



Using mobile technologies in mathematics Education: Perspectives from student teachers and teacher educators in Chipata district, Zambia

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Abstract

Mobile technologies have advanced and have impacted greatly on the way humans socialise, learn and interact. The ubiquity of these devices have an effect in the teaching and learning of mathematics in that they pose an interactive and pedagogical challenge to mathematics learners and educators because of their multiple functions which can put the most up-to-date information at the fingertips of the user. The study was conducted to explore the access, perception and extent to which these mobile technologies were being used in mathematics teaching and learning in teacher training institutions in Chipata, Zambia. The study used a mixed method design in particular concurrent mixed method triangulation in which both qualitative and quantitative approaches were employed to collect data. Purposeful and convenient sampling methods were used to come up with 129 respondents which were 6 mathematics lecturers, 3 ICT Coordinators and 120 mathematics student teachers from the teacher training institutions. Students and educators use mobile technologies to access information (research), collaboration (data sharing and conversations) through social networking sites such as whatsapp/Facebook, communication, lesson preparation and as storage devices. The usage among by student educators to teach mathematics was still low.

It was recommended that educational institutions to upload study resources on their websites for students to download, improve/install Wi-Fi internet connectivity for students 'use and also students and lecturers to form whatsapp groups for academic interactions beyond the walls of the classroom.

Keywords: mathematics education, perception, mobile technologies, use, student teachers, teacher educators

1. Introduction

The aim of this study was to obtain student teachers and teacher educators perspectives on the usage of mobile technologies in the teaching and learning of mathematics in the teacher training institutions. Billions of mobile technologies are now accessible in the market nowadays (Elmorshidy, 2012) ^[4]. Mobile devices such as mobile phones and personal digital assistants (PDAs), have become ubiquitously available and have changed the ways people establish relationships (Haddon, 1997) ^[5]. Learners, whether young children, teenagers or university students, are accustomed to seeing and using camera phones and handheld games devices (Wishart, 2008) ^[20]. Mobile devices combine communication and computing into a multipurpose gadget that provides users with various types of services (Bergman, 2000). Indeed, mobile technology users access information using their device everywhere and anytime (Brightman, 2008) ^[3]. Current developments in capabilities of mobile devices, both smart phones and laptops or tablet computers, have led to a significant rise in the penetration rate of wireless devices among the general population. Even more noticeable over recent years is the increasingly fast-growing rate of penetration of mobile devices among younger people. Students as true representatives of the "digital natives" generation (Prensky, 2001) ^[15] are keen to discover new technologies. Mobile devices became a default means of opening the Internet according to current surveys (Internet in

Britain Report, 2011) ^[6], while the number of UK mobile contract subscriptions have surpassed considerably UK population (Car phone ware house Penetration Rate of Smartphones, 2011).

Mobile technological advancement has demonstrated its transformative impact on the way we speak, learn and socialise in cultural, social and economic spheres in many developed countries (OECD, 2008) ^[13]. Perplexingly, such robust use of mobile technologies has yet to be integrated effectively into the formal learning sector to bring about the transformative changes that many educationalists have envisaged (Cuban, 2012; Dede, Honan, & Peters, 2005; Flanagan & Jacobsen, 2003; Romeo, 2006). The development of mobile technological media would, as posited by enthusiasts, give learners and educators unlimited access to diverse worldviews, nurture their spirit of inquiry and supersede traditional styles of teaching and learning.

Lim (2004:169) ^[9] proposes that the use of technology under the master plan 'move away from teacher-centred practices and gravitate towards student centred practices;' should be "situated in the social constructivist paradigm" where "students work together on learning tasks to construct knowledge with teachers scaffolding the process, mediated by mobile technologies".

In Zambia, the access to mobile phones by household has also increased according to ZICTA (2015: viii) ^[23].

“Around 64.5 percent of the households in the country have access to a mobile phone determined by at least one member of the household owning a mobile phone. Further, about 51 percent of people aged above 10 years in Zambia are active users of mobile phones. Only 13.5 percent of the individuals that own mobile phones have smart phones. About 71 percent of individuals that own smartphones use the devices to access Over The Top (OTT) applications like Whatsapp, Viber, Facebook, Skype and Twitter for communication using instant messaging or voice calling. Access to Computers by Households improved in the proportion of households that have access to a computer, determined by at least one member of the household owning a computer, from 4.9 percent recorded in 2013 to 7.1 percent in 2015. The majority of internet users constituting 63 percent of the internet users spend their time online on social networking sites.”

MOESVTEE (2013) identified the key competences for teachers at all the levels in curriculum indicating that; “Teachers’ professional life revolves around knowledge and learners. The knowledge is always increasing and changing while the learners are uniquely different and live in the changing social environment” (p.17).

Against this background, Teacher Education Programmes are focussing at producing a teacher with high levels of competences in: Material that is to be taught, Skills in different teaching methodologies, Creativity, constructiveness and innovation and Information and Communications Technology which is offered by all the Teacher Education institutions in order to equip student teachers with sufficient skills in this new learning area (MOESVTEE, 2013).

These competencies can be obtained from various sources in the professional life of a teacher and teacher-educators. Some of them include interaction with mobile technologies such as mobile phones, laptop computers and iPads or tablets which can be used to acquire knowledge in various academic disciplines and as pedagogical tools.

MOESVTEE (2013: III, IV, 17) through The Zambia Education Curriculum Framework (ZECF) indicated that;

“Zambia is undergoing rapid socio-economic development and each sector is no exception. Education is an agent of change while education has always been perceived as a social sector; it is also an economic tool for development. In 1996, Ministry of Education (MOE) developed a national policy on education, ‘Educating Our Future’ in order to respond to the developmental needs of the nation as well as those of the individual learners..... From time to time, individual, community, national and global needs change, knowledge expands and new technologies emerge....”
(p. iii, iv, 17)

With these global trends, mobile technologies are almost everywhere, a learner can access a mobile phone, an Ipad or tablet or a laptop computer which can be used both as a social tool or an educational tool as recognised by MOESVTEE (2013) in the 2013 Revised Curriculum Framework for

Zambia. With the growing portability and functional convergence of technologies, as well as with cost reduction of products and services, mobile devices are increasingly present in everyday life. According to the 2013 UNESCO Report, mobile technologies are commonly found nowadays even in areas where schools, books, and computers are scarce. Due to the fall in prices of these technologies, mobile phones, tablets or iPads and laptop computers in particular, many people, even in impoverished areas, can afford and know how to use such mobile devices (UNESCO, 2013) ^[18].

Therefore, the presence and relevance of such devices in everyday life have motivated research in the educational field (Pachler, Bachmair, & Cook, 2010). Mobile learning (m-learning) is the field of study that analyzes how mobile devices can contribute to learning (Batista, 2011). M-learning involves the use of mobile technologies, either solely or combined with other communication and information technologies to allow learning anywhere, at any time (UNESCO, 2013) ^[18].

One of the goals of the Ministry of Education is to produce a learner who is capable of appreciating the relationship between scientific thought..., action and technology advances on one hand and sustenance of the quality of life on the other, ... and if science, mathematics, technology and practical subjects are to be properly and meaningfully learned, they will require not only teachers who are competent to teach these fields, but also schools and colleges supplied with relevant equipment, books, apparatus to enable them teach effectively in the 21st Century, (MOE, 1996). It suffices to indicate that teaching and learning in the current times is being affected by advancement in technology and its integration cannot be over-emphasized. Sichone (2011) ^[17] did agree that gone are the days when Information Communication Technology (ICTs) was a luxury but the current times have called for an integration of education with ICTs which are creating new learning and teaching possibilities.

With the ubiquity of mobile devices in society, the questions that may arise therefore is “how are students teachers and educators use mobile technologies in their teaching and learning of mathematics?”

In particular the following research questions guided the study:

- What type of mobile technologies do student teachers access?
- How is the usage of mobile technologies in the selected Mathematics teacher training institutions?
- What are mathematics educators’ and learners’ perceptions (views) on the role of mobile technologies in the teaching and learning of Mathematics in the selected Mathematics Teacher Training Institutions?

2. Conceptual Perspective

Research studies have attempted to examine mobile technology learning through identified theoretical perspectives and frameworks such as activity based approaches, authentic learning, action learning and experiential learning (Sharples, Taylor & Vavoula, 2007). More recently, Kearney, Schuck, Burden and Aubusson (2012) ^[7] espoused a pedagogical framework of mobile learning informed by a socio-cultural perspective, comprising three central features: personalisation,

authenticity and collaboration. How learners ultimately experience these distinctive characteristics is strongly influenced by the use of ‘time-space’: the organisation of the temporal (scheduled/flexible; synchronous/asynchronous) and spatial (e.g. formal/informal, physical/virtual) aspects of the m-learning environment (see Figure 1).

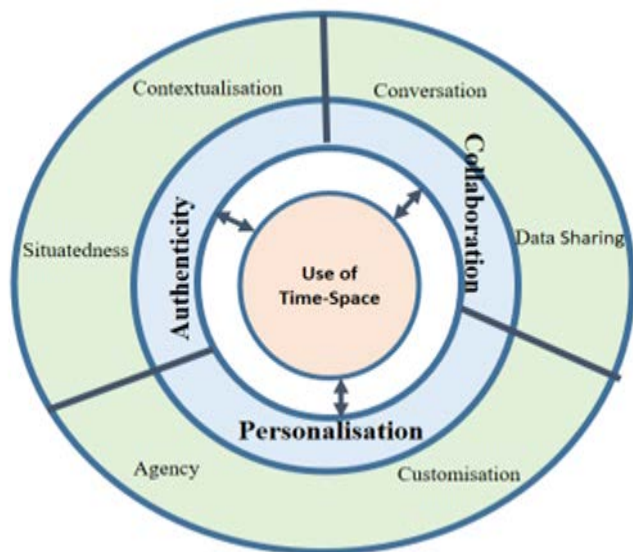


Fig 1: Conceptual framework; Adapted from Kearney, Schuck, Burden and Aubusson (2012:8)

The rationale behind these scales is provided through the use of sub-themes under each of the central features and which pinpoints the critical features of m-learning from a pedagogical perspective. Personalisation consists of the sub-themes of agency and customisation. High levels of personalization would mean the learner is able to enjoy a “high degree of agency in appropriately designed m-learning experiences” (p. 9) together with the ability to customise and tailor both tools and activities, leading to a strong sense of ownership. In the case of authenticity, the sub-themes of contextualisation and situatedness bring to bear the significance of rich, contextual tasks both in formal and informal settings. Thirdly, collaboration consists of conversation and data sharing sub-themes, as “people engage in negotiating meaning” (mediated by a mobile device) potentially ‘making rich networking connections to other people and sharing information and resources across time and space’ (p. 10). The authors emphasise that the framework provides a useful lens to explore how technology in the form of mobile handheld devices works in a range of formal and informal learning settings.

3. Theoretical perspective

3.1 Mobile technology in education

In the advent of the mobile technologies such as laptop, cellphone, iPhone, iPod, iPad, and tablet, people in all walks of life are using them anywhere and anytime. These mobile gadgets are equipped with applications which can read pdf files, PowerPoint presentations, and documents (Aunzo and Climaco, 2015) [1].

Mobile technologies are becoming more embedded,

ubiquitous and networked, with enhanced capabilities for rich social interactions, context awareness and internet connectivity. Such technologies can have a great impact on teaching and learning of mathematics. Learning will move more and more outside of the classroom and into the learner’s environments, both real and virtual, thus becoming more situated, personal, collaborative and lifelong. The challenge will be to discover how to use mobile technologies to transform learning into a seamless part of daily life to the point where it is not recognized as learning at all.

“Technology can equip students to independently organize their learning process. So, instead of being passive recipients of information, students using technology become active users” (Moeller and Reitzes, 2011).

In addition Ben-Zaken (2004) [22] provides a scenario in which a mobile gadget plays a very important role in the current times. “You are a 16-year old student, sitting at a bus stop waiting for your bus to arrive. Trying to prepare for your upcoming Geometry exam you take out your cellular phone, open the installed mathematics m-Book and start learning, you review theorems and definitions while manipulating interactive diagrams, search the web to look for additional definitions, use geometry applets to explore concepts and test your understanding by doing some quizzes that your teacher stored in the class site for you to browse from the mobile device. You are already on your bus when your friend calls and asks for help with an exercise. You both then send a message attaching the module of the exercise each of you reviewed and compare the solving attempts. Now you feel ready to send the exercises to your teacher for her or him to check them. While busy doing all of the above, you’ve meanwhile reached home. Using your home PC you check your teacher’s comments and continue your preparations there”. This suggests that the portability of mobile devices provide a platform of interactive learning to take place anywhere at any time.

Percival and Claydon (2015) [14] commends the usage of mobile devices by both students and educators by indicating that the use of tablet PCs in mathematics education offers a viable means to enhance learning by permitting students to store notes through keyboarding and also indeed the lecturer distributing PowerPoint notes electronically to learners.

A number of studies have been conducted on mobile technologies across the globe. This study did not dwell on use and integration of ICT in education generally. The research focused on how students and educators can harness the ubiquity of mobile devices in the teaching and learning of mathematics in specific contexts. While other researchers have used either a qualitative or quantitative approach to studying teacher education curriculum design, this research tried to take a holistic approach by using both.

4. Methodology

This study adopted a concurrent mixed method design in which both qualitative and quantitative approaches were used. A concurrent mixed method procedures are those in which the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the

research problem. The target population included; mathematics student teachers, mathematics teacher-educators (lecturers) and ICT Coordinators in the five (5) teacher training institutions in Chipata District, Zambia. This population was appropriate because the training of mathematics teachers in Zambia merely depends on the pedagogies employed by the educators and how students respond to such instructions in order to yield meaningful and capable teachers who would be able to teach mathematics after a training program. With the ubiquity of mobile technologies, it is imperative that such devices are integrated in the teaching processes in order to maximise the acquisition of teaching and learning skills. ICT coordinators were important to form this population because they coordinate the integration of technology in the teaching and learning processes across all curriculum and indeed able to explore how these mobile devices can be used.

A convenient sampling method was used to come up with 120 student teachers from the five (5) mathematics teacher training institutions to answer a questionnaire and in a Focus Group Discussion (FGD). Of the 120 students, 85 were given a questionnaire and 35 in an interactive FGD. This sampling method was appropriate because the number of students taking mathematics from some of the teacher training institutions was not sufficient to the required number to form the sample from that institution. Purposive sampling was used to select 6 mathematics teacher-educators and 3 ICT Coordinators from each teacher training institution. Two (2) mathematics teacher educators and 1 ICT Coordinator were selected from each institution. On the other hand ICT Coordinators were considered because they are conversant with what kind of functions mobile technologies can offer to both educators and student teachers. In relation to this study, both mathematics teacher educators and ICT Coordinators were important because they train teachers and conversant with how mobile technologies works respectively. In order to collect both qualitative and quantitative data, three methods were applied, namely a questionnaire, semi-structured interview guide and Focus Group Discussions (FGDs). Qualitative data was collected using a questionnaire while quantitative data was collected using interviews and FGDs. The total sample used in the study was 129.

4.1 Background information of respondents (Bio-data)

Table 1: Response rate of respondents

Respondents	Response Rate		Percentage (%)
	Number Expected	Number Responded	
Students	100	85	85
Lecturers	10	6	60
ICT Coordinators	5	3	60
Total	115	94	81.70

Information in Table 1. Shows that there was a high response rate from students and at least more than half of the lecturers and ICT coordinators responded to the interview which gave a total of 94 (81.70%) respondents. Mugenda and Mugenda (2003) states that 50% response rate is adequate, 60% good and 70% and above is rated to be very good. Based on this

statement the response rate for this study was considered to be a good sample to provide useful data. There was a failure rate of 18.3% respondents, which could be due lecturers' tight and busy schedules that made it difficult for some of them to respond to the questionnaire. Also, some students responded to less than 50% of the items in questionnaires and thus such questionnaires could not be used for the study.

Table 2: Program of study of the student teachers

Program of Study	Number of student teachers	% of student teachers
Bachelor's Degree- Mathematics single Major	6	7.1
Bachelors' Degree - Mathematics with another teaching subject	13	15.3
Diploma in secondary Mathematics Teaching	39	45.9
Primary Teachers Diploma	27	31.8
Total	85	100.0

Table 2 above shows that most respondents 39(45.9%) were doing Diploma in Secondary Mathematics Teaching, 27(31.8%) were studying Primary Teachers Diploma, 13(15.3%) were training to attain a Bachelors' Degree in Mathematics with another teaching subject and 6(7.1%) were studying to obtain a Bachelor's Degree with Mathematics single Major.

5. Results and Discussion

5.1 Access to mobile technologies

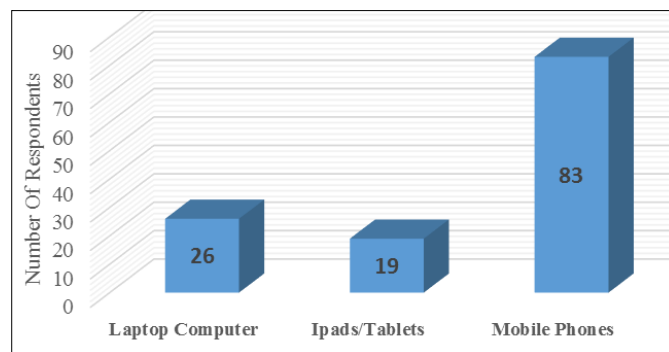


Fig 2: The Type of Mobile Technologies owned by Student Teachers as Personal Gadgets

Figure 2 above shows that 83(97.6%) out of 85 student teachers owned mobile phones as personal gadgets, 26(31.8%) out of 85 owned laptop computers and 19(22.2%) out of 85 also owned Ipads/Tablets.

In a focus group discussion with one mathematics class at College C, when asked the mobile technology they owned as a personal gadget, one of them responded;

“In this class the most common ones I see with classmates are phones and laptops with tablets/Ipads quite minimal.”

Table 3: Mobile Technologies which can be used in formal Mathematics learning and teaching according to student teachers

Mobile technology type	Number of student teachers	% of student teachers
Laptop computer	52	61.2
Ipads/Tablets	20	23.5

Mobile phones	12	14.1
Total	85	100

Table 3 above show the responses for mathematics students teachers on which mobile technology can be used in formal Mathematics learning and teaching, the 52(61.2%) felt the most desirable mobile technology to integrate in formal mathematics teaching was a laptop computer, the 20(23.5%) indicated Ipad/tablets were ideal gadgets to be integrated in teaching mathematics and the 12(14.1%) said mobile phones could be an ideal form of teaching mathematics. The results suggested that a laptop computer was the best mobile gadget that could be used in formal mathematics teaching.

5.3 The Mobile Technology Usage among Mathematics Student Teachers and Educators in the Selected Teacher Training Institutions

The sub section below presents the findings on the student teachers' usage of mobile technologies in the learning of mathematics.

The findings are presented in figures, tables and verbatim.

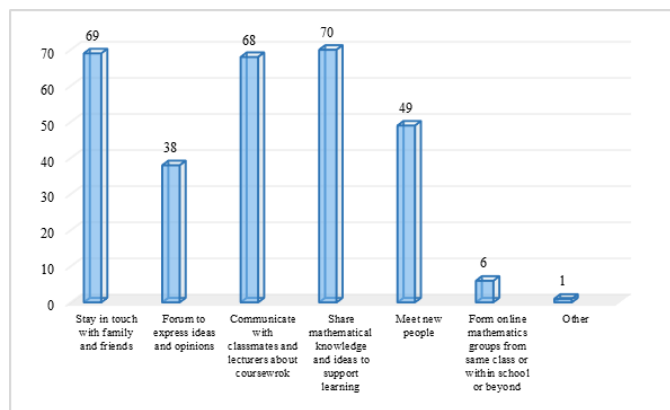


Fig 3: Social Networking sites or instant messaging

Out of 85 student teachers taking mathematics, Figure 3 above shows that 70(82.4%) used their personal mobile gadgets to share mathematical knowledge and ideas to support their learning, 69(81.2%) used them to stay in touch with family and friends, 68(80.0%) used their mobile gadgets to communicate with classmates and lecturers about course work, 49(57.6%) used them to meet new people and make friends and relationships, 38(44.7%) used mobile gadgets through social media as a forum to express ideas, 6(7.1%) used social media sites to form online mathematics groups from the same class or within school or beyond and only 1(1.2%) out of 85 used social media for other purposes. From the result in figure, we can deduce that social networking sites through mobile gadgets were used by student teachers mainly for sharing mathematical knowledge and ideas, to communicate with classmates and lecturers and to stay in touch with family and friends.

In a focus group discussion with mathematics students' teachers at College C, one student explained as stated below.

“Here we have a Facebook group for the class called learning mathematics with Mr. Z. and we share a lot of information pertaining to mathematics and other areas

of our course program. For example if I have a question in mathematics and I fail to solve I post it on the group and members share ideas on how to find the right solution and I feel helped in many ways”.

Another student echoed to the importance of group chats existing in the college like whatsapp and Facebook indicating;

“We exchange information, if I’m stuck, I simply ask my friends using my mobile gadget even on my comfort of my bed without getting to move out and the answers will come forth definitely.”

Mathematics Lecturer 3 from College B had this to say also;

.....Yaah, for me personally I use these mobile gadgets in my teaching, I do not know with other lecturers, but I use a laptop together with a projector, so if I prepare slides, I take the students to a convenient place like a college hall and they have to see from there. In this way it’s quite advantageous because like here the numbers of students in class are quite big so if I just stand at a central point and explain issues students wouldn’t be helped, but if I use a laptop and projector it’s quite convenient to put across a concept because all could see from a distance unlike on a chalkboard.

ICT coordinator 1 from College A added also as below

“Mobile technologies to say the least are libraries..., you can download books on free sites and even purchase books. They provide online learning to a larger extent.”

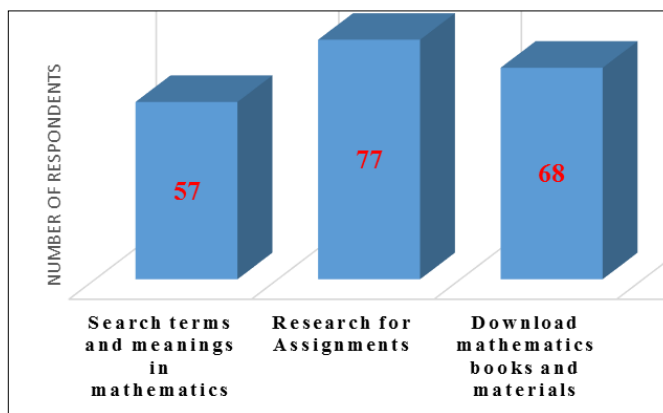


Fig 4: Usage of mobile gadgets for research (Surfing the internet)

Figure 4 above shows the responses from the mathematics student teachers on how they used their personal mobile gadgets in research or surfing the internet for. In each response, out of 85 student teachers 77(90.6%) indicated that they researched for assignments, 68(80.0%) surfed internet to download mathematics books and other materials, 57(67.1%) said they searched terms and their meanings in mathematics and only 1(1.2%) used the internet for other things. We can deduce from the results that mathematics student teachers used the internet mainly to research for assignments and downloading of various mathematics for them to read. This

showed that mobile technologies are helping students in their educational attainment in their quest to become mathematics teachers in Zambian secondary schools.

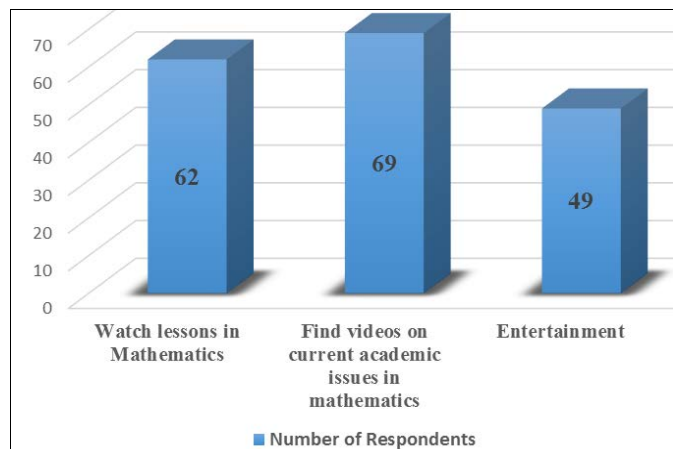


Fig 5: Usage of video sharing sites

Figure 5 show the responses on what mathematics student teachers do when they visited video-sharing sites on YouTube and other sites. Out of 85 students in each response, 69(81.2%) said they visited such sites to find videos on current academic issues in Mathematics which was the highest response, 62(72.9%) indicated that they downloaded videos to watch Mathematics lessons, the 49(57.6%) visited the videos sharing sites just for entertainment sake and 0(0.0%) watched any other things apart from the indicated options. The results in Figure suggested that mathematics student teachers visit video sharing sites using their mobile gadgets to find videos that explain current mathematics issues and indeed to watch mathematics lessons. The results indicated that the mobile gadgets are used to learn mathematics through watching videos that relate to what they are learning in their course work.

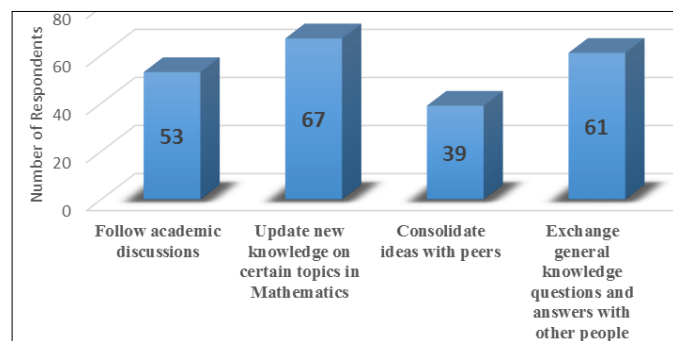


Fig 6: Usage of blogs on internet

Figure 6 above shows the responses on how student teachers used blogs on the internet. The data in the figure indicated that out of 85 student teachers who responded to each item of usage on blogs, 67(78.8%) used mobile gadgets to follow blogs in order to update new knowledge on certain topics in Mathematics, the 61(71.8%) followed blogs to exchange general knowledge questions and answers with other people, the 53(62.4%) followed academic discussions, the 39(45.9%) followed blogs using the mobile gadgets to consolidate ideas

with peers and 0(0.0%) followed blogs on other reasons not specified in the figure.

The results in Figure 6 suggest that students follow blogs to update new knowledge on certain topics in Mathematics education.

In a focus group discussion one student from College C expressed as;

S2: “Mobile gadgets bring about laziness in us learners because we rely too much on them to get information, for example even simple addition of $5+26,-10+45$ so onOne would need to use a mobile phone. So in this way they erode the spirit of hard work and mental ability great mathematicians of old were known for as we learnt in the History of Mathematics like Carl Friedrich Gauss who added the first 100 natural numbers in third Grade within a short period of time to the dismay of his teacher.”

5.4 Ways of using mobile technologies (Laptop, mobile phones and (Ipad/Tablets) in the teaching and learning of mathematics.

In summary to a number of interactive questions on the questionnaire, mathematics student teachers were asked to suggest some ways of how mobile technologies can be used and indeed their perception in the teaching and learning of mathematics. Below were some of the views as they were stated.

Mobile technologies are convenient because we don't need to write notes as the lecturer is making a PowerPoint presentation because we know the notes will be given to us electronically on our gadgets through either the WhatsApp group or our emails or flash drive.so we concentrate more in the learning process.

5.5 Online groups (Whatsapp, Facebook, Wechat, tweeter, Imo)

On the use of instant messaging in teaching and learning, the mathematics lecturers had a number of views as expressed below;

Mathematics Lecturer 6 from College B explained as below;

“On that one we have a whatsapp group for all the lecturers in the college and we help each other on many issues. And again we encourage the classes and students themselves to form up whatsapp groups,.....we have one for the classes that I teach DH8, DH 10 and DH11, and it's purely on professional and academic matters and mathematics questions, interactions..... Students ask questions and we share solutions. It's quite good because others are shy to ask in class but they would ask on whatsapp group. It's quite educative. It's a leeway of how to find solutions to problems.

Mathematics lecturer 1, confirmed also

“In India ...yes I had a WhatsApp group with my

students and we shared information in mathematics. Students interacted well and learning and teaching was taking place. But here in Africa, I have not tried but we just communicate with students using emails which is one-to-one rather than group chats."

ICT Coordinator added his voice concerning how mathematics student teachers and lecturers can utilize the whatsapp message system;

"Yes in fact to a larger extent mathematics learners /educators from the study area can create groups (WhatsApp, Facebook, we chat)So whoever has some questions will ask on the group especially those who are shy in class."

and Ben-Zaken (2004) ^[22] in support to a wide range of functionality of mobile technologies especially provided the following scenario based on at least three realistic observations:

"(1) Technology plays an important role in learning and teaching because it promotes active learning. (2) Learning is a social-cultural process and teachers and peers are part of the individual cognitive process. (3) The talking function of mobile phone is no longer its dominant function and textual and visual communications as well as uses of web resources and applications (online and local) are fast becoming central functions of modern mobile communication"(p. 1).

The findings in this study are in tandem to a larger extent with the TPACK framework and the situated learning theory by Lave and Wenger (1991). The theory posits that "learning is not merely the acquisition of knowledge by individuals, but instead a process of social participation. The students and lecturers socially interacted with mobile devices through exchange of information on mobile phones and discussions that ensued in the process. Both lecturers and students indicated that they helped each other to answer mathematics questions using the mobile gadgets. The theory presupposes that learning occurs in specific social contexts and communities of practice. It is in line with the socio-cultural theory which permits learners to work collaboratively in groups so as to share learning experiences in their communities of practice (Nie, 2007). Formation of whatsapp and Facebook groups proved that learning was not merely through the walls of the classroom but anywhere in a specific context. In the comfort of a bedroom, students indicated that they could send a message of any form applicable to ask for assistance in mathematics questions. Some lecturers formed and belonged to online whatsapp groups in which collaborative learning took place.

Situated learning theory considers the learner's learning environment as being pivotal to learning (Traxler, 2007). This is in agreement with situating learning in which a learner's context increases his/her learning experience because knowledge can be adapted to that learner's specific context.

The findings also showed that students and lecturers involved

mobile technology in the teaching and learning of mathematics which is a requirement of the TPACK Framework which reflects the intersection among three domains of teacher knowledge: content, pedagogy and technology (Mishra & Koehler, 2006, 2008). Research has shown that mathematics students and educators can move from seeing content, pedagogy, and technology as independent domains of knowledge to recognizing the transformative potential of the interdependence among the three domains.

6. Conclusion

In conclusion, the study has tried to provide some answers to the question at hand which was; "How are the student teachers and Educators use mobile technologies in training of mathematics teachers in Zambia?" The study has established that both student teachers and educators use mobile devices in a number of ways. The usage hitches on communication, collaboration, data sharing, video sharing, online group chats in the communities of practice, lesson preparation, storing of mathematics resources, and for research were the common ones.

Mobile technologies such as tablets and mobile phones will feature prominently in the current and future learning environments. Mobile technologies such as the iPad/Tablet as observed offer benefits such as seemingly boundless access to information and advantages for collaborative learning. However, the study found that these devices also carry the potential to distract learners and create frustration in the classroom. When incorporated into the learning/teaching prudently and reflexively, educators can maximize their potential to enhance learning and minimize their interference with learning.

7. Recommendations

For Practice

- i) Curriculum planners, policy makers and training institutions need to consider students' learning styles in the use of mobile devices in mathematics by uploading the recommended and prescribed books in all courses on their website for students to access or better still, need to sell iPads/tablets loaded with study materials sold at an affordable price.
- ii) Mathematics students and educators to form online interactive groups such as whatsapp or Facebook for data sharing, discussions and collaboration.
- iii) Institutions should provide and improve free internet (Wi-Fi) for students to use for educational purposes.

For further research

- i) A similar study can be done in secondary schools by determining the effectiveness of mobile gadgets in student performance in certain topics in mathematics.
- ii) A study on the effects of social media on college student's academic performance.
- iii) A study to investigate any coloration between availability and use of mobile technologies on one hand, and students' academic performance.

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