Assessment of Utilization of Social Network in Learning Mathematics among Pre-Service Teachers in Colleges of Education in Kano State, Nigeria

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Abstract

This study investigated pre-service mathematics teachers' level of utilization of social network in learning mathematics in Colleges of Education (COEs) in Kano state, Nigeria. The study adopted the descriptive survey design. A sample of two COEs, one Federal Government - owned and one State-owned, was randomly selected by simple random sampling technique. From the two COEs, a sample of 126 mathematics pre-service teachers made up of 67 males and 59 females was then selected using cluster sampling technique. A structured questionnaire (Pre- Service Mathematics Teachers Social Network Utilization Questionnaire) was used to collect data. The questionnaire had an internal consistency reliability index of 0.76 obtained by Cronbach Alpha method. The data collected was analyzed using mean to answer the research questions while t-test was used to test the formulated hypotheses at 0.05 α- level. Results indicated that pre-service mathematics teachers in COEs utilized Facebook, WhatsApp, Instagram, TikTokand Snapchat to learn mathematics most often among all other social network sites and that male students use social network sites for the purpose of learning mathematics more often when compared to female students. It was recommended that Pre-service teachers in COEs should be encouraged by course lecturers to use Social Media Network Sites (SMNSs) to learn mathematics by giving online assignments.

Keywords: Technology, Social Network, Pre-service Teachers

Introduction

The present technological era has made the world a global village where human beings socially interact and communicate from far and near distances. This social interaction using technology has penetrated into various areas of human endeavor including education sector. Technology has both positive and negative consequences. Technology has, positively, exposed man to a better and easy way of doing things but has negatively changed the adolescents' language with new acronyms and code words. However, the choice of using technology positively or negatively remains the decision of the particular individual user or group. In education, technology is used positively to bridge communication gap along distances and ensure that information is gotten in real time. This is achieved through the development of several devices that ease communication. These devices include the telephone, radio, fax, e-mail, internet, social media and a lot of others (Kitzman and Kristopher cited in Naibi, Ayagi and Abdullahi 2021). However, this paper will focus on social media also known as Social Media Network Sites (SMNSs).

Social media is defined as the means of electronic communication which are created online for the purpose of sharing information, exchanging personal messages and viewing videos and images, among others. According to Kitzman and Kristopher (2011) cited in Naibi, Ayagi and Abdullahi (2021), social media are interactive computer-mediated technologies that facilitate the creation and sharing of information, ideas, career interests and so on, through virtual communities and networks. These technologies includes but not limited toWhatsApp, Facebook, Twitter, Instagram, YouTube, etc.

The history of social media dates back to 1970s. Golub (2018) elaborated the historical development of social media from 1971 when Ray Tomlinson exchanged a message between two computer set close to each other. In 1978, Randy Suess and Ward Christensen constructed the first social media called the Bulletin Board System (BBS). They created the first post about the event which is thought to be the beginning of a virtual community. In 1994, people started using Geocities, the first service for web hosting created by John Rezner and David Buhnett. This service allows users to create their websites. In 1995, The Globe.com and Classmates were created for private needs like communication with friends, publication of contents and other means of interaction. In 1999, blogger was created to communicate with friends or write some data through blog. In 2003, three more social media sites were created including LinkedIn. In 2004, Mark

Zuckerberg created and presented Facebook to provide information for the needs of college students. After Facebook, You tube followed in 2005 by Chad Hurley,Steve Chen and Jwaid Karim. This was followed by the creation of twitter in 2006. Other social media sites followed later. Therefore, Social Media Network Sites (SMNSs) are offshoot from the internet (Golub, 2018).

. On the utilization of SMNSs, Amadi, Rowland Ekpenyong and Umedo (2018) agreed that social media sites enjoy the largest community of users across gender, age, nationality and even professions. Statistics published in 2023 (Sasu, 2023) showed that there are 4.8 billion social media users worldwide representing 59.9% of the global population and 92.7% of all internet users. Also, between April, 2022 and April, 2023, there were 150 million new social media users globally. This equals approximately 410,000 new users of social media everyday and 4.7 new users or approximately 5 new users every second.

In Nigeria, as of January 2023, there were 31.6 million active social media users representing 14.3% of the total Nigerian population. Of this active users, male users form the majority of active users (58.3%) compared to female. Also, the age group most reached by social media is young men and women aged 18 – 34 years (Sasu, 2023). Further, Business Insider Report (2019) cited by Naibi, Ayagi and Abdullahi (2021) revealed that Nigerian youths spend an average of 3 hours 17minutes daily using social media which is slightly higher than the global daily average time of use of social media which was put at 3hours 14mins. Looking at the age group of most active users of SMNSs in Nigeria (18 – 34 years), it clearly shows that the most active users of SMNSs in Nigeria can be found in our institutions of higher learning.

In addition, may studies have been conducted by scholars on social media usage by students in Nigerian tertiary institutions, Musa (2015) discovered that Facebook and WhatsApp were the most preferred SMNSs among undergraduate mass communication students in Nigeria and students use SMNSs for communication, collaboration, knowledge sharing and making friends. Fasae and Adegbilero-Iwari (2016) found that Facebook, google and twitter were the most used SMNSs among students of public universities in South-West, Nigeria. However, electricity failure, poor internet connectivity and receiving unwanted pictures and messages were the problems encountered by students while using SMNSs. Amadi, Rowland Ekpenyong and Umedo (2018), studied the perception of undergraduate mathematics students towards the utilization of social network and its impact on their performance in Rivers state, Nigeria. Findings revealed that

SMNSs when properly utilized could enhance academic performance. Also, Facebook and WhatsApp were mostly used by students when compared to other sites. On gender, Amadi, Rowland Ekpenyong and Umedo (2018) found that male students were inclined to using SMNSs for educational purposes when compared to their female counterparts.

However, it is worrisome to note that some scholars (Wang, Chen & Liang, 2011; Alt, 2015) alleged that SMNSs is affecting students' academic effectiveness by reducing the time students commit to academic work. Also, Omokhomion and Asika (2023) lamented that there is observed deviation, distraction and divided attention between SMNSs activities and students' academic work. Further, Bataiya (2023) listed other disadvantages of use of SMNSs to include being distractive, spreading fake news, criminal and antisocial activities and cyber bullying. Therefore, educators must be worried and concerned about whether students at tertiary level use the precious daily average time spent on SMNSs for their academic studies to learn or otherwise. This is one of the motives behind the present study which is designed to investigate the utilization of SMNSs in learning mathematics among pre-service mathematics teachers in Colleges of Education (COEs) in Kano state, Nigeria. Pre-service teachers are students receiving teacher training in Faculties and Institutes of Education in Universities, various COEs, some Polytechnics and other higher institutions that offer courses related to teacher education.

In Kano state, researches on social media usage among students of tertiary institutions were also conducted. Ibrahim and Yakasai (2021) found a significant influence of Part 3 undergraduate students' use of SMNSs and their perceived playfulness and creativity-enhancing practices in a Government –owned University in Kano metropolis, Kano state, Nigeria. Abdullahi, Bashir and Usman (2021) revealed that students of Mass Communication in Kano University of Science and Technology, Wudil, use social media to a greater extent in their learning process and that SMNSs contribute to academic achievement of Mass Communication students. Naibi, Ayagi and Abdullahi (2021) also found that 96% of the one hundred and one (101) sampled students surveyed in Aminu Kano College of Islamic Legal Studies (AKCILS), Kano, use social media as tools for learning. Google was found as the most used SMNS for learning (82.7%) and the least used SSMNS was twitter (0%). Almost equal proportion of male students (95%) and female students (96%) use SMNSs as learning tools.

Other most recent studies on social media usage in secondary schools include that of Omokhomion and Asika (2023) who discovered that the most used SMNSs by Junior Secondary School students in Esan West LGA of Edo state, Nigeria in 2021/2022 session in learning mathematics include Facebook, Instagram, WhatsApp, TikTokand twitter. Also, more male students use social media to learn mathematics more than the female students. Omokhomion and Asika (2023) also established that social media positively influence students' academic performance in mathematics. Marban and Mulenga (2022) found that face book was the most widely used SMNS among Grade 11 and Grade 12 pupils in Zambia. In terms of gender, no significant difference in pupils' mathematics Face book usage between male and female while there was significant difference in Face book usage for learning mathematics based on grade level.

Summarily, literature search showed that SMNSs are important tools in learning. However, various SMNSs were used by students of varied higher institutions of learning for various purposes, academic and personal. On gender, findings on use of SMNSs in learning have been inconsistent. Also, there is need for more studies on use of SMNSs in learning Mathematics as few studies were conducted with none carried out in Kano state. Further, a gap exists in the literature as no study was conducted, to the best knowledge of the researcher, on COEs students' usage of SMNSs in learning mathematics with particular reference to the type of COE based on ownership (Federal or State-owned).

Purpose of the study

The major purpose of this study was to assess the level of utilization of SMNSs in learning Mathematics among Federal College of Education and State College of Education students in Kano state with the following specific objectives:

i. To determine the most frequently used Social Media Network Sites SMNSs by pre-service teachers in COEs.
ii. To find out whether there is gender difference in the utilization of SMNSs for the purpose of learning mathematics among COE students in Kano state.
iii. To investigate whether difference(s) exist in the usage of SMNSs for learning mathematics amongst the pre-service teachers in Federal College of Education and those in the state-owned College of Education.

Research Questions

The following research questions were raised to guide the study:

i. What are the most frequently used SMNSs for learning mathematics by pre-service teachers in COEs?
ii. What is the difference in the level of SMNSs usage for the purpose of mathematics learning between male and female pre-service teachers in COEs in Kano state?
iii. What is the difference in the level of SMNSs usage for learning mathematics between pre-service teachers in FCEs and those in state COEs?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 α- level in order to determine whether the observed differences are statistically significant:

i. There is no significant difference in the mean SMNSs usage score for learning mathematics between male and female pre-service teachers in COEs.
ii. There is no significant difference in the mean SMNSs usage score for learning mathematics between pre-service teachers in FCEs and those in state COEs.

Methodology

The study adopted the descriptive survey design. This design was considered appropriate because Merriam and Tisdell (2015) cited by Rasheed and Motunrayo (2018) recommended that descriptive survey can be used where a study seeks to describe the characteristics of a certain group or estimate the proportion of people with certain characteristics. The target population for the study consisted of 402 NCE III mathematics students of public COEs in Kano state during the second semester of 2021/2022 session. NCE III students were considered because they have passed through all the courses and had used some of the SMNSs in one course or the other, unlike NCE I and NCE II who have not yet taken so many courses that may warrant the use of SMNSs. There are four (4) public COEs in Kano state. Out of the 4 COEs, two (2) are Federal Colleges of Education (FCEs) and two are State Colleges of Education (SCOEs). Out of the 402 NCE III mathematics students, 242 are males and 160 are females.

From the 4 COEs, two (2) COEs (one FCE and one SCOE) were randomly selected using simple random sampling technique. Also, one hundred and twenty six (126), students were randomly selected from the two COEs using cluster sampling technique. These 126 students comprised of 72 FCE students (43 males and 29 females) and 54 SCOE students (24 males and 30 females). This gave a total of 67 males and 59 females as sample size. This sample was considered adequate based on the submission of Sheka (2011) that a sample of about 15% - 30% of the population is sufficient for social science researches.

The instrument used to collect data for the study was Pre-Service Mathematics Teachers' Social Network Utilization Questionnaire (PMTSUQ) which has two (2) sections. Section A contained some demographic information like gender of student and type of school ownership (FCE or SCOE). On the other hand, section B contained eleven (11) items where various SMNSs were listed. Respondents were expected to indicate the level of usage of each SMNS for learning mathematics by ticking the selected level from the four levels provided. The four levels were coded as follows: Very Often Used (VOU) = 4, Often Used (OU) = 3, Rarely Used (RU) = 2, Not Used (NU) = 1. The instrument was validated by experts in educational technology and test and measurement. PMTSUQ had an internal consistency reliability index of 0.76 from Cronbach-Alpha method. One research assistant was used in distributing and retrieving the questionnaires. A total of 126 questionnaires were distributed, out of which 107 were successfully retrieved and analyzed.

For the data analyses, mean and t-test were used to analyze the data. The choice of mean was based on the recommendation of Boone and Boone (2013) that data which are obtained by calculating a composite score (sum or mean) from four or more type of Likert scale items, should be analyzed at the interval scale. A cut –off mean of 2.50 was accepted as indicating usage of a SMNS. A mean below 2.50 indicates a site is not used for learning mathematics. The hypotheses were tested at 0.05 alpha level of significance.

Results

Based on the data collected and analyzed, the following results were obtained.

Research Question One: What are the most frequently used SMNSs for learning mathematics by pre-service teachers in COEs?

Table 1: Mean Rating of Pre-Service Teachers' Utilization of SMNSs for Learning Mathematics

S/n	Social Media Network Sites	VOU	OU	RU	NU	Mean	Decision
1	Face Book	62	24	3	18	3.21	Used
2	WhatsApp	82	12	5	8	3.57	Used
3	LinkedIn	6	12	7	82	1.46	Not Used
4	Skype	4	11	7	85	1.38	Not Used
5	Yahoo	14	9	6	78	1.62	Not Used
6	You Tube	26	18	10	53	2.16	Not Used
7	Instagram	39	21	11	36	2.59	Used
8	Twitter	13	21	9	64	1.84	Not Used
9	TikTok	37	20	9	41	2.50	Used
10	Telegram	19	13	7	68	1.84	Not Used
11	Snapchat	38	20	9	40	2.52	Used

Table 1 revealed that the most frequently used SMNSs among COE students are Face book with mean of 3.21, WhatsApp with mean of 3.57, Instagram with a mean of 2.59, TikTok with a mean 2.50 and Snapchat with a mean of 2.52. On the other hand, the least used SMNSs are Skype (1.38), LinkedIn (1.46), Yahoo (1.62), twitter (1.84) and Telegram (1.84).

Research Question Two: What is the difference in the level of SMNSs usage for the purpose of mathematics learning between male and female pre-service teachers in COEs in Kano state?

Table 2: Mean Rating of Pre-Service Teachers' Utilization of SMNSs for Learning Mathematics by Gender

S/n	Social Media Network Sites	VOU		OU		RU		NU		Mean	
		M	F	M	F	M	F	M	F	M	F
1	Facebook	33	29	11	13	2	1	9	9	3.24	3.19
2	WhatsApp	43	39	6	6	4	1	2	6	3.64	3.50
3	LinkedIn	2	4	3	9	3	4	47	35	1.27	1.65
4	Skype	1	3	6	5	1	6	47	38	1.29	1.42
5	Yahoo	6	8	4	5	3	3	42	36	1..53	1.71
6	YouTube	16	10	8	10	4	6	27	26	2.24	2.08
7	Instagram	20	19	12	9	8	3	15	21	2.67	2.50
8	Twitter	6	7	10	11	6	3	33	31	1.80	1.88
9	TikTok	17	20	11	9	4	5	23	18	2.40	2.59
10	Telegram	10	9	5	8	6	1	34	34	1.85	1.84
11	Snapchat	22	16	7	13	6	3	20	20	2.56	2.48
										2.23	**2.25**

Table 2 shows that out of the five most frequently used SMNSs, male students used face book (3.24, 3.19), WhatsApp (3.64, 3.50), Instagram (2.67, 2.50) and snap chat (2.56, 2.48) to learn mathematics more than their female counterparts whereas females used TikTok (2.40, 2.59) to learn mathematics more than the male students. In terms of the level of usage of SMNSs, both male and female rarely used SMNSs for learning mathematics (mean of 2.23 and 2.25 respectively) which means the level of utilization of SMNSs for learning mathematics is low among male and female students of COEs.

Research Question Three: What is the difference in the level of SMNSs usage for learning mathematics between pre-service teachers in FCEs and those in state COEs?

Table 3: Mean Rating of Pre-Service Teachers' Utilization of SMNSs for Learning Mathematics by Type of COE (Federal -F or State – S)

S/n	Social Media Network Sites	VOU		OU		RU		NU		Mean	
		F	S	F	S	F	S	F	S	F	S
1	Facebook	37	25	14	10	2	1	8	10	3.31	3.09
2	WhatsApp	52	30	2	10	3	2	4	4	3.60	3.43
3	LinkedIn	4	2	6	6	3	4	48	34	1.44	1.48
4	Skype	3	1	4	7	5	2	49	36	1.36	1.41
5	Yahoo	7	7	4	5	5	1	45	33	1.55	1.70
6	You Tube	12	14	9	9	5	5	35	18	1.96	2.41
7	Instagram	29	10	10	11	6	5	16	20	2.85	2.24
8	Twitter	10	3	9	12	6	3	36	28	1.88	1.78
9	TikTok	30	7	9	11	6	3	16	25	2.86	2.00
10	Telegram	14	5	8	5	5	2	34	34	2.03	1.59
11	Snapchat	27	11	12	8	6	3	16	24	2.81	2.13
								G/Mean		**2.33**	**2.11**

Table 3 revealed that pre-service teachers in FCEs utilize all the five most frequently used SMNSs, Face book (3.31), WhatsApp (3.60), Instagram (2.85), TikTok (2.86) and Snapchat (2.81) more than their counterparts in State College of Education with Face book (3.09), WhatsApp (3.43), Instagram (2.24), TikTok (2.00) and Snapchat (2.13). In terms of the level of usage of SMNSs, both FCE and SCOE students rarely used SMNSs for learning mathematics (mean of 2.33 and 2.11 respectively) which means the level of utilization of SMNSs for learning mathematics is low among FCE and SCOE students.

Hypothesis One: There is no significant difference in the mean SMNSs usage score for learning mathematics between male and female pre-service teachers in FCEs and SCOEs.

Table 4: Summary of t-test Analysis on the SMNSs Mean Usage Score of Maleand Female Students of COEs

Group	N	Mean	SD	df	t-value	p-value	Decision
Male	55	122.45	5.45	105	5.01	0.000	Significant
Female	52	117.64	4.52				

From Table 4, it can be seen that the calculated value of t is 5.01 and the P-value is 0.000. Therefore, P – value of 0.000 is less than alpha value of 0.05. Based on this result, the null hypothesis one was rejected. This implies that there was a significant difference between the mean SMNSs usage scores of male and female pre-service teachers in COEs in favour of male students.

Hypothesis Two: There is no significant difference in the mean SMNSs usage score for learning mathematics between pre-service teachers in FCEs and those in state COEs.

Table 5: Summary of t-test Analysis on the SMNSs Mean Usage Score of Pre –service Teachers of FCE and SCOEs

Group	N	Mean	SD	df	t-value	p-value	Decision
FCE	61	142.36	5.82	105	14.02	0.001	Significant
SCOE	46	97.25	4.22				

From Table 5, it can be seen that the calculated value of t is 14.02 and the P-value is 0.001. Therefore, P – value of 0.001 is less than alpha value of 0.05. Based on this result, the null hypothesis two was also rejected. This implies that there is a significant difference between the mean SMNSs usage scores of pre-service teachers in FCE and SCOEs in favour of FCE students.

Discussions of Findings

Finding from research question one showed that the most frequently used SMNSs for learning mathematics among pre-service teachers in COEs in Kano state are face book, WhatsApp, Instagram, TikTok and Snapchat (Table 1). This finding agreed with the results of some previous studies where it was discovered that the most often utilized SMNSs by students at tertiary level is face book and WhatsApp (Amadi, Rowland Ekpenyong & Umedo, 2018) and at basic level of education are Facebook (Marban & Mulenga, 2022) while at upper basic (JSS), the SMNSs often used are face book, WhatsApp, Instagram, TikTokand twitter (Omokhomion & Asika, 2023).

However, the result contradicts that of Naibi et al (2021) who found that Google was the most used SMNS for learning (82.7%) and the least used SMNS was twitter (0%) among students of AKCILS. The difference in the findings could be attributed to the fact that the study of Naibi et al (2021) was not purely on mathematics students as the usage may likely differ according to students' area of study.

Finding from research question two indicated that male students used Facebook, WhatsApp, Instagram and Snapchat more frequently than females in learning mathematics while females use TikTok to learn mathematics more frequently than males. (Table 2). However, the level of use for both male and female was low as the SMNSs were found to be rarely used. This finding agreed with the result of Omokhomion and Asika (2023) that more male students use social media to learn mathematics more than the female students.

Finding from research question three revealed that pre-service teachers from FCEs utilize all the five most frequently used SMNSs (face book, WhatsApp, Instagram, TikTok and Snapchat) more than those from SCOEs (Table 3). In terms of the level of usage of SMNSs, both FCE and SCOE students rarely used SMNSs indicating low level of utilization of SMNSs for learning mathematics. This finding could be attributed to the fact that in most FCEs, the environments are ICT-friendly which could, possibly, promote use of SMNSs more than SCOEs.

Moreover, finding from hypothesis one established the existence of a significant difference between the mean SMNSs usage scores of male and female pre-service teachers in COEs in favour of male students. Although, the level of usage for both male and female students seems to be low, yet it is statistically significant, indicating that the level of usage of SMNSs among male pre-service teachers is significantly higher than the level of use by females (Table 4). This finding agreed with the results of Amadi, Rowland Ekpenyong and Umedo (2018) who found that male students were inclined to using SMNSs for educational purposes when compared to their female counterparts. It also supports the finding of Omokhomion and Asika (2023) that more male students use social media to learn mathematics compared to the female students. However, this finding contradicts those of Naibi et al (2021) and Marban and Mulenga (2022) who revealed no gender difference in the usage of SMNSs between male and female students.

The outcome of this study (hypothesis two) also established the existence of a significant difference in the usage of SMNSs between students of FCEs and those of SCOEs in favor of FCE students (Table 5). This implies that the level of usage of SMNSs among pre-service teachers in FCEs is significantly higher than the level of use by students of SCOEs. In all the five (5) most frequently used SMNSs discovered in this study, pre-service teachers in FCE had higher mean score than those in SCOE. This result could be attributed to the fact that FCEs possibly have better friendly environment like wireless network, electricity, etc. that could encourage the use of SMNSs for learning among students.

Conclusion

Based on the findings of this study, it can be concluded that despite the importance of SMNSs in learning mathematics, pre-service teachers in COEs rarely use them as tools for learning. The level of utilization of SMNSs was, therefore, low. There was gender difference in the utilization of SMNSs among pre-service mathematics teachers in COEs in Kano state. Male pre-service teachers in COEs utilize SMNSs in learning mathematics more often when compared to their female counterparts. Also, there was a significant difference in the level of utilization of SMNSs for learning mathematics based on type of COE by ownership. Pre-service teachers in FCEs utilize SMNSs to learn mathematics more frequently when compared to their counterparts in SCOEs**.**

Recommendations

In order to improve the use of SMNSs for learning mathematics, the following measures are recommended:

1. Pre-service teachers in COEs should be encouraged by course lecturers to use Social Media Network Sites (SMNSs) to learn mathematics by giving online assignments and exercises.
2. Mathematics educators in COEs should endeavor to link their students to SMNSs where resource materials for learning mathematics can be easily accessed.
3. Female pre-service teachers should be specially enlightened by parents and COEs on the importance of using SMNSs for academic purposes so as to reduce the gender differences in the utilization of SMNSs.
4. Departments of Mathematics in COEs should organize sensitization program for pre-service mathematics teachers on the uses of SMNSs in learning mathematics especially those sites found to be underutilized in this study..
5. Management of SCOEs should provide a good and uninterrupted wireless internet connection to facilitate easy access and use of SMNSs for sharing mathematical knowledge

between students and teachers and among students themselves. This will go a long way in improving the usage of SMNSs among SCOEs students.

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