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The influence of internet search engines and cellphones on the achievement of college of technology students in Cameroon

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Abstract

The rapid growth and sophistication of handheld phones, supported by accessible software, have made them indispensable for students, enabling instant access, storage, retrieval, and refinement of information anytime and anywhere. This study seeks to obtain insights into how the use of technology in teaching and learning influences students' learning. Participants in the study revealed that the relationship between the Use of Search Engines (USE) in teaching and academic achievement of students in the College of Technology of the University of Buea was statistically significant. The correlation coefficient for the same relationship indicated a weak positive relationship, while qualitative data reveled that teachers held divergent, but positive views on how search engines were used in teaching. The qualitative findings on teachers' views of how search engines influence students' academic achievement also presented a variety of ways through which students consolidate their learning. Regarding the use of cellphones, students on the average reported favourable attitudes, implying that the relationship was statistically significant, while the correlation showed a moderate negative relationship. Teachers provided a variety of positive ways in which cellphones are used in teaching, and in relation to its influence on learning indicated that it increased their pace while fostering program coverage. They, however, indicted that it also caused distractions. Based on Rogers' diffusion of innovation theory, educators should adapt technology use to adopter categories to enhance learning and reduce distractions.

Keywords

Computer, innovation, online, learning, teaching.

INTRODUCTION

Naumann [1] contends that search on the web happens to be a daily activity for many people throughout the world, and that search and communication constitute the most popular uses of the computer. In addition, he posits that applications involving search are everywhere, and that the most popular use of the computer on the internet is in information retrieval. Information retrieval around the 1950s focused on text and documents, but today that focus has been expanded to include multimedia and cloud computing. Searching for information online is a task that requires skills, otherwise the searcher ends up with so much irrelevant information than is needed. Web search, therefore, require a series of search techniques, such as user queries, filtering, classification, question answering, relevance, evaluation, and users and information needs. The rapid growth, and development of Information and communications technologies

has influenced all domains of life especially education. In Cameroon Higher education, delivery of instruction is expected to use both face-to-face and online delivery strategies in an effort to maximize students' achievement, and improve quality educational offerings. Consequently, this study seeks to obtain some insights, with regard to how the use of technology in teaching and learning influences students' learning. The study is guided by the following research questions: (RQ1) How does the USE in teaching influence the academic achievement of students in the College of Technology in the University of Buea? and (RQ2) How does the use of Cellphones in teaching influence the academic achievement of students in the College of Technology in the University of Buea?

Search engine

According to Lutkevich [2], a search engine is a coordinated set of programs that search for, and identify items in a database that match specified criteria. Search engines are used to access information on the World Wide Web. In addition, a search engine is a software program that helps people find the information they are looking for online, using keywords or phrases. Students, faculty members, and researchers, now turn to the web as their first stop for information, since it has emerged as the largest information market where demand and supply are met. The development and growth of the web were enhanced by the revolution and explosion of digital information in the 21st century [3].

The evolution of search engine in teaching started from the early 1990s, with the advent of the internet, which brought along computer networks, World Wide Web, email and search engines. Distance learning, Web-conferencing, and other forms of communication likewise became increasingly common in the educational landscape. The term ICT, or Information and Communication Technologies, was used to embrace the many technologies or electronic tools that facilitate gathering, recording, storing, and retrieval of information, and the exchange and distribution of information to others, Bokova [4]. Teachers saw the power of the Internet to connect people, access information, and create virtual experiences. In 1998, the International Society for Technology in Education (ISTE) sponsored National Educational Technology Standards (NETS) for students, teachers, and later on administrators. NETS outlined the skills and knowledge required to be competitive, and successful in a global and digital world.

The search for information, using the internet rather than the library, is now the norm among students, faculty and researchers. According to Ozonuwe et al. [5], students are less likely to visit the library or a librarian for information, and instead use the public internet and search engines). Search engines software are basically used to find information in the internet, and one of the most popular search engine, Google, uses crawling to discover what pages exist on the web, and constantly looks for new and updated pages (URL) to add to its list of known pages. Once a page is discovered, the crawler examines its content, and uses an algorithm to choose which pages to crawl, and how often. The search engine then processes the text content, analyzes, and tags it with attributes and metadata that help it understand what the content is, and indexes it, This also enables the search engine to weed out duplicate pages, and collect signals about the content, such as the country or region the page is local, to and the usability of the page. The final stage of search engine operation is searching and ranking. When a user enters a query, the search engine searches the index for matching pages, and returns the results that appear the most relevant on the search engine results page (SERP). The engine ranks content on a number of factors, such as the authoritativeness of a page, back links to the page, and keywords a page contains [2].

In this connection, Shahibi and Rusli [6] found out that, online media usage for education had no significant effect on students' academic achievements, while the perceived use of the internet had a positive impact on student achievement in the learning process. A study by Soegoto and Tjokroadiponto [7], revealed that internet use for academic purposes and academic success are directly correlated while student social life was inversely correlated, whereas study by Nawaz [8] revealed that internet use has a positive impact on students' academic achievement, since they help students in the preparation of advanced lectures and assignments.

Cellphones

Ng et al. [9] carried out a study to examine the extent to which students in one Malaysian university use smartphones to support their school-related learning, and how these activities

relate to cumulative grade point average (CGPA). The results of the study showed that, though respondents had spent a substantial amount of time in using smartphones for their learning task, the effort reflected negatively on their academic performance.

Frimpong et al. [10] conducted a study to determine how often students use their phones in the classroom, examine mobile phone technologies available for learning, and find the effects of mobile phone usage on the student's academic performance. The study findings revealed that a majority use mobile phones in class to enhance their understanding of topics under study. In the same vein, a study by Rabiu et al. [11] examined the influence of mobile phone usage on academic performance among secondary school students and revealed that mobile phone usage significantly influences academic performance among male and female senior secondary school students.

The diffusion of innovations theory

Diffusion of innovation theory is based on a set of generalizations regarding the typical spread of innovations and trends within a social system, and therefore, explains why some innovations are adopted, while others are ignored at various levels of analysis [12]. According to Rogers [13], the diffusion of the Innovations theory process has four factors that influence the adopters: The innovation itself, the communication channels which may be interpersonal, and mass media, time and social system. The theory has three major premises that deal with the diffusion of innovations: innovation-decision process, individual innovativeness, and the rate of adoption of perceived attributes.

The innovation-decision process is focused on time, and has five distinct stages. The first step is knowledge. At this phase, the adopter must first learn about the innovation, become aware of it, and have a basic understanding of how it works. The second stage or phase is persuasion. Before adopting the innovation, the adopter must decide whether they support it, or reject it [14]. In the third stage, the adopter must decide whether to accept, or reject the innovation. In the fourth stage, the invention is put into effect and finally confirmation, where the person evaluates the results of the innovation, and confirms that the decision to adopt the innovation was appropriate.

Early adopters, according to Rogers [13] constitute about 13.5% of people in a system to accept an invention, and they aid in spreading awareness and reducing scepticism about a new concept. A system's early majority is made up of 34% of its members, who accept innovations. The early majority interacts frequently with their peers, but seldom holds positions of opinion leadership in a system. They provide interconnectedness in the system's interpersonal networks. The early majority may deliberate, for some time, before completely adopting a new idea.

The late majority are the next 34 % of the individuals in a system to adopt an innovation, and the adoption may be the result of increasing network pressures from peers. Their relatively scarce resources mean that most of the uncertainty about a new idea must be removed before the late majority feel it is safe to adopt. Laggards are the last 16% of the individuals in a system to adopt an innovation [13].

The major weakness of this theory is that the theory does not adequately provide a basis for predicting outcomes, as well as socio-economic issues of ICT in the social system [15].

Constructionism

Theory was inspired by the constructivist theory that states that individual learners construct mental models to understand the world around them [16]. Seymour [16] has been a huge proponent of bringing technology to classrooms, beginning with his early use of the Logo language to teach mathematics to children. Seymour, opined that constructionist learning involves students drawing their conclusions through creative experimentation, and the making of social objects. The constructionist teacher takes on a mediator role; teaching students is replaced by assisting them to understand, and help one another to understand their problems, and the teacher's role is that of a facilitator who coaches students to attain their own goals.

Constructionist Learning Theory promotes student-centred, discovery learning in which students use what they already know, to learn more [17]. Seymour [16] also contends that rather than lectures or step-by-step guidance, students learn through participation in project-based learning in which they make connections between different ideas and areas of knowledge facilitated by the teacher, through coaching.

Seymour [16] emphasized how knowledge is structured using computers, and how students' perceptions of prior experiences lead to the

knowledge structure. The Constructionist Theory also focuses on the view of learning as a reconstruction, rather than as a transmission of knowledge. Hence, students should have the experience from manipulating materials because learning is most effective when learners draw from experiences acquired from engagement in activities. Seymour's constructionist theory has several advantages for assessing how ICT affects student achievement. There, students create knowledge for themselves, based on the data they gather from their environment.

Seymour's constructionist theory has two limitations. First, it lacks structure, given that some students require highly structured environments to be able to perform their tasks. The Constructionist theory calls for the teacher to discard a standardised curriculum in favour of a more personalized course of study based on what the student already knows. This could lead some students to fall behind others in performing their tasks, and this can also affect the performance of slow learners [18]. The second weakness of the theory is that it can lead students to be confused, and frustrated because they may not have the ability to make relationships and abstracts between the knowledge they already have, and the knowledge they are learning in the classroom. The Diffusion of Innovation Hypothesis is supported by the constructionist theory, since it was the first to integrate technology into the teaching and learning process [19]. Their ability to connect new experiences to prior knowledge is vital when people accept new technologies, according to the diffusion of innovation theory. As a result, the two theories in this research are mutually supportive.

RESEARCH METHOD

The research design utilized in this study was the mixed methods case study research design (MMCSR). A mixed method case study design is a type of study in which the quantitative and qualitative data collection, results, and integration, are used to provide in-depth evidence for a case(s), or develop cases for comparative analysis [20], [21].

The population of study consisted of 1,467 students and 32 lecturers of the College of Technology (CoT) in the University of Buea. A sample of 300 students and 5 teachers was selected. The sampling techniques employed were the disproportionate random sampling and the purposive sampling techniques. The disproportionate random sampling was used to select undergraduate students of Level 300 and 400 from four different programs of study in a manner that students were selected equally, and at random from each program. The purposive sampling technique was used to select teachers from the CoT of the University of Buea. The instruments that were used for data collection were a questionnaire, an interview guide, and documentary information analysis form. The questionnaire included four different sections and was used to assess students' perceptions on the use of ICTs in the CoT. The first section contained demographic information of participants. Section two and three contained items grouped according to the two indicators of the study (search engines and computers). The questionnaires items were structured on a 4-point Likert scale with options ranging from Strongly Agree, 4 (SA), Agree (A), 3, Disagree (D), 2 and Strongly Disagree (SD), 1. Each of the indicators was composed of ten items. The Cronbach Alpha Coefficient for the first research question was 0.74 while that for second, question was 0.76. The interview guide was used to collect information from teachers on how the use of ICTs in the CoT affected students' academic achievement across programmme and programmme level in the CoT. The interview guide consisted of two items per research question of the study. The documentary information analysis form was used to collect student achievement scores from student records. Grade point average in all four programmes to measure students' academic achievement. Questionnaire data were analysed using both descriptive and inferential statistics. The descriptive statistics tools that were used included frequency counts and percentages, while the inferential statistics tool that was used to calculate the relationship between each indicator of the study and students' academic achievement was the Pearson Product Moment Correlation Coefficient. The interview data was analysed thematically.

RESULT AND DISCUSSION

Findings showing the relationship between use of information and communication technology in teaching, and academic achievement of CoT students were presented in the tables below. In addition, the statistical tool for data analysis for

the study (Pearson Product Moment Correlation Coefficient) was computed, and following that, research questions were answered, and various research hypotheses tested.

Table 1. Correlations of the study's variables

	Use of Search Engines	Use of Computers	Academic Achievement
Use of Search Engines	1.000		
Use of Computers	0.362**	1.000	
Academic Achievement	0.038**	0.016*	1.000

Table 1 presents the degrees of association between the predictor (Use of ICTs) and the outcome (students' academic achievement) variables. The probability values (*p*-value) for the relationship between the indicators on the use of ICTs and students' academic achievement were significant since p-values were all less than 0.05 for a 2-tailed test. Specifically The double stars (**) signifies that the correlations are valid at the 99% level of significance while the single star (*) signifies that the correlations are valid at the 95% level of significance.

Search engines and academic achievement

Findings from Table 1 revealed that more students were of the opinion that search engines were used in the teaching of CoT students. In particular, three-quarters (73.0%) of respondents agreed that they were using more than one search engine to access information on their courses. More than three-quarters of respondents (76.3%) also agreed that they rely more on internet search engines than on the University library for information. That notwithstanding, a great number of students (69.7%) did agree that their teachers permit them to use search engines in class when need arises.

Tabel 2. Frequency and percentages of students' responses on USE in teaching

Items	Stretched				Collapsed	
	SA	A	D	SD	SA/A	SD/D
a. I use more than one search engine to find information online	103 (34.3%)	116 (38.7%)	32 (10.7%)	49 (16.3%)	219 (73.0%)	81 (27.0%)
b. I rely more on internet search engines than on the school library for research	110 (36.7%)	119 (39.7%)	49 (16.3%)	22 (7.3%)	229 (76.3%)	71 (23.7%)
c. Our teachers permit us to use search engines in class when need arises	71 (23.7%)	138 (46.0%)	65 (21.7%)	26 (8.7%)	209 (69.7%)	91 (30.3%)
d. I do not always find the information I need immediately from search engines	48 (16.0%)	125 (41.7%)	90 (30.0%)	37 (12.3%)	173 (57.7%)	127 (42.3%)
e. Our teacher sometimes teaches us how to query search engines and get the precise information I need	35 (11.7%)	84 (28.0%)	113 (37.7%)	68 (22.7%)	119 (39.7%)	181 (60.3%)
f. I am always highly satisfied with the first page of search engine results I get	26 (8.7%)	88 (29.3%)	138 (46.0%)	48 (16.0%)	114 (38.0%)	186 (62.0%)
g. I use search engines mainly to find journal articles	25 (8.3%)	78 (26.0%)	115 (38.3%)	82 (27.3%)	103 (34.3%)	197 (65.7%)
h. I have a set of criteria that I always use to evaluate the search engine results	45 (15.0%)	150 (50.0%)	75 (25.0%)	30 (10.0%)	195 (65%)	105 (35%)
i. I often access search engines through my computer	66 (22.0%)	117 (39.0%)	90 (30.0%)	27 (9.0%)	183 (61.0%)	117 (39.0%)
j. I do not have enough knowledge on how to use search engines effectively	46 (15.3%)	91 (30.3%)	78 (26.0%)	85 (28.3%)	137 (45.7%)	163 (54.3%)
Multiple Response Set (MRS)	557 (19.2%	1,106 (26.9%)	845 (19.6%)	474 (13.6%)	1,681 (56.0%)	1,319 (44.0%)

Verification of hypothesis, (H01), the USE in teaching has no significant effect on CoT students' academic achievement in the University of Buea.

The findings of the study revealed that the *p*-value for the relationship between the USE in teaching and academic achievement of students in the College of Technology in the University of Buea was less than the cut-off *p*-value of 0.05 (*p*-value=0.000<0.05=α), implying that the relationship was statistically significant. The researcher, therefore, rejected the null hypothesis, and concluded that the USE in teaching has a significant influence on the academic achievement of students in the College of Technology in the University of Buea.

The findings from the correlation table revealed that the correlation coefficient for the relationship between the USE in teaching and students' academic achievement in the College of Technology in the University of Buea was 0.038**, implying a weak positive relationship between the USE in teaching and academic achievement.

The qualitative findings revealed that teachers had different views on how search engines were being used in teaching courses at the CoT in the University of Buea. Five main themes emerged from the transcribed data. Firstly, some respondents were of the opinion that search engines were used to better the understanding of concepts by students.

Respondent R1 specifically stated that;

> R1: *Regarding the USE in teaching and learning, for example, if they come across something in class that they need to verify, or to have a better view, or have a better version, to have a better understanding of what they are trying to say.*

This view was supported by R2, who stated that;

> R2: *May be if we meet, or come across a concept that is a little bit complicated, and we need to check on the modern explanation like a modern approach for the same author, so that is when search engines can be used.*

In addition, some respondents were of the opinion that search engines are utilized in keeping abreast of latest information. In particular, respondents' R1 and R5, stated respectively that;

> R1: *At times we don't just rely on textbooks or the library; we equally go on to search engines in order to get updated information*.

> R5: *Teachers use it; they don't just rely on the library. Of course, they have to use search engines in order to find information, since the world is globalizing, and things are changing, and technology is also changing.*

Moreover, other respondents were of the opinion that search engines were used to reconcile certain controversies with the course content. In particular, R4 stated that;

> R4: *I think that teachers and students use it more out of classroom, but once in a while during class lessons, we allow students to refer to it for better understanding and clarification or if there is a bit of controversies regarding the content being taught.*

Furthermore, respondents believed that search engines were used in updating useful software. In particular, R5 ststed:

> R5: *Of course, they use search engines in order to find other information. Since the world is globalizing, and things are changing, and technology is also changing. So, at times we have tests, but that are not updated. So we need to go to the websites in order to have updated information. Yes, you know also that we can be current.*

Finally, some responses held that search engines helped in accessing different dimensions of a particular concept. In particular, R5 stated that;

> R5: *… but at the level of the classroom, if we have to use it, maybe just in case there is something that really needs to be clarified between students, you know or there are times that there is an argument, or there are different definitions concerning a theory. So, we want to come to a compromise, or we say let's look amore updated version, so we can allow students to access search engines*.

The qualitative findings on teachers' views of how search engines influence students' academic achievement revealed that teachers had mixed views. Four main themes emerged from the transcribed data. Firstly, some teachers were of the opinion that search engines provided links between theory and practice.

In particular, R2 stated that*;*

R2: *You know we have more than one search engine, so the whole idea is to be able to relate recent developments to existing theory.*

In addition, findings revealed that the USE promoted innovations. R2 specifically stated that;

R2: *When you convey that into the understanding of the students, that is relating existing theories or formal theories to recent developments to students get and understand better, and evolve, yes innovate ideas*.

Moreover, findings also revealed that the USE in teaching raised students' interest in learning. Specifically, R3 stated that;

R3: *Search engines impact students' performance in that they increase their interest in learning, since technology often excites learners*.

Finally, findings revealed that the USE in teaching decreased the independent thinking capacity of some students. In particular, P5 said that,

P5: *Over reliance on search engines tome is not good. This is because it makes it difficult for students to think independently, they just copy ready information from search engines, and submit as their own ideas*.

By applying triangulation as a strategy to improve the validity and reliability of the study's findings, the researcher utilized two separate research designs (case study and descriptive survey designs), two complementary data collection (interviews and surveys), and data analyses techniques (inferential statistics and thematic analyses) to explore the same phenomenon (information and communication technology, academic achievement). The findings from the quantitative study revealed, that the USE in teaching had a significant influence on the academic achievement of students in the College of Technology in the University of Buea. The qualitative findings regarding the USE use at the CoT, provided complementary evidence to the quantitative findings in that; the USE provided a better understanding of concepts, helped students in keeping abreast of latest information, reconciling controversies with content, updating software, and providing different views on various dimensions of a concept. In addition, qualitative findings, in particular, clarified that the observed patterns and trends in the numerical data, that is the positive relationship between search engine use and CoT students' academic achievement, was due to the fact that, search engines used helped in linking theory and practice, promoted innovation, rand aised students' interest. Contrary to the quantitative evidence, qualitative findings also diverged in that they revealed that the USE in teaching may equally contribute in decreasing student's independent thinking capacity.

Cellphones and academic achievement

Concerning the use of cellphones in teaching, the frequencies of students' responses were displayed in Table 3.

The findings revealed that over three-fifth of respondents (59.2%) had more favourable attitudes towards the use of cell phones in teaching in CoT in the University of Buea. In particular, a greater percentage of students (54.3%) agreed to using their cell phones as the only tool to access most of the learning material that is shared online, and that teachers mostly shared course materials with students through cellphone applications (71.7%).

The findings from the correlation table above revealed that the correlation coefficient for the relationship between the use of cellphones in teaching and students' academic achievement in the College of Technology in the University of Buea was -0.513**, implying a moderate negative relationship between the use of cellphones in teaching and students' academic achievement.

The qualitative findings revealed that teachers had different views on how cell phones were used in teaching courses at the CoT in the University of Buea. Four main themes emerged from the transcribed data. Firstly, some respondents stated that cell phones are used in accessing vital information. Specifically, respondent R1 and R2, were quoted respectively as follows;

R1: *Once in a while we allow students to use their cellphones, for example, if they have to say something quickly. Maybe they want to find out some information so they access*

search engines through their cellphones, so it's really easier that way.

R2: *… and at times they are allowed to use cellphones to search information from other search engines to be current in the course of the lesson*.

In addition, cellphones were used for sharing of documents by teachers and students. In particular, respondent R2 stated that;

R2: *The cellphone can only be useful in cases where we have maybe some PDF files or WORD documents that are too large and voluminous for students to print out and be using in class and so in order to economize the course for students, they can use their cellphones in class to follow lessons*.

Table 3. Frequency and percentages of students' responses on use of cellphones in teaching

Items	Stretched				Collapsed	
	SA	A	D	SD	SA/A	SD/D
a. Teaching through a cell phone makes me retain information better	31 (10.3%)	75 (25.0%)	109 (36.3%)	85 (28.3%)	106 (35.3%)	194 (64.7%)
b. I use my phone as the only tool to access most of the learning material that is shared online	57 (19.05)	106 (35.3%)	77 (25.7%)	60 (20.0%)	163 (54.3%)	137 (45.7%)
c. My use of my cellphone distracts me from learning effectively	40 (13.3%)	125 (41.7%)	94 (31.3%)	41 (13.7%)	165 (55%)	135 (45%)
d. Our teachers share most course materials with students through our cellphone applications	84 (28.0%)	131 (43.7%)	52 (17.3%)	33 (11.0%)	215 (71.7%)	85 28.3%
e. I easily go through my notes when sent to my cell phone	43 (14.3%)	117 (39.0%)	87 (29.0%)	53 (17.7%)	160 (53.3%)	140 (46.7%)
f. Our teachers have negative perceptions on students' use of cellphones in learning	77 (25.7%)	113 (37.7%)	74 (24.7%)	36 (12.0%)	190 (63.3%)	110 (36.7%)
g. There are laid down standards in our college on how students have to use cellphones in learning	53 (17.7%)	102 (34.0%)	102 (34.0%)	43 (14.3%)	155 (51.7%)	145 (48.3%)
h. Some teachers still prefer to teach with the use of other ICT tools other than cellphones	82 (27.3%)	126 (42.0%)	63 (21.0%)	29 (9.7%)	208 (69.3%)	92 (30.7%)
i. Some course programs do not allow us to use cellphones in class	94 (31.3%)	125 (41.7%)	47 (15.7%)	34 (11.3%)	219 (73.0%)	81 (27.0%)
j. I find it easy using my cellphone to accomplish learning task of all sorts	68 (22.7%)	127 (42.3%)	63 (21.0%)	42 (14.0%)	195 (65.0%)	105 (35%)
Multiple Response Set (MRS)	629 (21.0%)	1,147 (38.2%)	768 (25.6%)	456 (15.2%)	1,776 (59.2%)	1,224 (40.8%)

Moreover, the use of cellphones in teaching at the CoT was limited by the presence or availability of other alternative devices, such as computers. Specifically, respondents' R2, R4, and R5 respectively stated that;

R2: *Cellphones are very important though we don't over encourage their use by students given that there are also computers, since cellphones have limited capacity for example there are some software that we use in the computer that cannot run on a cellphone*.

R4: *With respect to cellphones I can say that they are not really a tool in teaching in class but once in a while we can always allow students to access search engines with the use of their cellphones. Phones are not reliable because there are some applications too heavy to operate with a phone so computers are preferable*.

R5: *Cellphones cannot really carryall applications. Some are to heavy for cellphones*.

Finally, findings revealed that the use of cellphones in classroom teaching at the CoT was restricted for students, given that it could be a potential source of distraction. In particular, respondent R2 stated that;

R2: *Yeah, we use it in class but in a minor little way. Yeah, we do not allow students to the exposure gadgets like cellphones in class, they can always cause distractions*.

Table 4. Teachers' views on cellphone use and its impact on CoT students' achievement

Themes	Sample Quotations
a. Increases learning speed	"Mobile phones allow for quick and fast verification of unclear facts during lessons, so students are able to access info in real time which increases learning speed" "They influence achievement in that cellphones save time, which could have been used to go to the for example the library to start checking relevant books to read"
b. Foster fast program coverage	"There are times that if teacher is not coming to class or before the teacher shows up large volumes of notes are released to students who study the material ahead of time, this makes us go fast in our programs. Thus, much can be taught at a short time"
c. Negative effects	"If the use of cellphones are not limited in the classroom, students sometimes start visiting other irrelevant stuff, especially social media apps which tend to make them loose concentration, and so they fail to understand the lesson" "They sometimes steal students' attention and concentration from the lesson"

Again, the findings showed that teachers differed in their views concerning how the use of cell phones in teaching influenced CoT students' academic achievement. Three main themes emerged from the transcribed data. Firstly, some teachers were of the opinion that the use of cell phones influenced CoT students' academic achievements by increasing the learning speed of students. Specifically, the sample quotations for respondents' R1 and R4 respectively stated that;

R1: *Mobile phones allow for quick and fast verification of unclear facts during lessons, so students are able to access info in real time which increases learning speed.*
R4: *They influence achievement in that cell phones save time which could have been used to go to the for example the library to start checking relevant books to read*".

In addition, other teachers were of the opinion that the use of cell phones influenced CoT students' academic achievements by fostering fast program coverage as the following sample quotation from respondent R3 demonstrated;

R3: *There are times that if teacher is not coming to class or before the teacher shows up large volumes of notes are released to students who study the material ahead of time, this makes us go fast in our programs thus much can be taught at a short time*.

Finally, other teachers believed that the use of cell-phones in teaching influenced the academic achievement of CoT students negatively. In particular, respondents' R2 and R5 said;

R2: *If the use of cell phones are not limited in the classroom students sometimes start visiting other irrelevant stuff especially social media apps which tend to make them loose concentration and so they fail to understand the lesson*.
R5: *They sometimes steal students' attention and concentration from the lesson*.

Verification of hypothesis, (H02), the use of cell phones in teaching has no significant effect on CoT students' academic achievement in the University of Buea.

The findings of the study revealed that the p-value for the relationship between the use of cellphones in teaching and students' academic achievement in the CoT in the University of Buea was less than the cut-off *p*-value of 0.05 (000<0.05), implying that the relationship was statistically significant. The researcher therefore rejected the null hypothesis, and concluded that the use of cellphones in teaching has a significant

influence on CoT students' academic achievement in the University of Buea.

As a strategy to improve the validity and reliability of the findings of the study, qualitative findings on the influence of the use of cell phones on students' academic achievement, were used to explain quantitative findings for the particular objective of the study in the following way. The findings from the quantitative study revealed that the use of cell phones in teaching had a significant positive influence on the academic achievement of students in the College of Technology in the University of Buea. Regarding this finding, the qualitative findings explained that the positive influence was due to the fact that, cellphones were crucial in accessing vital information. Another reason was that cellphones facilitated file and document sharing among students and between students and their teachers. Moreover, cell phones improved the rate of program coverage, and increased teaching and students' learning speed. Furthermore, other qualitative findings showed a remarkable divergence from the quantitative results in that the use of cellphones, restricted classroom usage, and limited the use of other alternative devices. However, this divergence could not explain patterns in the quantitative dataset for the study on the use of cell phones in teaching.

Discussion of findings

The findings of the present study revealed that the USE in teaching had a significant positive influence on the academic achievement of University of Buea CoT students. This corroborates Shahibi and Rusli [6], whose study found that the perceived use of the internet had a positive impact on student achievement in the learning process. In addition, the findings from the present study are supported by that of Soegoto and Tjokroadiponto [7], relating to the correlation between student use of the internet on their academic achievement, social life, and activities. Contrary to the findings of the present study however, Shahibi and Rusli [6] on one of the objectives in the earlier mentioned study, established that online media usage for education (search engines) had no significant effect on students' academic achievements.

Findings from interviews with teachers revealed the USE in teaching affected students' academic achievements, both positively and negatively, by helping link theory with practice, by promoting innovations, raising students' interest, and in contrast, by decreases students' independent thinking capacity. These findings supported findings by Shahibi and Rusli [6], who found that online media usage for education helped students in improving their academic achievement. Moreover, findings from the present study are in line with those of Nawaz [8], who found that internet use had a positive impact on students' academic achievement, as they helped in the preparation of advanced lectures and assignments.

The findings have implications for cognitive flexibility theory by Spiro and Jehng [22], which emphasizes that some domains of knowledge are complex, and ill-structured, and that the instructional design for such domains should represent the complexity of the domain by creating webs of information, using multiple perspectives, and embedding the knowledge within multiple contexts. The USE in learning require that students acquire large amounts of information on the same concept from different authors who approach the same concept from different angles, and provide a variety of context-based examples to clarify their explanations. This display of multiple perspectives on a concept, which are accessed through search engines by the students of CoT, allows for easy and fast understanding of obscured concepts that need advance reading.

The findings from the study revealed that the use of cell phones in teaching had a significant negative effect on the academic achievement of CoT students in the University of Buea. These findings are supported by those of Ng et al. [9], whose study revealed that though students had spent a substantial amount of time in using smartphones for their learning tasks, the effort reflected negatively on their academic performance. In addition, the findings from the present study are equally supported by those by Hossain [23], that mobile phone usage had a negative effect, hurting students' academic performance.

The thematic analyses of interview revealed that the use of cell phones in teaching had both positive and negative influences. While vital in accessing information, and sharing of documents, their use was restricted in the classroom. Further, the use of cell phones in teaching had both positive and negative effects on students' academic achievements by increasing students' pace of learning, and enhancing program coverage. These findings are supported by

Frimpong et al. [10], who found that students used mobile phones during class to enhance their understanding of topics under study. On the contrary, these findings did not support those of Rabiu et al. [11], who found that the frequency of mobile phone usage by students did not significantly influence academic performance among male and female students.

The findings have implications for Rogers [13] diffusion of innovation theory, which emphasizes on how, why, and at what rate new technology and trends circulate within a population, the stages that the users of such innovations advances through, and the effects of the rate of spread on the lifestyle and on learning. Diffusion of innovations theory suggests that there are five main categories of adopters—innovators, early adopters, early majority, late majority, and laggards. Educators can use this knowledge to target specific groups of teachers and students when introducing new innovations, and can also adjust their dissemination strategies, based on the type of adopters they are targeting.

CONCLUSION

All in all, the USE in teaching and learning exercised a limited influence on students' achievement as indicated by the weak correlation from the students' participants report. The data from teachers' interview however, showed a variety of ways in which search engines are used in teaching, and correspondingly, how they benefit students' achievement indicating that weaknesses, such as inadequate search skills by students, low bandwidth, costs of data, and frequent power cuts, may be responsible for the trend of the students' opinions. The situation relating to the use of cellphones from the students' opinions is no better as only slightly above half of them took a positive stand, triggering a moderate, but weak correlation. Though once more, the views of teachers seem to portray a positive variety of ways of use, and some benefits for student achievement, they also indicate that it was a source of distraction.

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