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## Effectiveness of the Use of Whatsapp in the Learning of Mathematics among University Students

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### **Abstract:**

*This study aimed at investigating the effectiveness of the use of WhatsApp in the learning of Mathematics among university students. The research design used was descriptive survey. The Simple random sampling technique was used to select a sample of 200 respondents for the study. Questionnaire was the main tool used in collecting data for the study. The study achieved a response rate of 92.2%. Descriptive statistics including frequencies and percentages were used to analyse the data collected for the study. The analysed data showed that WhatsApp is very effective in the learning of Mathematics among university students. Students also showed a positive perception towards the use of WhatsApp in their academic activities. It was also revealed that easy passage of mathematical information to peers and convenience were the two major factors that influence the use of WhatsApp Messenger by university undergraduate students. It was therefore recommended that WhatsApp should be integrated in the learning of mathematics among students in order to foster quick and easy sharing of information among students. Conclusions, implications and recommendations have been discussed in the work.*

**Keywords:** Effectiveness, Whatsapp, learning of mathematics, university students

### **1. Background to the Study**

Technology has a positive impact on learning and mathematics is not an exception. Lam and Lawrence (2002) contend that technology offers learners with rules in their own learning cycle and quick access to knowledge that their instructor might not be able to offer. Technology as a whole has a very important role to play in the teaching and learning of mathematics. Ittigson and Zewe (2003) argued that technology is central to teaching and studying mathematics. ICT strengthens the ways mathematics is learned and increases students' comprehension of fundamental concepts. A variety of scholars have conducted studies to assess the effects of using ICT in mathematics. Becta (2003) outlined the main benefits – ICT facilitates greater cooperation between students and enables contact and information sharing, ICT offers students immediate and reliable input, and this leads to a productive mind-set, and ICT also helps students to concentrate on reaction methods and explanations rather than waste energy on tiresome numerical calculations.

Barhoumi and Rossi (2013) asserted that ICT is regarded to be a new concept covering a wide range of applications, learning methods and learning tools and techniques. It includes a variety of technological applications, processes, audio and video. An environment that is well-structured is essential in order to enable the user to connect diverse tools to construct, share and develop his/her level of knowledge with a variation of learning models (Rossi & Mustaro, 2014). Information and Communication Technology aims to deliver instruction to students not only present in the classroom but at any other place. The wireless portable devices such as mobile phones, iPods, MP3 etc could provide many possibilities to respond to the needs of this generation. Evans and Johri (2008) assert that a distinguishable feature of mobile learning is the opportunity to learn anywhere and anytime. One of the powerful applications that makes learning easier and convenient is WhatsApp Messenger.

WhatsApp messenger is a cross – platform instant messaging application for smart phones. The client software is available for iPhone, Blackberry OS, Android, and Windows phones. WhatsApp Messenger is an application that runs on almost all recent types of devices and operating systems. The application was developed by Brian Anton and Jan Koom who are all yahoo employees and supported by about 8 billion investments by Major Sequoia, and has been on the market since 2009. The main aim of the developers of this application is to replace the existing SMS platforms for a system that is free of charge. As a means of sending and receiving messages from individuals or groups, WhatsApp Messenger also has some very important features such as attachment of documents, pictures, aural files, video files, as well as web links

among others. In just a few years, Whatsapp Messenger has become highly successful with over 350 million users and has been ranked as the highest downloaded application worldwide. (Cohavi, 2013).

Another interesting feature about WhatsApp Messenger is the ability to create a group and to communicate within the group. The current version of WhatsApp Messenger has a capacity to contain 250 members in a group where they can share information at the same time. The creator of the group becomes the administrator of the group and can add participants and also remove participants from the group. All the participants of the group can share messages and every member of the group will have access to that information. Due to these features of WhatsApp Messenger, Pempek, Yermolayeva and Calvert (2009) affirmed that several users are changing the channels where they look for news, information and entertainment.

Mercier and Higgins (2013) studied the implementation of online cooperative and collaborative learning approaches in virtual communities to encourage learning activities in mathematics and observed that a number of factors were affecting students' involvement, cooperative and collaborative communities. Learners are encouraged and positively focused on participation in online communities to share knowledge related to mathematics courses. Likewise, other research in the field of WhatsApp learning communities also established that online learners were using Whatsapp application and were incorporating it in online learning through learning communities and that the usefulness and ease of the use of the WhatsApp messenger were the main factors affecting learners' participation and acceptance of online collaboration (Litchfield, Dyson, Lawrence & Zmijewska, 2007).

Research posed by Yu, Tian, Vogel, and Kwok (2010) conveyed that online discussions among learners by means of social learning communities interacted through mobile learning communities, noticeably enhanced learners' social networks, increased their self – esteem and improved their learning. Similarly, Preston et al. (2010) discovered that almost 70% of the learners indicated that they learn just as much when engaged in online communities such as WhatsApp groups, Facebook communities, Twitter chats and Google+ communities, as they do face-to-face lectures that are held in the classroom in the presence of other students.

It can be observed from the various researches that, the emphasis was laid on how Information and Communication Technology has helped in the teaching and learning of Mathematics and other subjects such as English (Communicative Skills) and the findings were that Information and Communication Technology has been very effective in the teaching and learning of Mathematics and other subject areas. It is therefore very important to single out WhatsApp Messenger, which is a component of ICT and very popular and then study its impact in the teaching and learning of Mathematics. And that is exactly what this research work is about. It is against this background that this study sought to explore the effectiveness of the use of WhatsApp in the learning of mathematics in the faculty of science and technology in the University of Cape Coast.

## 2. Statement of the Problem

The WhatsApp Messenger application has the capability of entertaining, educating and informing its audience, of which are the main function of the mass media. Due to these functions of WhatsApp, it has become very necessary to study the “effectiveness of using WhatsApp in the learning of mathematics among university students in Ghana. This has become very necessary because a lot of research have been conducted on the impact of technology in the teaching and learning of mathematics and this work deems it very important to single out WhatsApp which is a subset of technology and very effective so that we can study its effects on the learning of Mathematics.

Mathematics is a very important subject in all the stages in the pre – university education in Ghana. Unfortunately, students find it very difficult to pass this subject. As pre – service teachers of mathematics who are all exposed to this important application (WhatsApp Messenger), it is very important to explore the effectiveness of WhatsApp Messenger in the learning of mathematics since it is very educative in other horizons of academics. Also, this study will help to find out how we can effectively integrate WhatsApp Messenger in the learning of Mathematics and the impact it will have on students in the near future. It is necessary because most of the students in the department where data was collected use WhatsApp application for learning.

## 3. Purpose of the Study

The purpose of this study was to find out the effectiveness of using WhatsApp Messenger application in the learning of mathematics among university student specifically Department of Mathematics and ICT Education, University of Cape Coast.

## 4. Research Questions

- What is the prevalence of WhatsApp Messenger in the learning of Mathematics?
- What are students' perceptions towards the use of WhatsApp Messenger as a tool for learning mathematics?
- How useful is WhatsApp Messenger to students in the learning of Mathematics?
- What factors influence the use of WhatsApp Messenger among mathematics education students?

## 5. Design and Instrumentation

Creswell (2008) declared that research approach is essential as an efficient strategy in order to increase the research validity. For that reason, this study used a descriptive survey approach. This approach was deemed appropriate for the study because the study focused on gathering numerical data and generalizing it across groups of people. Salaria (2012) citing Aggarwal (2008) argues that descriptive work is committed to the compilation of data on existing situations

or circumstances for the purpose of description, analysis and interpretation. In this study, data was collected using a questionnaire. Questionnaire has been deemed as the heart of a survey operation (Kothari, Edwards, Hamel & Judd, 2009). Not only is a questionnaire used to search for information concerning certain situations and problems in educational research, but also to make inquiries into people's views and attitudes of (Koul & Fisher, 2004). In this study, the questionnaires for students consisted of six sections. Section A comprising structured questions concerned with the demographic details of students such as gender, age and educational level. Respondents were required to provide background information on demographic characteristics as it was useful in finding the characteristics of respondents. Section B comprised structured questions concerning the usefulness of the WhatsApp application. Section C on the other hand, sought information on students' perception towards WhatsApp adoption. A five-point Likert scale with options of "Strongly agree, Agree, Neutral, Disagree and Strongly disagree" was used to indicate the level of agreement among respondents. Section D of the questionnaire sought information on the level of usage of WhatsApp among university students. Respondents were asked to tick on the alternatives provided and rank the benefits of using WhatsApp.

## 6. Selection of Participants

This research was carried out with students in the department of Mathematics and ICT Education, Faculty of Science and Technology Education, College of Education Studies, University of Cape Coast, Ghana. The participants were level 100 to level 400 mathematics education students of the said department. The target population was levels 100 to 400 mathematics education students which was made up of 345 students. Simple random sampling technique was employed to select participants for the study. The participants for the study were selected based on random sampling in order to prevent biases. A total of 200 respondents were selected to participate in the study.

## 7. Validity and Reliability of Instrument

The instrument used for data collection was subjected to intense scrutiny by senior lecturers and researchers in the Mathematics and ICT Education department of the University of Cape Coast to ensure the validity of the instrument. The face validity and construct validity of the questionnaire was further determined by a group of mathematics education lecturers and other researchers after systematic review of the instruments. The reliability of the Likert scale questionnaire items was examined using the Cronbach's alpha. Gay and Airasian (1996) believed that Cronbach's alpha could be used to analyse internal consistency when numbers were represented by choices. The items in this questionnaire that measured each scale were observed to be acceptably reliable as the various sub sections scored alpha coefficients of 0.76 and above. The Cronbach's alpha was estimated by determining the internal consistency reliability on how all the items on the instrument was associated to all other items and to the whole questionnaire.

## 8. Data Collection Procedure

The study was conducted in the University of Cape Coast, Ghana. A sample of 200 undergraduate students offering mathematics education filled in the questionnaires. In order to ensure smooth distribution of the questionnaire, permission was sought from the lecturers in charge of the respective levels who data was collected from their students during lecture hours. After permission was granted, copies of the questionnaires were distributed randomly to the respondents in every column of the class making sure that every column was at least served with a questionnaire. In all, each level was served with 50 questionnaires. The questionnaire was conveyed in such a way that respondents easily understood and required approximately 30 minutes to complete. On the day of data collection, the researchers visited the level concerned after which the other level was visited for the same purpose for the administration of the questionnaire. The consent of both lecturers and students were sought to which a consensus was reached before administration of the instruments began. The primary aim of the study was again explained to the respondents before administration begun and they were assured during the period of anonymity and confidentiality. All questionnaires administered were retrieved on the same day. However, it took the researchers a total of four days to collect data from the respondents.

## 9. Data Analysis and Discussion

One hundred and eighty – four (184) respondents completed and returned the questionnaire correctly which represents 92% of the total respondents. Out of the total respondents, 142(77.2%) were males and 42(22.8%) were females. This is a clear indication of lower participation of females in mathematics education at the higher level. An interpretation of the findings and a presentation of the results are presented and discussed in details in accordance with the research questions.

## 10. Discussion of Results Regarding Research Questions/Hypothesis

- Research Question 1: What is the prevalence of WhatsApp Messenger in the learning of Mathematics?

The third research question sought to identify the prevalence of WhatsApp usage in the learning of mathematics. Table 1 presents the results from the responses of the students.

Statements	SA		A		N		D		SD	
	F	%	F	%	F	%	F	%	F	%
I have used WhatsApp for at least three years	116	63.0	48	26.1	10	5.4	6	3.3	4	2.2
I am always active on WhatsApp everyday	60	32.6	72	39.1	21	11.4	21	11.4	10	5.4
I read all messages on my WhatsApp everyday	54	29.3	53	28.8	30	16.3	32	17.4	15	8.2

Table 1: Prevalence of Whatsapp Usage

Table 1 talks about the level of usage of WhatsApp among the respondents and it indicated that, 164 respondents representing 89.1% have used WhatsApp for at least three years. This finding agrees to the findings of Mercier and Higgins (2015), which states that about 85% of university students have used WhatsApp over the past four years. 132(71.7%) respondents are also always active on WhatsApp, however, only 107(58.2%) of the respondents read all the messages from their platforms. From the findings of similar studies, it is evident that the level of usage of WhatsApp in distance learning to bridge the gap between students and their peers, learners and tutor is very high. The WhatsApp platform has been exploited for other reasons (Moran, Seaman & Tinti-Kane, 2011; Kim & Sin, 2013). Based on the findings from this study and other supported literature, it is obvious that the level of usage of WhatsApp is very high among university students and since the usage is very high, it is expedient that important information could be disseminated to students through this platform.

- Research Question 2: What are students' perceptions towards the use of WhatsApp Messenger as a tool for learning mathematics?

The second research question explored the perceptions of undergraduate mathematics education students towards the use of WhatsApp messenger as a tool for learning mathematics. The Table 2 presents the results of the respondents.

Statements	SA		A		N		D		SD	
	F	%	F	%	F	%	F	%	F	%
I perceive learning mathematics via WhatsApp is a pleasant idea	58	31.5	63	34.2	34	18.5	20	10.9	9	4.9
I perceive learning mathematics via WhatsApp is a positive idea	46	25.0	84	45.7	28	15.2	22	12.0	4	2.2
I perceive that using WhatsApp, it helps me to pass information discussed easily	92	50.0	67	36.4	17	9.2	5	2.7	3	1.6
I perceive the use of WhatsApp in learning to be easy	83	45.1	73	39.7	19	10.3	6	3.3	3	1.6
I am of the perception that sending mathematics messages is understandable	60	32.6	78	42.4	34	18.5	6	3.3	6	3.3
I am of the perception that anytime I face technical problems using WhatsApp I will be able to solve them in one way or another	52	28.3	63	34.2	43	23.4	16	8.7	10	5.4

Table 2: Students' Perception towards the Use of Whatsapp Messenger

From Table 2, 130(70.7%) of the respondents perceived learning mathematics as a positive idea since learning via WhatsApp is very pleasant. A cursory look at the table indicates that majority of the respondents have the perception that they can easily pass information to their mates through WhatsApp. About 159(86.4%) of the respondents perceive WhatsApp to be a very comfortable means of sending academic information to their mates and hence perceive WhatsApp to be very important. The results presented above indicate that undergraduate mathematics education students have positive perception towards the use of WhatsApp messenger in the learning of mathematics. This suggests that when WhatsApp messenger is formally integrated into the academic activities of students, it will go a long way to improve upon their mathematics learning. Thus, all students will have the opportunity to communicate with their lecturers on a single platform and instructors will be able to address the issues and misunderstanding of students even outside the lecture hall. These findings are also supported by the study of Clark and Roberts (2010) which recognised the educational use of social networking such as WhatsApp which has been very effective and students have the perception that if it is to be officially introduced as a major way of communicating to students, it will be welcomed. Similarly, Cetinkaya (2017) identified that students have positive opinions about the use of WhatsApp messenger as a tool for learning.

- Research question 3: How useful is WhatsApp Messenger to students in the learning of Mathematics?

To ascertain the usefulness of WhatsApp Messenger to undergraduate students in the learning of mathematics, responses of items in relation to the first research question were analysed and the results are displayed in the Table 3 below.

Statements	SA		A		N		D		SD	
	F	%	F	%	F	%	F	%	F	%
WhatsApp helps me to seek help related to Mathematics courses from students who have already taken the course	72	39.1	81	44.0	15	8.2	7	3.8	9	4.9
The use of WhatsApp increases my mathematics learning productivity	49	26.6	69	37.5	36	19.6	25	13.6	5	2.7
My performance in mathematics has improved by the use of WhatsApp	44	23.9	56	30.4	42	22.8	30	16.3	12	6.5
Interaction through WhatsApp has helped me to solve some of my mathematical problems	57	31.0	76	41.3	31	16.8	16	8.7	4	2.2
Interaction through WhatsApp has helped me to become active in mathematics learning	47	25.5	53	28.8	43	23.4	28	15.2	13	7.1
Interaction through WhatsApp has increased my confidence level in learning Mathematics	43	23.4	53	28.8	45	24.5	30	16.3	13	7.1
Communicate with my classmates about matters related to Mathematics	76	41.3	78	42.4	20	10.9	7	3.8	3	1.6
WhatsApp helps me to discuss ideas about courses with my classmates	71	38.6	82	44.6	19	10.3	3	1.6	9	4.9
I have found that WhatsApp is useful in my Mathematics learning	50	28.7	67	38.5	42	24.1	3	1.7	12	6.9

Table 3: Usefulness of Whatsapp Messenger to Students in Learning Mathematics

Table 3 shows the types of academic activities that the students used WhatsApp Messenger for in the learning of mathematics. One hundred and fifty – three (153) respondents, representing 83.2% of the respondents showed that WhatsApp helps them to get help from their mates in relation to mathematics via WhatsApp messenger. Also, 133 respondents representing 73.2% generally agreed that they have gotten their difficult mathematical questions solved through WhatsApp messenger and hence they find WhatsApp messenger very useful in the learning of mathematics. It is worthy to note that just a handful of the students representing (15)8.6% indicated that WhatsApp messenger is not useful in the learning of mathematics. Results from Table 1 indicate that WhatsApp helps them to discuss ideas about mathematics courses with their course mates and also helps them to communicate with their course mates about matters related to mathematics. Thus, WhatsApp messenger enhances communication among students on issues relating to their mathematics learning. From the findings of our research, it is very clear that WhatsApp is very useful in the learning of Mathematics. Most of the participants reported using WhatsApp for staying connected with course mates for academic purposes. Apparently, the finding is in consonance with the findings of a similar study by Cetinkaya (2017) on the impact of WhatsApp usage on the success in the Education process. His findings revealed that using WhatsApp to support the traditional learning is very effective for enhancing students' success in the education process. It was also ascertained from students' statements that learning could also occur unintentionally and that messages with images were more beneficial to their learning.

- Research Question 4: What factors influence the use of WhatsApp Messenger among mathematics education students?  
The fourth research question explored the various factors that influence student's usage of WhatsApp in the learning of mathematics. The results are indicated in Table 4.

Statements	SA		A		N		D		SD	
	F	%	F	%	F	%	F	%	F	%
WhatsApp is convenient for academic engagement purpose	82	44.6	74	40.2	18	9.8	9	4.9	1	0.5
WhatsApp allows me to academically engage with peers and lectures at my time and any place	74	40.2	79	42.9	23	12.5	7	3.8	1	0.5
Using WhatsApp, it helped me to pass any information discussed easily	88	47.8	78	42.4	13	7.1	4	2.2	1	0.5
Using WhatsApp helps to form student groups for educational purposes	94	51.1	67	36.4	13	7.1	4	2.2	6	3.3
I use WhatsApp to communicate with instructors during office hours and meetings	60	32.6	71	38.6	27	14.7	15	8.2	11	6.0
I see messages on my WhatsApp to be very important	44	23.9	81	44.0	35	19.0	9	10.3	5	2.7
Learning how to use WhatsApp messaging is easy	85	46.2	67	36.4	22	12.0	4	2.2	6	3.3

Table 4: Factors Influencing the Use of Whatsapp among Students

Table 4 presents the factors influencing the use of WhatsApp in the learning of Mathematics among the respondents. According to the students, one of the major factors that influence their usage of WhatsApp is that, it helps them to pass any mathematical information easily to peers for discussion as indicated by 166(90.2%) of the respondents. Another important factor, which 156(84.8%) of the respondents see as a factor influencing the use of WhatsApp is that, it is very convenient for academic purposes. From the findings, it is obvious that most students are influenced by the opportunity that WhatsApp messenger presents to enable effective communication among students and between lecturers and students. This finding is in line with the findings of Duch, Groh and Allen, (2001) which states that, since the year 2000, a wide range of ICT tools including WhatsApp were being exploited in Malaysian schools to support the learning of different subjects due to its ease of use and portability.

### 11. Implications of the Research Findings for Teaching, Learning and Policy Implementation

The findings imply that WhatsApp enables learners to easily gain access to learning resources outside of lecture hall interactions, enables effective communication (among students and between students and their lecturers), and also encourages collaborative learning through the formation of WhatsApp groups. These benefits and increasing popularity of WhatsApp propose that it could be used as a tool to enhance students' learning, especially in African universities that may possibly have limitations in finances as well as infrastructure.

### 12. Conclusions and Recommendations

The findings from the study affirm that there is a high prevalence of students' usage of WhatsApp among university undergraduate students in mathematics education. The students used in the study also depicted a positive perception towards the usage of WhatsApp messenger as a tool for learning mathematics. Also, it can be concluded that mathematics education students find WhatsApp very useful in enhancing their learning of mathematics. Communication with others (lecturers and colleague students) on matters related to mathematics courses was the major reason among the participants in using WhatsApp for educational purposes. Finally, the study concluded that the major factor that influences university undergraduate mathematics education students to employ the use of WhatsApp in the learning of mathematics is the ability of WhatsApp to enable students communicate in groups together with their lecturers. Based on the conclusions, the study recommends that WhatsApp messenger be used as a supportive technology to enhance students learning in tertiary institutions.

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