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Application of Digital Mobile Devices in Enhancing Teaching and Learning at the University of Venda

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Abstract: The University of Venda distributed tablets to students for facilitating and enhancing their studies. However, the provision of tablet PCs to students may not be a panacea for quality learning, especially, to technological disadvantaged rural student population. The aim of study was to investigate the use of digital mobile devices for enhancing teaching and learning at the University of Venda. The research questions focused on determining the current level of use of mobile devices how they can be used effectively for teaching and learning. Mixed methods approach was applied with data being solicited from a convenient sample of students, lecturers and an IT technician. The results of the study indicated that many students and lecturers are active and have higher perceptions of mobile devices usage. The results of the study are to be used to explicate and advance the integration of the mobile devices for promoting learning and teaching accomplishments.

Key words: Teaching and learning, digital mobile devices, mobile technologies, determining, provision, promoting learning

INTRODUCTION

Mobile devices are becoming ubiquitous, inexpensive and hence are within reach of many people in the world today. New and advanced value-added functions have been introduced within these devices. The variety of these advanced functions, results in the improved device user-friendliness to the extent that there is creation of opportunities to offer learning supports anywhere at any time. The rate of students owning these multifunctional mobile devices is exponentially growing (Looi *et al*., 2014). Other developments in wireless communication networks namely the 4G/data card, Wi-Fi and Long Term Evolution (LTE) further extend the prospect of supporting education for mobile technology users.

According to, Clark and Mayer, mobile devices permit learning experiences which can effectively educate learners as they have information access availability. Wong and Looi (2011) state the advantages of relating mobile technologies such as portable computers, smart phones or personal digital assistants in Higher Education Institutions (HEI) to learning activities. Mobile devices were found to have the potential to help teachers understand and develop new literacies, engaging in rich language learning contexts and exploring physical education (Baran, 2014). According to, Woodcock *et al*. (2012), smartphones emerged as hybrids of mobile phones and brought superb connectivity features, a variety of hardware collection and software-based functionality. Tablets then burst into the market after the release of the first Apple iPad in March 2010 (Johnson *et al*., 2013a, b).

Martin and Ertzberger (2013) explained the tablet PC and smartphone features regarding their relevance to mobile learning. According to Sanders *et al*. (2016), tablet PC comes with high powered operating system, variety of design which features various screen shapes, sizes, quality resolutions and various weight which are towards to weghtless. Komado explains some of the features of a smartphone such as long battery life, warp-speed processing from powerful micro-processors, quality connectivity and messaging (Lee, 2016).

Mobile learning: According to Baran (2014), the definitions of mobile learning emphasize mobility in learning. The definition also emphasizes on access and situativity (Cheon *et al*., 2012). Kearney and Maher (2013) indicated that it also emphasizes on convenience and contextuality as well as ubiquity. Mobile learning allows academics and learner's global and seamless access to information. It also enables convenience, suitability and immediacy which are valued by students and teachers

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and enhances student's learning (Baran, 2014). Cheon *et al.*(2012) indicated that mobile learning provides chances for individualized, situated, concerted and informal learning without being restricted to classroom contexts.

Martin and Ertzberger (2013) believe portability and mobility made mobile devices more attractive tools. Sevillano-Garcia and Vazquaz-Cano (2015) argued that a direct relationship exists between the idea of global learning and the capability of mobile devices providing educational environments that are highly interconnected. Mobile devices are being embraced by institutions of higher education and significant investments in arrangement of content, infrastructure and resources associated with the integration of mobile devices into learning environments have been made by institutions (Johnson *et al*., 2013a, b).

Infusion of mobile devices in rural universities: Most research done focused more on urban universitie's use of mobile phones to support teaching and learning (Poon, 2013; Elzarka, 2012; Sevillano-Garcia and Vazquaz-Cano, 2015). While use of it in teaching and learning is a welcome development, this has not come without challenges. Research indicates that different countries and organisations have experienced different perceptions, opportunities and challenges in the adoption of it in their teaching and learning service provisions (Johnson *et al*., 2013a, b). The case study of this research is the University of Venda (UNIVEN), a rural based university in South Africa and situated in Thohoyandou, Vhembe District of Limpopo Province. After realising that there is an influx of mobile technologies worldwide in teaching and learning whereby students can do their work anywhere and anytime, UNIVEN also jumped on this technological bandwagon. In 2015, the university made national history in South African tertiary institution by distributing tablets to more than 13000 students with the aim of enhancing the quality of teaching and learning. This bridged the digital divide as most students at the university generally use computers from the computer centres, library and labs to access online learning resources.

Problem statement: In South Africa's higher education system which has both urban and rural components, formally disadvantaged and privileged universities, the use of IT in teaching and learning has its own problems when it comes to infrastructure development and IT skills. Although, the UNIVEN had adopted the technology, the question was whether there is the necessary infrastructure to support its uptake? Are the students using the applications for learning? Is the university meeting the required bandwidth for nonstop or fast streaming and content security from authoring groups The study, therefore, investigated the prevailing levels of utilisation of mobile technology in teaching and learning at the University of Venda, the factors and obstacles that affect the use of these technologies in teaching and learning and their impact on teaching and learning. The introduction of tablet PCs may not be a panacea for improving the quality of teaching and learning particularly to a population that is not familiar with the latest technologies. Therefore, there was need to investigate the pedagogical value and use of mobile technologies in teaching and learning.

Reaserch aim and research questions of the study: The aim of the study was to investigate the potential use of digital mobile devices in teaching and learning at the University of Venda.The research questions of the study were to:

- RQ1: what is the level of mobile device's usage at UNIVEN
- RQ2: how can mobile devices be effectively used for teaching and learning at UNIVEN
- RQ3: what are the perceptions of University students and lecturers on mobile devices as tools for teaching and learning

MATERIALS AND METHODS

Articulating from Zikmund *et al.* (2013) and Bryman *et al.* (2014), the researcher used the case study research design. Figure 1 shows the research methodological thinking of this study. Our epistemological position is one of Subjectivism with an interpretive approach (Huff *et al*., 2016). The summary of the research methodology applied is shown in Table 1.

Population and sampling: The population pertaining to this research was students, lecturers and an IT technician. Students and lecturers are the users of the mobile devices for teaching and learning. The IT technician helps students with the tablet PCs technical faults which informed this study on other problems students faced with the use of tablets PCs. This study used non probability sampling because it focuses on indepth information and does not wish to make inferences and generalisations (Bryman *et al*., 2014). The sampling techniques used in this study were convenience and judgmental sampling (Wild and Diggins) and also that the sample must be representative of the whole population. The quantitative research method sample size (Weirs, 2011) consisted of 370 students from all schools and for the qualitative, 8 student's school representatives

Table 1: Summary of research methodology

Research design	Data collection methods	Respondents	Sampling techniques	Data analysis methods
Quantitative research	Questionnaire	Students	(Systematic sampling)	Descriptive analysis
Qualitative research	Semi-structured interviews	IT technician, lecturers and student's representatives from UNIVEN	(Convenience sampling)	Analytic and thematic qualitative analysis

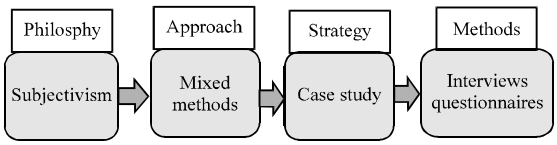

Fig. 1: Research methodology

and 8 lecturers, one from each school. The 370 respondents were selected using non-probability convenience sampling and 17 interviewees were selected using judgemental sampling which gave us the sample size for quantitative data of the study. UNIVEN students made the sample frame for this study. Of the 370 questionnaires distributed, 300 were returned. On the returned questionnaires, all questions were answered. All 17 interviews were conducted and all questions were answered.

RESULTS AND DISCUSSION

Data analysis: Questionnaires and semi-structured interviews were the data collection instruments which were used in this study Tustin. Data analysis helps in interpreting and drawing conclusions from the collected data. According to Creswell, descriptive analysis was used on the quantitative method that is questionnaire responses whilst thematic analysis was used on the qualitative method that is the semi-structured interview responses. A pilot study was done such that the adopted questionnaire was refined in a way that respondents had no problems in answering the questions and there was no problem in recording as well. The questionnaire's internal consistency was assessed by calculations of Cronbach alpha on the SPSS such that responses of the questionnaire were correlated to each of the questions in the questionnaire.

Demographic presentation: The gender question required respondents to indicate their gender according to the gender items presented. The results are illustrated in Fig. 2 of the 300 students who participated, 51%were female while 49% were male.

Participant's age: Respondents were asked to indicate their age in years (Fig. 3). The largest percentage of respondents (84%) fell in the 15-25 year age range, followed by the 16% who fell in the 26-35 years age range.

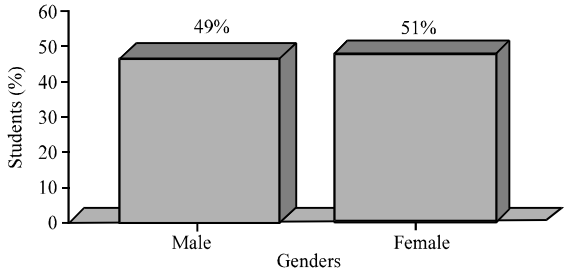

Fig. 2: Percentage of student's participants

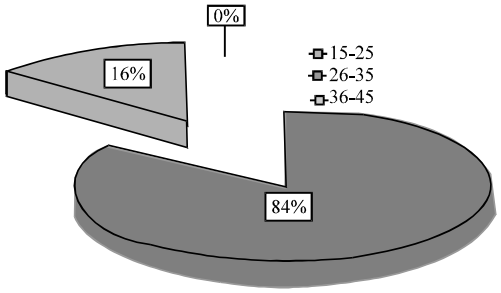

Fig. 3: Percentage of the participant's age

There were no respondents in the 36-45 years range. The largest percentage (84%) was because most students who participated are undergraduates and follows within the range of 15-25 years of age.

Current mobile device's use: The researcher sought to determine the current use of mobile devices by students towards learning.

Prior knowledge of internet use: The results in Fig. 4, indicate that most students are aware of the stated internet activities. Of the 300 returned questionnaires, the responses showed that 289 can access the internet, 260 can download materials, 225 can download applications, 265 can type notes on their mobile devices, 238 knows how to access social media sites, 251 send emails and 220 can post comments on blogs. These results are an indication that students can use their mobile devices for learning as the numbers show that the students do have access on internet using their mobile gadgets.

The few students who indicated otherwise probably are those with phones that cannot connect to the internet.

However, they have tablet PCs which were distributed by the university which might mean that they are not using those tablet PCs to do school work.

Mobile learning usefulness: Participants were asked to indicate if learning is now fun through mobile device's use and if mobile devices are not a distraction in class. The first pie chart on Fig. 5 shows that 73% of the respondents were enjoying learning using their mobile devices. Only 4% do not agree with the idea due to reasons such as 'tablet PC is nolonger working or 'not in possession of a smartphone. About 19% of the respondents were neutral which implies that this small group might be those students who are resistant to change and not decisive of the better learning method from the traditional one. This pie chart shows that the students agree that learning is now fun.

The second pie chart displays the results on whether mobile device's use would not be a distraction in class. 41% of the respondents said that mobile gadgets would not distract students in class whereas 25% said the devices would distract them in class. This implies that some students are not aware of how they can utilise their devices in class whereas some have knowledge on how to put their devices to good use. Basset and Kelly (2013) explained that lack of detailed educational plans or guidance both for teachers and students on how to use their personal devices for educational purposes may also prohibit mobile learning activities. It is therefore, clear that students need to be educated on using mobile devices for learning.

Communication improvement: The participants were asked to indicate whether the use of mobile devices improves communication between students and between students and lecturers. Figure 6 shows the outcome.

In Fig. 6, first bar gragh shows that a greater percentage of 54% agrees that mobile devise's use improves student to lecturer communication. Only 22% of the respondents disagreed with this statement. On second bar gragh, 70% of the respondents agree that the use of mobile gadgets improves student to student communication whereas 13% disagreed. These results imply that mobile devices effectively improve both student to student and student to lecturer communication. This makes learning easy as students can directly communicate with their lecturers/peers concerning course related issues.

Traditional learning vs. mobile learning: Mobile learning has its advantages on teaching and learning. There was need to investigate whether some students still think

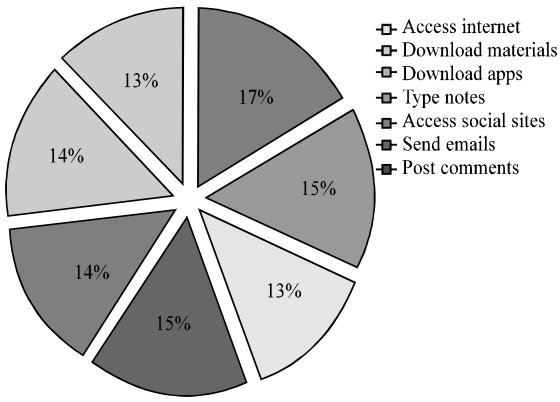

Fig. 4: Percentage of internet use

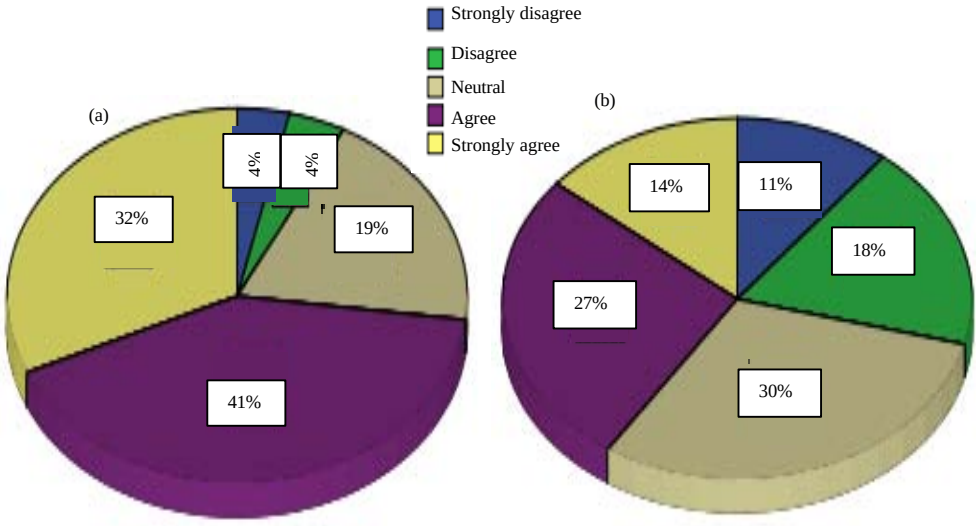

Fig. 5: Use of m-Learning in class: a) Learning is now fun and b) Disatraction in class

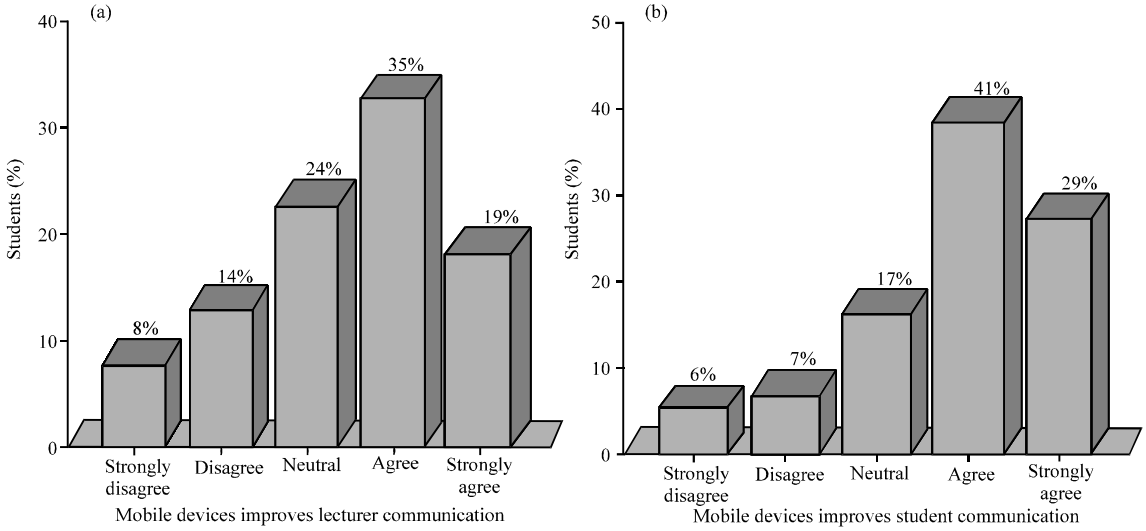

Fig. 6: Communiacation improvment

mobile learning is just as effective as mobile learning. Figure 7 shows what respondents think about traditional learning. About 45 and 34% of the students who participated in the study indicated that traditional learning is not as effective as mobile learning. This is because with traditional learning, communication is made easy, learning can be done anywhere, study materials can be accessed anywhere and discussions can be done as well recording lectures. Only 5% of the respondents are on the view that traditional learning has the same effect with mobile learning. Traditional learning produces good grades. It can be improved when incorporating mobile devices in and out of classrooms.

Capabilities enhancing student's learning: It was important to consider the perceptions of the students on mobile learning. Therefore, this sub-section incorporates the expectations of students and their capabilities towards learning.

Promoting mobile learning in class: Participates were asked whether they would want to see mobile learning in class. Figure 8 displays the results.

As shown in Fig. 8, 42+22 = 64% of the respondents agreed that they would want mobile learning in classes. This would help them in catching up with lectures which they did not understand. The 7% do not agree with this statement. This could be a group of students who did not fully understand the question or those who resist change. Although, it can be argued that mobile devices can distract student in class to a greater extent, interactive classroom activities simplify teaching and learning (Wallace, 2014).

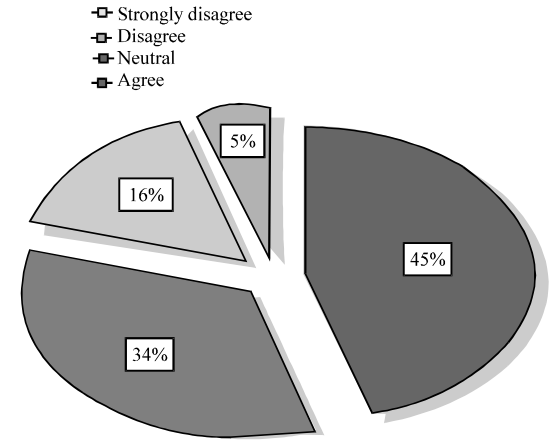

Fig. 7: Traditional learning vs. mobile learning

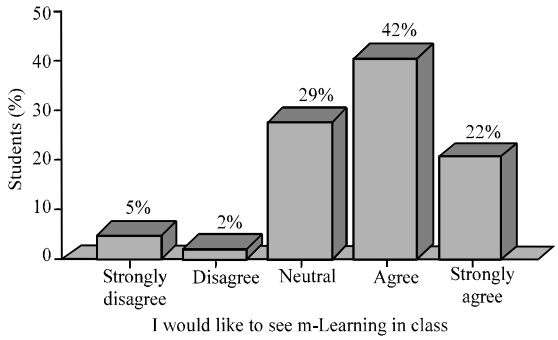

Fig. 8: Promoting mobile devices in class

Ways of using mobile devices: Participants were asked to indicate how they want smartphones and tablet PCs to be used in learning. Figure 9 shows the outcome. The 79% of

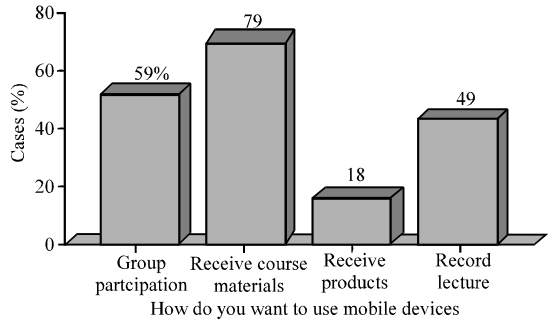

Fig. 9: Ways of using mobile devices

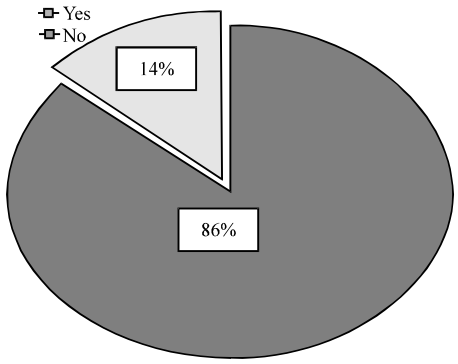

Fig. 10: Investment of tablet PCs as a learning tool

Table 2: Student's limitations in using mobile devices

	Responses		
Variables	Number	Percentage	Cases (%)
Cannot download	30	7.9	10.2
Connection speed	97	25.5	33.1
Tablet PC not working	127	33.4	43.3
Do not know how to use	9	2.4	3.1
None	117	30.8	39.9
Total	380	100.0	129.7

Table 3: Percentage comparison

	Responses	
Frequencies	Number	Percentage
Access internet	289	16.5
Download materials	260	14.9
Download apps	225	12.9
Type notes	265	15.2
Access social sites	238	13.6
Send emails	251	14.4
Post comments	220	12. 6
Total	1748	100.0

the respondents indicated that they would want to receive course materials. This is very helpful to students. If course materials are sent to students early, it would assist them in understanding the lecturer more in class as they would be having questions to ask already. Moreover, 59% would also want group participation. This is also helpful when the class has a group whereby anyone who needs assistance will be assisted through the class group anytime anywhere. The 49% would want to record lectures.

This is also important in the sense that students would be able to go through the recorded lecture in their own free time and they would gain clarity on the topic. The 18% would want to receive podcasts. Podcasts are helpful as students will listen to the study material wherever they are. The smaller percentage might be because those students do not know what podcasts are and have never used them.

Tablet PC as a learning tool: It is crucial to know if the distribution of tablet PCs should be an ongoing project at the University. Therefore, a question was asked on whether the participants think that tablets PCs are a worthy investment as a learning tool. The 86% of the respondents indicated that tablet PCs are a worthy investment. Investing in tablet PCs is enhancing teaching and learning at the university. However, 14% do not think it is a good idea. This could be the group of students who still think mobile learning is just as effective as traditional learning (Fig. 10).

Students limitations in use of mobile devices: There are factors which hinder students from using the mobile devices for learning. Table 2 shows the responses of the participants in this regard.

As shown in Table 3, the highest percentage of 33.4% indicated that their tablet PCs are no longer working which is a limitation to mobile learning. The 7.9% of the respondents cannot download study materials on their devices. This could be the group of students who are using their smartphones and not the tablet PC due to many reasons like tablet PC not working or small smartphone size. The 25.5% are not using their mobile devices because of connection problems. Some students cannot connect to Wi-Fi on campus due to low bandwidth. The university is still improving the Wi-Fi issues so that students can access the internet anywhere. 2.4% of the students do not know how to use mobile devices for school work while 30.8% do not have any limitation of using their mobile learning towards learning.

Lecturers perceptions on mobile technologies: The researcher was interested in exploring lecturer's perceptions on the motivation and usefulness of the mobile devices in their educational experience. The study is a framework of how mobile devices can be a vital tool that will assist them in their teaching, interactions between instructor and students and provide possible

applications that would be easy to implement, yet provide value and relevance to students. Below is the analysis of data from lecturer interviews.

Technology experience in teaching: On the question of describing the experience of technology use in teaching, 100% of the interviewed respondents admitted that they all used technology in teaching. The 80% of the respondents explained it this way:

> "I use lot of technology especially the internet. I want students to search information on the internet. I communicate with them through emails with attachments which students do not like. They don't like emails, they prefer Facebook and WhatsApp. The first meeting, I ask for email addresses"

The results showed that most lecturers are making use of technology for teaching. All the respondents were using emails for communication. They were also using social media as a means of communication.

This response means that lecturers are aware that using technology in teaching enhances teaching and learning. Mobile device's use therefore, makes the experience of technology use viable because students are able to access information from anywhere anytime.

Mobile learning activities: On the question of whether lecturers have explored mobile learning activities in class, 85% of the respondents had the same response. They admitted that they incorporate mobile learning activities in class. Lecturers are excited with the introduction of tablet PCs as they can help many students in accessing learning materials. They had been using phones to communicate with students for years:

> "Yes, a lot. Before tablet PCs were distributed, I was using Facebook. Most of my students were interacting with me using their mobile phones since 2011"

Facebook groups were created and lecturers were posting learning materials and discussing school related issues with students via. Facebook. The disadvantage was for those students who come from rural areas who may not have smartphones which can be used to access the internet.

Tablet PCs in class: Participants were asked if they still see their students with the distributed table PCs in class and what students will be doing with them. The 70% of the respondents agreed that they still see their students with tablet PCs. They said they see students using these tablet PCs in class as the students will be recording them while lecturing. One of the respondents said:

> "Yes, most of the time, they record me when I am lecturing"

In addition to this, another respondend explained this way:

> "Yes, I have to push them to use them, I forced them to bring them to class and they started using them for class purposes"

It is a good thing that some lecturers encouraged their students to use mobile devices in class and use them for class purposes as some students may not know how important mobile devices are to student learning cycle.

Communicating with mobile devices: On the question of how the participants feel about tablet PCs technology for communication with the students, a significant number of respondents (35%) stated that they encourage students to make use of their mobile devices in class for class purposes. This assists students in that they will revise their work at home while listening to the recorded audio from the lecturer which helps them understand the module better.

Incorporating mobile learning in class: Participants were asked about any ideas for incorporating mobile learning in the classroom. It appears that all the respondents grasped the mobile learning concept well. They supported it and recommended that other lecturers should also make use of mobile devices as long as students are using them for school work.

> "Mobile devices are here to stay. As lecturers, we need to accommodate them and encourage students to use them especially, the older lecturers who were born before technology tend to become sensitive with these devices. I want students to use them for school work"

Lecturer's perceptions of mobile learning in education: There were different perceptions about the effectiveness of mobile devices for student learning in education among the respondents. All the respondents shared a common view that there is need to educate teachers and students to use mobile devices in order to improve their teaching and learning.. The 60% stated that mobile devices could be used for more than just communication add together their knowledge and share information with ease (Ericson,

2013). As mentioned, tablet PCs and smartphones are one of the pillar tools which can be used as a platform for social networking at the university. It is therefore, crucial to convert the social networking platform into an edu-networking platform, so that, students can network using these tools as there is Wi-Fi on campus.

Tablet PC as a learning tool: Interaction with the respondents also has led to an understanding that the distributed tablet PCs play a positive role in enhancing teaching and learning at UNIVEN. All the respondents expressed their views on whether tablet PCs are a worthy investment. They explained that tablet PCs are assisting many students as some students come from poor backgrounds and could not afford tablet PCs themselves. Participants further highlighted the issue of time. They pointed out that there is need to distribute the tablet PCs at the beginning of year, so that, new students can use them to access study materials and improve their performances.

> "I believe in that and I would be happy if they distribute them in time"

Student's views on communications with mobile devices: Participants were also asked to explain if they communicate with their lecturers or classmates and how they feel about using mobile devices for communicating with lecturers or classmates.

All the respondents stated that they were communicating using their devices. 40% of the respondents used the blackboard for communication.

> "We do, we have a page on the UNIVEN called blackboard so we communicate with our lecturers there. It is so convenient"

However, 60% of the respondents said they do not know about the Blackboard and how they can make use of it. In addition, another respondend said:

> "Communication is effective. There are times when the lecturer cancels the class, the lecturer will inform us on groups which saves time"

The above statement shows that communication using smartphones and tablet PCs is cheaper and fast. Mobile devices increase student access to educationally relevant content and enable communication with teachers and peers through online tools and resources for 24/7 learning.

Study time management: Participants were asked to explain if they were able to manage their study time effectively and complete their work on time using mobile devices. All the respondents mentioned that it is not easy to manage study time because of the social networks. They said that social networks were a big distraction to their learning but were trying their best to put their school work first and complete their assignments on time.

Social networks take a lot of time for students. Mobile devices such as tablet PCs and smartphones are one of the essential tools which can be used as a platform for social networking at the University. It is crucial to convert the social networking platforms into edu-networking platforms, so that students can edu-network using these tool as there is Wi-Fi on campus.

Perceptions of mobile learning in education: Respondents gave their perspectives on the effectiveness of tablet PCs and smartphones in their learning. All the respondents expressed their gratitude to the University for the distribution of tablet PCs to the students and the Wi-Fi on campus. About 80% of the respondents complemented the university for encouraging mobile learning.

> "The university is doing a great job towards mobile learning. Many students are coming from disadvantaged backgrounds that they cannot afford these devices yet they are very important"

Tablet PC as a leaning tool: A question was asked on whether the University should keep distributing tablet PCs to students. All the respondents explained that the university should keep distributing the tablet PCs as they are helping many students who could not afford these devices yet they are needed in the learning experience. All the respondents recommended that the university should keep distributing tablet PCs.

The major findings from the study indicated that students and lecturers consider mobile devices as useful tools for teaching and learning. It was also revealed that mobile devices improve communication between lecturers and students which informed meant that the environment where they are useful for learning is not in the classroom only but both in and out of classroom. These major findings supported the main objectives of study which establishes that mobile device's use, enhance teaching and learning at UNIVEN. The findings clearly showed that mobile devices have a positive impact on the academic experience. The results also indicate that there is a gradual acceptance of the LMS by both academics and students if training on its usage is given to academics and students, respectively.

CONCLUSION

A condusive platform for mobile learning such as training for both students and lecturers should have been put in place before issuing tablet PCs. Students and lecturers should have been informed about the incorporation of mobile learning before being given the devices. This could have helped them to know that the tablet PCs were there for educational purposes.

The reviewed literature showed that learner's interaction with technology on a daily basis is rapidly increasing as learners are well aware of the evolution of technology. The study helped to identify the current use and perceptions of mobile learning at UNIVEN. It was shown that students and lecturers accepted mobile devices as tools for teaching and learning and that the use of mobile devices is improving their educational experiences. It was found from the study that students like interacting with their peers using mobile devices. However, some students only have vague knowledge of how mobile devices can support learning they simply perceive the 9.7" touch screen tablet as an electronic version of their text books, convenient for chatting with their peers and for looking up information on the internet. Results suggested that digital mobile devices are enhancing teaching and learning at UNIVEN.

RECOMMENDATIONS

Based on the results of this study, the following recommendations to management, lecturers, students and further studies are offered to support the effective use of mobile technology in learning:

Inorder to reduce the number of tablet PCs which are taken to the IT officies for repair per day, it is recommended that the management do more background check on the brand of the devices so that they can purchase quality tablet PCs as students use them intensively.

Training on mobile technologie's use is highly recommended. It is recommended that lecturers should encourage their students to use their mobile devices for school work such as recording lectures and taking pictures of important information.It is through mutual conversation that one comes to a shared understanding of an issue or topic.

Lecturers are recommended to use different mobile platforms to communicate with their students so that students feel comfortable to ask any school related question and get help. The use of email, social networks can assist in this regard.

Lecturers should attend training on the capabilities of mobile technology and its potential use in and outside of the classroom including applications that are available that is the blackboard. The blackboard is a great teaching platform where the courselines, assignments, topics and test dates are shown. It will improve mobile learning if trainings are done so that all lecturers have the necessary knowledge of using the blackboard.

It is recommended that students should view their mobile devices beyond just communication tools but mostly for learning. Due to mobility of theses gadgets, it is recommended that students should bring their mobile devices to classes and use them accordingly than use them out of classes only.

Conversation theory describes learning in terms of communication with teachers as well as with other students. Students should communicate with their lecturers and peers using their devices to get more understanding of the module or topic.

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