Recordings	325	64.6	102	20.3	76	15.1
3	Research	367	73.0	96	19.1	40	8.0
4	Emails	307	61.0	102	20.3	94	18.7
5	Calls	470	93.5	28	5.6	5	1.0
6	Reading	299	59.4	111	22.1	93	18.5
7	Social Networking	349	69.4	88	17.5	66	13.2
8	Office Applications	210	41.8	65	12.9	228	45.3
9	Dictionary/ Calculator	335	66.6	111	22.1	57	11.4
10	Alarms	332	66.0	86	17.1	85	16.9
11	Artifacts	243	48.3	118	23.5	142	28.2
12	Learning Materials	300	59.6	105	20.9	98	19.4
13	Notes	261	51.9	95	18.9	147	29.2
14	Bluetooth	338	67.2	81	16.1	84	16.7
15	Discussions	355	70.5	70	13.9	78	15.5
16	Java support	0	0.0	0	0.0	503	100
17	Notifications	0	0.0	0	0.0	503	100
18	Demonstrations	21	4.2	37	7.4	445	88.5

The results in Table 1 clearly show the technologies used most by students. A 5- point Likert scale was used. It was seen from the table that majority of students used mobile phones for text messaging (262, 52.1%), audio recordings (175, 34.8%), research (177, 35.2%), normal calls (362, 72.0%) and social networking (199, 39.6%). With numerous functionalities added to smart phones these days, voice call, which is the oldest functionality of mobile phones, is now less significant and used less frequently than before (Prensky, 2004). Hence, if m-learning could be achieved through utilizing smart phone on campuses, students would certainly see it as a great advantage. Applications that were used amongst students were calculator 33(69%), phone camera 20(42%) and video capacity 13(27%). Technologies that were used amongst students were calculator 33 (69%), phone camera 20 (42%) and video capacity 13 (27%) (Woodcock, 2012). Table 2 shows the mean and standard deviation of mobile phone technologies used by students.

Table 2: Mean and standard deviation of mobile phone technologies used by students

	N	Min	Max	Mean	Std. Deviation
Technologies	503	2	5	4.29	.675
Valid N (listwise)	503				

It was seen from Table 2, that the mean and standard deviation of mobile phone technology utilization was 4.29 and 0.675 respectively. This means that most students were using some of the mobile phone technologies to support their learning. Means that were greater than 3.49 indicated high patronage in the use of mobile phone technologies, below 2.49 indicated a low patronage and a mean between 2.5 to 3.49 showed average patronage. The scale for mobile phone usage is as follows;

Low usage = 1.0 – 2.49, Average usage = 2.5 – 3.49, High usage = 3.5 – 5.00

Therefore, it showed that students were frequently using mobile phone technologies to support their learning, since the mean was found to be 4.29, which falls, between 3.5 – 5.0, indicating high usage. Information concerning the mobile applications that help in science learning in particular is presented in Figure 3.

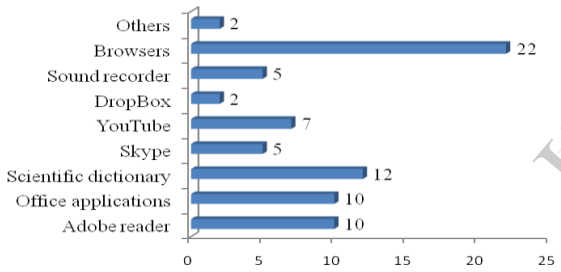

Figure 3: Mobile applications that help in science learning

From Figure 3, it is clearly seen that most students 22 (29.3%) see that browsers help them in science while others 10 (13.3%) think that Office Applications and Adobe Readers are mobile applications that help them in Science. Only a small number of students 2 (2.7%) believed that DropBox helped them in science learning. Other students 2 (2.7%) also thought screen munchers as well as language translators helped in learning science.

Mean and standard deviation of students usage of mobile phone technologies according to their universities is presented in Table 4.

Table 3: Descriptives of the use of mobile phone technologies amongst the Universities

Technologies	N	Mean	Std. Deviation	Std. Error
University of Ghana	143	4.21	0.601	0.050
University of Cape Coast	129	4.26	0.653	0.057
Kwame Nkrumah University of Science and Technology	231	4.44	0.716	0.047
Total	503	4.29	0.675	0.030

It is clear from the Table that the means of University of Ghana (UG), University of Cape Coast (UCC) and Kwame Nkrumah University of Science and Technology (KNUST) were determined to be 4.21, 4.26 and 4.44 respectively. KNUST is a science and technology biased university, so it is not surprising that students from that university used mobile phone technologies more than the other two universities. To examine the differences in students' use of mobile phone technologies in the various universities, the One-Way ANOVA test was conducted. Results presented in Table 4.

Table 4: Anova of the use of mobile phone technologies amongst the universities

Technologies	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	4.946	2	2.473	5.525	0.004
Within Groups	223.829	500	0.448		
Total	228.775	502			

It was revealed in Table 4 that statistically ($p<0.05$, $F=5.525$), there is a significant difference in use of mobile phone technologies amongst the universities. The difference was subjected to further statistical testing. Results are presented in Table 5 and 6.

Table 5: Post Hoc: Tukey HSD of technologies used in the different universities

(I) Name of University	(J) Name of University	Mean Difference (I-J)	Std. Error	Sig.
University of Ghana	University of Cape Coast	-.048	0.081	0.060
	Kwame Nkrumah University of Science and Technology	-0.233*	0.071	0.003
University of Cape Coast	University of Ghana	0.048	0.081	0.060
	Kwame Nkrumah University of Science and Technology	-0.185	0.074	0.791
Kwame Nkrumah University of Science and Technology	University of Ghana	0.233*	0.071	0.003
	University of Cape Coast	0.185	0.074	0.791

*. The mean difference is significant at the 0.05 level.

Post-hoc multiple comparisons using the Tukey HSD tests from Table 4.10 revealed that statistically there is no difference between the use of mobile phone technologies between UG and UCC, MD (Mean difference) = 0.048, $p>0.05$, however, there is a significant difference between UG and KNUST, MD= 0.233, $p<0.05$ and UCC.

Table 6: Homogeneous Subsets of mobile phone technologies used in the universities

Name of University	N	Subset for alpha = 0.05	
		1	2
University of Ghana	143	4.21	
University of Cape Coast	129	4.26	
Kwame Nkrumah University of Science and Technology	231		4.44
Sig.		1.000	0.800

The results in Table 6 indicate that students in KNUST used mobile phone technologies more often than the other two universities. But, the use of mobile phone technologies was the same between students of UG and students of UCC. This again might be related to the courses offered at these universities. According to the findings, the more Science and Technology, the more the intensity of mobile phone technologies being used in the institution. The differences in university students' use of mobile phone technologies according to their ages was examined through the One-Way ANOVA. The results are revealed in Table 7 and 8.

Table 7: Descriptives of the use of mobile phone technologies amongst the age groups

Technologies	N	Mean	Std. Deviation	Std. Error
Below 21	81	4.11	0.791	0.088
22-26	389	4.33	0.633	0.032
27-31	26	4.42	0.758	0.149
32 and above	7	3.57	0.535	0.202
Total	503	1.71	0.675	0.030

For the group of below 21 years old reported a mean (M = 4.11) with a standard deviation (SD = 0.791) while the group of 22-26 years old reported a mean (M = 4.33) with a standard deviation (SD = 0.633), the group of 27-31 years old reported a mean (M = 4.42) with a standard deviation (SD = 0.758), and the group of 32 and above years old reported a mean (M = 3.57) with a standard deviation (SD = 0.535). Therefore, is no difference in the use of mobile phone technologies between the age groups below 21, 22-26 and 27-31 years. But, students above 32 were seen to be using mobile phone technologies more frequently. Here, we see some relationship between age and use of mobile phones.

Table 8: Anova of the use of mobile phone technologies amongst the age groups

Technologies	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	7.178	3	2.393	5.388	0.001
Within Groups	221.598	499	0.444		
Total	228.775	502			

An ANOVA test between the means revealed in Table 8 that F= 5.388 at p = 0.001. As $p<0.05$, the results indicated that there was a statistical significant differences in the overall mean groups. The difference was subjected to further statistical testing and the results are shown in Table 9 and 10.

Table 9: Post Hoc: Tukey HSD of mobile phone technologies used in the different age groups

(I) Age of student	(J) Age of student	Mean Differ-ence (I-J)	Std. Error	Sig.
Below 21	22-26	-0.215*	0.081	0.042
	27-31	-0.312	0.150	0.162
	32 and above	0.540	0.263	0.169
22-26	Below 21	0.215*	0.081	0.042
	27-31	-0.097	0.135	0.891
	32 and above	0.755*	0.254	0.016
27-31	Below 21	0.312	0.150	0.162
	22-26	0.097	0.135	0.891
	32 and above	0.852*	0.284	0.015
32 and Above	Below 21	-0.540	0.263	0.169
	22-26	-0.755*	0.254	0.016
	27-31	-0.852*	0.284	0.015

*. The mean difference is significant at the 0.05 level.

It was observed from Table 9 that statistically there is no difference between the use of mobile phone technologies and the age groups, MD = 0.312, $p>0.05$, however, there is a significant difference between the age groups below 21 years and 22-26 years, MD= 0.215, $p<0.05$ in addition to the age groups 27-31 years and above 32 years., MD=0.852, $p<0.05$.

Table 10: Homogeneous Subsets of mobile phone technologies among different age groups

Age of student	N	Subset for alpha = 0.05	
		1	2
Below 21	26	4.11	
22-26	389	4.33	
27-31	81	4.42	
32 and above	7		3.57
Sig.		.442	1.000

Results from Table 10 indicate that students from age group below 21 to 31 years old have been using mobile phone technologies to support their learning, but those above the age of 32 were seen not to be using these technologies often. This is not surprising as this age group was considered to be one that is termed as digital immigrants. Students in that age group probably prefer using laptops instead of mobile phones. A number of lecturers from the three universities were also involved in this study. They were asked to give some views about the utilization of mobile phone in learning of science.

Table 11: How lecturers use mobile phone technologies to support students' learning

	Mobile Phone Technology used by lecturers	Frequently		Occasional		Rarely or not at all	
		Freq	%	Freq	%	Freq	%
1	Sending Emails	11	15.5	20	28.2	40	56.4
2	Textual materials	13	18.4	12	16.9	46	64.8
3	Contact	44	61.9	15	21.1	12	16.9
4	SMS Notifications	33	46.5	16	22.5	22	31
5	Online submissions	9	12.7	14	19.7	48	67.6
6	Up-to-date information	47	66.2	8	11.3	16	22.5
7	Course Materials	9	12.7	4	5.6	58	81.7
8	Reading materials online	46	64.8	5	7.0	20	28.2
9	Encouragement	36	50.8	12	16.9	32.4	11.3
10	Bluetooth	2	2.8	5	7.0	64	90.2

A few lecturers use their mobile phones to contact their students 44 (61.9%), getting current information from the internet 47 (66.2%) as well as reading materials online 46 (64.8%). Most lecturers do not download materials using their phones 33 (46.5%), encourage submissions of assignments online 31 (43.7%), uploading course materials online 47 (66.2%) or sending emails 30 (42.3%). Lecturers are not conversant with the use of Bluetooth 55 (77.5%). Lecturers generally use mobile phone technologies averagely. At least some lecturers are aware of the possibilities that come with using mobile phone technologies in education.

It was also noticed that some of the lecturers who said they did not use mobile phone technologies to support their teaching, were actually using these phone technologies. But, they were not aware that they were using it to support their teaching. Because some of them were seen to be using mobile phone technologies to search for information on the internet for their class, which is a mobile phone technology that supported teaching. The mean and standard deviation of mobile phone technologies used by lecturers is presented in the Table 12.

Table 12: Mean and standard deviation of mobile phone technologies used by lecturers

	N	Min	Max	Mean	Std. Deviation
Mobile phone technologies	71	1	5	2.93	.900
Valid N (listwise)	71				

Table 12 shows that the mean and standard deviation of mobile phone technologies is seen to be 2.93 sand 0.900 respectively. This implies that majority of lecturers used mobile phones occasionally to support their teaching in one way or another. Means that were greater than 3.49 indicated high usage of mobile phone technologies, below 2.49 indicated a low usage and a mean between 2.5 to 3.49 showed average usage. The scale for mobile phone usage is as follows; Low usage = 1.0 – 2.49, Average usage = 2.5 – 3.49, High usage = 3.5 – 5.00

The level of usage by lecturers was determined to be 2.93, which falls between 2.5-3.49, indicating that mobile phone technologies were used by lecturers averagely. The relationship between number of years in profession and mobile phones used by lecturers is presented in Table 13.

Table 13: Relationship between number of years in profession and mobile phone technologies used by lecturers

		Number of years in profession	Mobile phone techno-logies used by lecturers
Number of years in profession	Pearson Correlation	1	.160
	Sig. (2-tailed)		.181
	N	71	71
Mobile phone technologies used by lecturers	Pearson Correlation	.160	1
	Sig. (2-tailed)	.181	
	N	71	71

A Pearson correlation was used to examine the relationship between number of years spent in profession and lecturers' use of mobile phone technologies. This revealed that number of years spent in profession is not significantly ($r=0.497$, $p>0.05$) related to lecturers' use of mobile phone technologies. That is the number of years spent in profession has no effect on the way lecturers' use mobile phone technologies. With an r value of .160, this correlation was seen to be weak. In a study conducted with 542 teachers, the respondents had teaching experience for 10 years or more while only 10% having less than 5 years experience. Therefore, from the result the number of years in the profession does not have any influence on how they use mobile phones. Therefore, no matter the number of years spent teaching, this has no effect on the mobile phone technologies used by lecturers.

Table 14: Descriptives on how lecturers use mobile phone technologies in the various universities

	N	Mean	Std. Deviation	Std. Error
University of Ghana	17	2.76	0.903	0.219
University of Cape Coast	17	2.71	0.686	0.166
Kwame Nkrumah University of Science and Technology	37	3.11	0.966	0.159
Total	71	2.93	0.900	0.107

It is observed from the Table that there was no difference in how lecturers use mobile phone technologies among the three universities. Therefore, in all three universities lecturers use the mobile phone technologies in the same way.

CONCLUSIONS AND RECOMMENDATIONS

Summary of findings

The composite results of this study suggest that adding mobile phone technology to support teaching and learning will have a positive impact on science education. The results of the data analysis provided a number of findings:

a. Most students listened to audio clips and watched video clips to support their learning. Majority of students, who used mobile phones in learning, mostly used it in conducting research. Some students used their phones in reading science news, books and articles online. Majority of students utilized science dictionaries and calculators available on their phone. Only a very few students utilized office applications on their phones.
b. Students from KNUST were also observed to be using mobile phone technologies more frequently than the other universities. Students between the ages 27 - 31 seemed to be using mobile phone technologies more than the other age groups.

CONCLUSION

Based on the findings of the study, the following conclusions were made:

a. Students who used mobile phone technologies more frequently improved their academic performance. This could be because this technology makes it easier to have access to information that can be read every time and everywhere. Therefore, students have information at the tip of their finger with just the click of a button.

b. Many lecturers did not use mobile phone technologies to support teaching by accessing the internet for information. But, after a follow up question, it was seen that majority of lecturers were accessing up-to-date information and reading materials online through their mobile phones. This follow-up sensitization seemed useful and made them aware of the instructional importance of the phone technology. Sensitization is therefore important in this process. These lecturers did not realize that they were using mobile phone technologies to support teaching. The number of years spent lecturing did not have an effect on how lecturers used mobile phone technologies. This was rather surprising for it would have been thought that the younger generation would take the lead. There is no difference in the way mobile phone technologies were used among lecturers in the three universities.

RECOMMENDATIONS

Based on the results and conclusions of the study, the following recommendations were made:

i. A well resourced mobile learning facility centre needs to be established within the universities, where staff and students will be trained and have the opportunity to use these technologies to support educational experiences. Universities need to support this facility with internet at a reduced cost, so that more students will have an opportunity to use these facilities.

ii. Students should be aware and take an interest in using mobile phone technologies to support their learning experiences. Science students should be more encouraged by their lecturers to use chat room, such as viber and whatsapp for group discussions, share images through Bluetooth for explaining scientific concepts and processes, use videoconferencing for face-to-face group discussions, read eBooks and download scientific materials from the internet.

iii. Science lecturers should encourage students in the use of mobile phone technologies in their learning. Lecturers are encouraged to design activities that allow students to appropriately use their mobile phones during lectures (such as rules around usage and etiquette). Science lecturers should consider adopting a mobile learning pedagogy approach that would involve encouraging opportunities for more group assignments and class discussions; in this case it would allow students to interact with science content more effectively.

iv. More research should be done in the areas of Business, Arts, Education and Social Sciences for comparison. Future research may want to include private institutions and examine differences based on region, available resources, and faculty technology training. This study was descriptive and the instruments used were only questionnaires and interviews. Further research should be conducted through a quasi-experimental study using a pretest-posttest design.

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