SMARTPHONES AS PARTNERS IN TEACHING AND LEARNING

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ABSTRACT

The purpose of this study was to investigate the different ways university students use their smartphones to improve upon learning. The study used 700 students and collected data on their phone use patterns during class as well as their conscious effort to use phones to learn. At the end of the study, the researchers found an insignificant negative correlation between the amount of time spent on the phone and students' grade. Second, there was a significant positive correlation between the amount of time spent on the phone and the amount of money spent weekly on the phone. Third, the study revealed that 92% of university students were more likely to spend ten Ghana Cedis (about $2) or less every week on their phones in buying either credit for calls and SMS or data for internet access. Finally, there were significant correlations between phone use during class and phone use for learning; and phone use for learning and phone use constraints. The implications for practice are discussed.

Keywords: University students, smartphone, students' grades, students' learning.

INTRODUCTION

The goal of every teacher is to make sure that students learn meaningfully. Before effective learning can take place, there is the need for students to pay attention and be engaged in and inspired by the teaching and learning process (Gagne, 1985). Teachers can prepare adequately in organizing the teaching and learning environment. However, much depends on the ability of the students to avail themselves for the teaching and learning process. When the teaching and learning process becomes irresistible, students cannot help than to follow the flow and learn meaningfully. The failure of teachers to help students stay focused on task is inimical to the learning process. One of the things that are taking the attention of the students (especially at the institutions of higher learning) from their teachers in their classrooms is the use of phones (Manu, Akyina, Yeboah-Appiagyei & Opoku, 2018). Students have gradually reached a stage where they cannot do away with the phone within the shortest instructional time. The more students spend their time on the phone, the more academic work suffers (Bjornsen & Archer 2015; Felisoni & Godoi, 2017; Lepp et al., 2014).

Unlike the phones that were used only for calling and texting instant messages in the olden days, the kind of phones available in the 21st century have functionalities that make its usage more addictive. The numerous applications serve as a one stop-shop that students explore without getting bored with them. The number of applications on a student's phone, to a greater extent, might determine the amount of time he or she spends on it. Smartphones have many interesting and captivating applications that cannot be matched with the dry lecture halls with monotonous voices from their lecturers who seem to struggle relating with their own students. When the lecture halls are consistently becoming the last place where

university students want to be, it calls for an introspective analysis of how institutions of higher learning go about their mandated business of teaching, learning and research.

There are so many ways students are investing heavily on the use of smartphones. For example, purchase of credit and data, time spent on phone, price of phone, influence of social media, among others. These are done at the expense of the academic work. The begging question is, in what ways can students be re-oriented to reap the benefits of using their smartphones in supporting the teaching and learning process? Educators, administrators, teachers, counsellors, and other stakeholders alike have the responsibility to explore the learning opportunities that university students can have in using their smartphones.

Statement of the Problem

There are several studies on different ways that university teachers can integrate the smartphones of their students into their teaching and learning process (Sternberg & Williams, 2002). Based on the relevance of technology in the lives of the developing students, Jonassen (2006) indicated that we can create an enabling environment for our students to use technology as partners in their learning. In spite of the availability of these evidence-based studies, it looks like many university teachers still design and develop their courseware around the traditional methods of teaching and learning. The effect is that students are gradually developing the feeling that the lecture hall is a boring place and consequently, skip lectures regardless of the relevance of the content. This observation is evident when marking students' examination scripts. There are simple answers to questions that students fail to provide due to their refusal to attend lectures. The impact has been poor grades while at the university and poor on the job performance after graduation. The technological space presents unmatched opportunities for lecturers and students alike to use their instructional time judiciously and by so doing, become better placed in the 21st century world.

LITERATURE REVIEW

The purpose of this study was to investigate into the different ways university students use their smartphones to learn. The rate at which students possess smartphones at the university level is increasing at a faster pace (Dzamesi, Akyina, Manu & Danso, 2019; Manu, Akyina, Yeboah-Appiagyei & Opoku, 2018). As the population of university students keeps on soaring in the 21st century, especially in developing countries, the smartphone presents opportunity for university teachers to extend the teaching and learning environment beyond the traditional classroom. The next sections present discussion on related studies on internet penetration, phone use, students' learning and constraints of phone use.

Internet Penetration around the world

The world is now one cosmopolitan with the oceans and languages serving as a partition. Technology has brought us together in such a way that has never happened before. Nonetheless, the wind of this development is not happening evenly across the various continents of the world. If the rate at which countries use technology is depicted by a black cloth with white stars, some countries would be brighter due to the presence of more stars whereas others would be darker. Africa in comparison with the rest of the world has internet usage of 11.0 % of the total number of people who use the internet. This figure is against North America (8.2%), Europe (16.8%), Asia (49.0%), South America (10.4%), Middle East (3.9%), and Oceanic/Australia (0.7%) (Internet Stats, 2018). In comparison to last year, the African penetration rate in terms of internet use increased from 10% to 11%. Apart from Africa, North and South America maintained last year's penetration rates as 8.2% and 10.4%

respectively. However, Europe and Asia dropped from the internet penetration rate recorded last year.

Based on the figures above, it is easy for one to conclude that Africa is not doing that bad at all in internet usage. However, the crux of the matter is that these revelations should worry leadership of countries as well as policy-makers in Africa. As we rub shoulders with the rest of the world, we stand to lose or gain, based on how we take advantage of the internet. Though, the 11.0% is not the least, in terms of the percentage of the population using the internet, Africa is still the last. Thirty-six point one percent of Africans are using the internet (Internet Stats, 2018). The rest of the world has Asia (49.0%), Europe (85.2%), Southern America (67.2%), Middle East (64.5%), North America (95.0%), and Oceanic/Australia (68.9%). With a world penetration average of 55.1%, our continent has long way to go in terms of taking advantage of the internet resources that are available to the world.

The above figures represent the actual number of people who are using the internet. In terms of the population of continents in comparison to the use of internet, Africa's population stands at 16.9%; Asia is made of 55.1%; Europe has 10.8%; Southern America is at 8.5%; Middle East stands at 3.3%; North America records 4.8%; and Oceania/Australia with 0.6%. One would have expected that similar percentages of the population of the various continents should be proportional to those using the internet. On the contrary, Africa and Asia are around 6% points short of their population rates. And since the Asian continent is more than three times the size of the African continent, it will not be fair to conclude that Africa is performing better like the Asians.

The Technology Acceptance Model
The technology acceptance model (TAM) was developed by Davis in 1989 as a model to explain the basis upon which employees adopt any new technology at the work place. Davis indicated that employees would accept the newest technology based on two factors. These factors were the usefulness of the tool to their work conditions and the simplicity in using the particular device. In relation to university students, they have had the opportunity to use the smartphones and have become used to them if not addicted to them. The other component of perceived usefulness of phones is a little deceptive. As of now, there are so many ways that students are using the smartphone inappropriately. At the same time, there are others who are not taking advantage of the various affordances smartphone provides. Since students are already using smartphones and would not resist any attempt by their lecturers to incorporate their use in the teaching and learning process, it creates learning opportunity for the students. However, there is the need for the lecturers to have a framework on how to use the technologies as they allow the students to use the phones during lectures. This will be the surest way of helping university students to be able to stay on task whiles learning.

Learning is a continuous activity and students are always seen using variety of approaches to achieve this objective. In today's dispensation, the application of electronic gadgets to learning activities has been documented. Among these electronic gadgets, smartphones have been rated to be the most popular device students use (Koehler, Yao, Vujovic, & McMenamin, 2012). Smartphones are considered to be mobile devices that combine the features of computing with communication abilities making them sophisticated gadgets. Some of these features include but not limited to digital camera, Global Positioning System, media players, internet, text messengers like SMS and electronic mails, call, calculator, Bluetooth, mass storage and video games (Suki, 2013; Lepp, Barkley, & Karpinski, 2014; Jairus et al., 2017). These smartphone devices on campuses are universal, with almost every

student owning one and their frequent use every day is on the ascendency not only at students' leisure time but also during class time (Felisoni & Godoi, 2017).

Phone use during lectures
The manner in which smartphones are used by students is of major concern to teachers as some students use them during class periods. For instance, Duncan, Hoekstra and Wilcox as cited in Felisoni and Godoi (2017), found a more serious trend of smartphone usage in class. They indicated that students reported to access their smartphones about three times during class periods. However, actual observation revealed that they accessed their smartphones close to twenty-one times during class time. Froese and others in 2012 as cited in Womack and Mcnamara (2017), acknowledged that students spent much time on their smartphones. Their study observed that students who used their smartphones to text in a 6 minute class lecture tended to use an estimated time of 2.69 minutes in sending text messages to their friends. That time should have been used to concentrate on what the teacher was teaching.

To understand how smartphone usage influences students' academic performance, a quantitative study was conducted among students of higher learning. The researchers used questionnaires with closed-ended questions to gather their data. Data on usage of smartphone habit such as how frequent they browse, information source and the websites they usually visit were collected. Data was also gathered on the number of hours the study participants used on their smartphones per day. The findings suggested an average of 5-7 hours was spent on smartphones and they frequently used smartphones for academic activities rather than non-academic activities which allowed them to get their knowledge updated leading to better academic performance and grades (Sumathi, Lakshmi, & Kundhavai, 2018).

Time on the phone and students' grade
Lepp et al. (2014) investigated whether there was a relationship between cell phone use, academic performance, anxiety, and satisfaction with life among students in college through a survey. A total of 536 students participated in the study. Demographic, satisfaction with life, anxiety, and information regarding cell phone and texting, and cumulative grade point average were collected and analysed. The outcome of the study indicated that students who used their cell phones frequently tend to have lower GPA, higher anxiety, and lower satisfaction with life compared to their colleagues who used their cell phones less frequently.

Bjornsen and Archer (2015) investigated the impact of phone use in-class and conducted series of test in two semesters. With 218 university students across all four levels, the researchers reported that there was a significant negative correlation between phone use in class and students' test scores regardless of the sexes of the students. In another study to examine the impact of phone use during class on students' learning, Kuznekoff and Titsworth (2013) came out with three main findings. First, university students who did not use their phones during class could provide 62% of detailed information. Second, these students were able to take detailed notes during lectures. Finally, the students without the use of phones in class performed a grade and half better than the low-distraction and higher-distraction groups on multiple choice questions.

In a similar study, Stollak, Vandenberg, Burklund, and Weiss (2011), in a conference proceedings, presented their investigation on the various social networking sites university students used. With the exception of Facebook that had a significant negative correlation with grade, the researchers reported that none of the other sites had any significant relationship with students' grade. Since Facebook was the most frequently used social media site among

the university students, it was obvious that it was more likely to take larger part of their time as compared to the other sites.

In Brazil, an experimental study was conducted to establish the kind of relationship that exists between the actual average time students spend on their smartphones in a day and their academic performance. The study involved 250 students. Results indicated a negative relationship between the total time students spent accessing their smartphones and their academic performance. Every 100 minutes a student use in accessing his or her smartphone averagely in a day actually makes the student drop by 6.3 points from his or her position per the school's ranking, across a range from 0 to 100. The impact is even serious, nearly two times as high, when only smartphone usage within class time is considered. The outcome of the research then posited that excessive smartphone usage by students could be harmful to their academic performance (Felisoni & Godoi, 2017).

Phone use and students' learning
The use of smartphone for learning is in line with the ideas of constructivist's learning. Constructivists hold the idea that children (students) construct their own knowledge with the guidance of teachers rather than being taught directly by teachers as in expository learning (Sternberg & Williams, 2002). To constructivists, students do not wait passively to be filled up with knowledge but rather they actively build, or construct, their own knowledge (Cobb, 1994). Constructivism embodies the ideas of discovery learning. Discovery learning is obtaining knowledge for oneself (Bruner, 1961). It is also known as problem-based, inquiry, experiential and constructivist learning (Kirschner et al., 2006). Sternberg and Williams (2002) assert that learning becomes more meaningful when students explore their learning environments rather than listen passively to teachers.

Mobile phones have seen a lot of advancement with regards to the functions they can perform. They are found everywhere and students use them for varied purposes on various campuses across the globe. Nonetheless, their use for educational purpose especially within the classroom has generated a lot of resistance from educators. It is admitted that smartphones could help with many pedagogical activities but can also be a potential source that could divert students' attention in class (Batista & Barcelos, 2014). This therefore opens the discourse on how effectively smartphone could be incorporated into formal education. Smartphone usage in classrooms and for academic purpose has been investigated among students from United Arab Emirates through a survey study. Results of the study specified that students use smartphones for their academic purposes such as downloading study material, browsing for related course material and reading. The cumulative effect is motivation to participate in class discussion, improvement of studying skills, early preparation and submission of assignments (Johnson & Radhakrishnan, 2017). According to Bentley (2017) smartphones could be used in the classroom in these ways:

1. Teachers should introduce the use of social media applications on smartphones in class. Social media are lively and students quickly embrace them. Therefore teachers should get hold of them and explore "the instructional and communication" potential these applications offer. The use of social media application on smartphones engages the students and serves to create new learning ways for them;

2. Using smartphones to create online class discussion forums in classrooms using variety of applications without directly going on to access the internet. This is particularly useful for students to develop their writing skills and also to give them the leverage to present and defend their points. This form of engagement gives students a

new feel and allows those that are less participatory in lecture or tutorial style of instruction to fully participate in class discussions;

3. Smartphones come with camera that can capture video and still images. Teachers can guide students to use these functionalities in classrooms effectively. Students can support their class assignments with videos or picture contents. These videos could be uploaded unto the "class information storehouse" on websites like YouTube or Vimeo. However, for this to be effective, teachers must take the pain to train their students on how to use video and picture editing applications;

4. Smartphones can be used in classrooms for recording lectures. Audio files can also be added to their assignments. Recorded lectures can be played several times at home by the student at their own pace to gain understanding of the lesson taught. However, it is important that teachers teach students how to edit audio files;

5. The use of text messaging application on smartphones is worth using in the classroom. Teachers send reminders to their students through text messages about incoming activity or quiz;

6. Smartphones come with calendar applications. Hence, students could be taught how to use them effectively to benefit them in their time management; and

7. Smartphones can be used to access the internet. Hence in the classroom, students could be asked to make a quick research on topics for class discussion. Teachers could also use this platform to help students learn how to gather information and assess the cogency of their sources (p. 1-2).

Based on the revelation by Bentley (2017), there are so many ways that teachers and educators can use the various applications on the students' smartphones and match the teaching and learning objectives and class activities with them. This strategy is an effective way for curriculum developers to help students to stay on task whiles integrating the smartphone into the teaching and learning process.

Constraints of Phone Use

Though the use of smartphones could impact positively on the lives of university students, excessive time spent on it can also be detrimental to the health and academic performance of the user. For instance, a descriptive study conducted on 1000 medical students to assess their mobile phone usage pattern and how it affects their psychological health, sleep, and academic performance using a self-administered questionnaire has shown the negative effects of its excessive usage. It was observed in the study that there exist a strong significant correlation between the use of mobile phone during the night and the uneasiness in waking up, tiredness, a drop in academic grades and decrease in habit of learning, less concentration, increased rate of missing classes and the habit of lateness to class. The findings seem to identify that majority of students excessively utilize their mobile phones to the detriment of their health and academic performance (Gupta, Garg, & Arora, 2016).

Smartphones have presented a lot of benefits yet their excessive usage can also pose a serious challenge to the educational system. The following constraints have been identified to impede effective use of smartphones in the classrooms. In fact, both teachers and students have their attention diverted when any of the following is used in the classroom: playing games; incoming call when the phone is on vibration or ring mode; message alert in sound or vibration mode; and sending text messages through SMS or over the internet through communication applications like WhatsApp, Viber and Hike (Mahesh et al., 2016).

Al-Arabiat, Ahmad and Sarlan (2015) studied the challenges that students at higher education institutions face in adopting mobile learning. The finding of their quantitative study revealed that students face a number of constraints trying to adopt mobile learning. Short battery life of smartphones identified in the study impede students learning since they have to recharge their phones after four hours of charge on the average. Small smartphone memory size causes "cognitive resource overload" when multiple functions or applications are used simultaneously on smartphones. It was also noted in the study that students were challenged because of limited 'mobile processing power, speed, and content streaming of materials.' Students admitted that they were challenged in using smartphone for mobile learning because of the limitation of wireless bandwidth. This may therefore lead to internet interruption when a number of students are logged on to the network. Finally, smartphones do not support all file types since some have different operating platforms and this serves to constrain students.

A descriptive study conducted to identity challenges faced by students at a university in Jordan, in terms of mobile phone usage, indicated that students were constrained by a number of factors. The study used questionnaires to collect information from 108 purposely selected students. The outcome of the study showed a number of barriers to the use of smartphone for learning purpose. These include:
- restrictions imposed by university on students not to use smartphones in classrooms;
- high cost of subscriptions charged by telecommunication companies;
- most faculty members are not well-informed about the significance of using smartphone for learning;
- few power sockets for charging smartphones; and
- learning activities in classrooms do not support the adoption of smartphone in learning (Alwraikat, 2017, p. 125).

Purpose of the Study
The purpose of the study was to identify the different ways university students use their smartphones to improve upon their learning. About 80% of university students have smartphones that can be used to learn in different ways (Manu et al., 2018). At the same time, it explored some of the challenges that students face in their attempt to integrate the smartphone in their learning.

Research Questions
The study was guided by the following research questions:
1. How much money do students spend on their phone every week?
2. In what ways do students use their phones to learn?
3. Is there any difference between males and females based on how they use their smartphones to learn?
4. Is there any correlation between time spent on the phone and the amount of money spent weekly on the phone?
5. Is there any correlation between time spent on the phone and students' academic grade?
6. Is there any correlation among the phone use in class, phone for improving learning and constraints of phone use?

Methodology
The purpose of the study was to identify the different ways university students use their smartphones to improve upon their learning. Based on the purpose, the researchers used survey research design to solicit the views of first year undergraduate students in one of the public universities in Ghana. The students were 1020 in number.

The instrument for data collection was a questionnaire. The instrument was designed by the researchers. It had three sections. The first section was on demographics (gender, age, level of education, and years of teaching). The second section had seven questions on ownership of smartphone, laptop, money spent a week on credit, etc. The last section had three constructs on phone use during lectures, phone use to improve personal and group studies, and constraints on phones use. The last section was on a five-point Likert scale from strongly disagree (1) to strongly agree (5). With the three constructs, the number of items was ten, eight and ten respectively.

The students answered the questionnaire online. The link to the questionnaire was placed on the students' WhatsApp platform in the second semester of the 2017/2018 academic year. All the first year students were given the opportunity to be part of the study by visiting the class WhatsApp platform and clicking on the link to answer the questionnaire online. Prior to the administration of the questionnaire, the researchers went to all the six lecture halls of the first year students and explained to them, the purpose of the study and how to respond to the questionnaire on their phones. At the end of the two-week period allowed for responding to the questionnaire, 723 students representing (70.9%) took part in the study. Screening and preparation of the data reduced the number to 700 and was entered into the SPSS 20.0 version for analysis.

Demographics
The researchers looked at the gender of the respondents. After running the simple frequencies in SPSS, there were 574 (82%) males and 126 (18%) females. This indicates that the males were nearly five times more than the females. The finding is different from earlier study where the number of males was three times of the number of the females (Manu, Akyina, Yeboah-Appiagyei & Opoku, 2018).

Table 1. Gender Distribution of Respondents

Gender	Frequency	Percentages
Male	574	82.0
Female	126	18.0
Total	**700**	**100**

(*Field data, 2018*)

Since there were traditional and non-traditional students, the researchers divided the age variable into three groups. These groups were 19-23, 24-28, and 29 or older. The descriptive statistics procedure indicated 293 (41.9%) for category one, 325 (46.4%) for category two, and 82 (11.7%) for the third group respectively. The finding seems to indicate that almost 60% of the respondents were not traditional students. Traditional students are more likely to fall within the ages of 19 and 23. If a higher number of students are graduating at ages such as indicated, it is more likely they might not work longer on the job market before they go on retirement. With a mean age of 24.7 and 3.58 standard deviation, such a trend could be an indicator for government to look into the matter and come out with interventions to help encourage students to enter the university at the right age.

Table 2. Age of the Respondents

Age	Frequency	Percentages
19-23	293	41.9
24-28	325	46.4
29 and Above	82	11.7
	700	**100**

(*Field data, 2018*)

RESULTS AND DISCUSSION

Research Question 1: How much money do students spend on their phones every week?

Spending money on phone has been a headache for many students and parents alike. The researchers wanted to know how much students spent on their phones, in terms of buying calling units and data for surfing the internet. The frequency test indicated that about 92% of students spent ten Ghana Cedis or less per week. With an average expenditure of 7.09 and 6.91 standard deviation in Ghana Cedis, it can be contested that students are not spending too much money on their phone since the amount the university students are spending weekly cannot provide two-square meals a day. Again, the amount spent on the phone might be affected by the environment within which the university is situated. The socio-economic dynamics of the students are the determinants of how much to spend at any point in time. All other things being equal, it is more likely students in the major cities would spend more than those in the smaller cities.

Table 3. Weekly spending on phone

Amount in Ghana Cedis	Frequency	Percentages
1-10	643	92.0
11-20	37	5.3
21 and Above	20	2.7
	700	**100**

Research Question 2: In what ways do students use their phones to learn?

The researchers had specific items on the various ways university students used their phones to learn. With the Cronbach alpha of 0.72, the reliability level among the individual items was statistically appropriate. The items on the *phone for learning construct* were eight focusing on the different ways phones are used to improve learning. After running the simple frequency with SPSS software, five out of the eight items had *agree* or *strongly agree* to the statements. Among the items, using the phone to surf the internet had the highest score (4.38). The lowest frequency was students using their phones to submit assignments (3.14).

The inability of majority of the students to submit their assignments online seems to indicate that students are not taking advantage of the cloud storage services that are freely provided online. If university students have proficiency in the use of the cloud technology, they would choose to save some of their assignments online for easy submission. On the contrary, it might also suggest that their lecturers are not requiring them to submit their assignments online. Buabeng and Yidana (2015) reported that lecturers sparingly use ICT tools during the teaching and learning process. This they attributed to inadequate technological infrastructure

in the various institutions. Whatever the reason might be, the current study does not have the answer. Nonetheless, saving files online is a 21st century skill such students have to acquire.

Table 4. Using phones for learning

Constructs	*Measuring Items (5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree)*	Mean	Cronbach Alpha
Phone for Learning	1. I use my phone to learn new words.	4.23	
	2. I am able to access the internet on my phone	4.38	
	3. I read news on my phone.	4.27	
	4. I use my phone to check the time table.	4.04	0.72
	5. I use my phone to submit my assignments.	3.14	
	6. If I don't understand anything in class, I check it out on my phone.	3.97	
	7. Phone calls or messages can easily distract my attention when learning.	3.98	
	8. Cell phones can be used to improve student learning.	4.35	
	Overall mean	**4.045**	

Research Question 3: Is there any difference between males and females based on how they use their smartphones to learn?

After running the independent samples t-test statistical procedure, where gender was the independent variable with the *phone for learning construct*, it indicated that there was no significant difference between male and female university students on how they use their phones to learn. The mean difference between the two groups was .021. The result of the test was $t(689) = .030$, $p = 0.976$, 2-tailed. The implication of the finding is that males and females are more likely to use their smartphones in similar ways. The finding might be due to the fact that lecturers have not been requiring their students to use their phones in the teaching and learning process. Maybe, the result might be different if phone use is integrated into the teaching and learning at the institutions of higher learning.

Table 4. T test of phone for learning based on gender

Variables	*(t)*	*p - value*
Males/females	.030	.976

Research Question 4: Is there any correlation between time spent on the phone and the amount of money spent weekly on the phone?

Students are spending many hours on their phones daily (Manu, Akyina, Yeboah-Appiagyei & Opoku, 2018). As a follow-up on this finding, the researchers wanted to find out whether there was any correlation between the time spent on the phone and money university students spent weekly on their phone. The Pearson moment product correlation indicated a positive significant correlation ($r = .118$, $p < .002$). This finding implied that the amount of time students spent on their phones was dependent on the amount of credit or data they bought weekly. Students who stay longer have to buy more data or calling credit. Eventually, students who stay longer on the phone are more likely to have poor time and financial

management. If lecturers are able to transplant some of their course activities onto the phone, then, it will save some of these students from their technology addiction.

Davis (1989), developing the TAM model indicated that employees were more likely to use a particular technology based on the ease of use and usefulness of the technology to them. Students are already spending money on their phones and once lecturers are able to help them to see the reason why they should use their phones to facilitate their learning, they will not have issues. Samuel, Onasanya and Olubode (2018), looking at the perception of Nigerian lecturers from 13 federal and state universities reported that lecturers perceived mobile technology as essential in facilitating research and collaboration. Therefore, when students are led out by enthused lecturers in the quest to integrate technology in the teaching and learning process, students can learn meaningfully.

Table 5. Relationship between weekly expense on phone and time on phone

Variables	(*r*)	*p*-value
Weekly expense on phone/Time spent on phone	.118	.002

Research Question 5: Is there any correlation between time spent on the phone and students' academic grade?

At the end of every semester, what matters most to students is the kind of grades they obtain. Students seem to be satisfied if the lecturer skips all lectures but gives every student better grade. With the importance of grades in the life of students in mind, the researchers wanted to know whether there was any correlation between students' time on the phone and their end of semester grades. For the purpose of this question, the researchers could obtain the end of semester grades of 373 students only out of the 700 in Information and Communication Technology (ICT) course. The Pearson moment product correlation indicated a negative correlation. However, the coefficient was not significant ($r = -.028$, $p > .585$). There are several studies that have found evidence on the negative relationship between students' grades and the time they spent on their phones (Bjornsen & Archer 2015; Felisoni & Godoi, 2017; Lepp et al., 2014).

The inability of the study to produce significant correlation between time on the phone and students' grade might be attributed to the nature of the information and communication technology course. The researchers used the end of semester grades of the participants in Information and Communication Technology course. Since students' time on the phone was part of the topics on the course outline, time on the phone was not perceived as a waste of students' time. For this reason, it will be interesting to check with humanity courses.

Table 6. Relationship between students' grade and time on phone

Variables	(*r*)	*p*-value
Grades/Time spent on phone	-.028	.585

Research Question 6:   Is there any correlation among the phone use in class, phone for improving learning and constraints of phone use?

Finally, the researchers wanted to know whether there was any significant correlation among the three constructs. To find an answer to the research question, the Pearson moment product correlation statistical procedure was used. The test produced interesting results. There was a significant negative correlation between *phone use in class* and *phone use for learning* ($r = -.151$, $p = .000$). The more students used their phones without the direction of the lecturer, the worse their performance would be. In terms of the correlation between *phone use in class* and *phone use constraints*, there was no significant relationship between the two constructs ($r = .009$, $p = .819$). In this scenario, students are not being encouraged to use their phones during lectures. If this happens, it is more likely that students would encounter setbacks in their smartphone usage.

The last was the correlation between *phone use for learning* and *phone use constraints* ($r = .280$, $p = .000$). The result indicated that there was a moderate positive correlation between the two constructs. The more students used their phones to learn, the more they were likely to have challenges. The finding seems to be expected since students will be using their smartphones for the first time to explore the courseware. With this, there might be times they have to move from their comfort zone and learn in different ways they might never have encountered before. This would be a possible source of constraints to the university students.

Table 7. Correlation among phone use in class, phone for learning and phone use constraints

Variables	(*r*)	*p*-value
PhoneInClass/PhoneForLearning	-.151	.000
PhoneInClass/PhoneUseConstraints	.009	.819
PhoneForLearning/PhoneUseConstraints	.280	.000

CONCLUSION

In conclusion, there are different studies that have come out with evidence to support the relationship between phone use and students' grade. The current study also found a negative relationship between time spent on phone and students' grade. However, the relationship was not significant. Students in Ghana have multiples of smartphones and are daily opting for the current applications that are on the market. Such trend of phone use is more likely to increase the time that they have been spending on their phones. And as they spend more time on their phone, the more they are spending the little financial resources they have as students in a developing country. It is time for lecturers, educators and educational technologists to step in and come out with interventions that would allow the students to use their smartphones to facilitate their studies as well as improve upon their performance (Reiser & Dempsey, 2012). This study seems to suggest that the university students are already using the various technologies. What is left is for their lecturers to come on board in terms of redirecting their technological efforts towards learning.

Implications for practice
1. The study revealed that university students are already making efforts to integrate their smartphones in the teaching and learning process. For this reason, lecturers should be trained in the constructivist learning theories that encourage students to use their smartphones to learn meaningfully.
2. Again, it looks like majority of the lecturers do not allow their students to submit their assignments online. This attitude does not encourage our students to begin to make

their accomplishments available electronically. Lecturers should encourage students to submit their assignments online as well as allow them to share their projects with the rest of the world.

3. There are supporting studies that point to the negative relationship between students' time on the phone and their end of semester grades. However, this finding was not confirmed in the current study. The nature of the course (ICT) might be the reason why the relationship was insignificant. There will be the need to replicate the study with non-technology related course.

4. There is the need for university administrators to support the establishment of technology infrastructure that will support the integration of information and communication devices students possess. Such stride will motivate lecturers to consider using the available technologies to help their students to learn meaningfully.

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