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WHATSAPP USE IN TEACHING AND LEARNING DURING COVID-19 PANDEMIC PERIOD: INVESTIGATING THE INITIAL ATTITUDES AND ACCEPTANCE OF STUDENTS

Nana Osei Bonsu, *Aburaman Senior High School, Ghana*

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Simon-Peter Kafui Aheto, *University of Ghana, Legon-Accra, Ghana*

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Valentina Arkorful, *University of Cape Coast, Cape Coast, Ghana.*

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Abstract

This study explores the acceptance and use of WhatsApp messenger for teaching and learning in senior high school during the COVID-19 pandemic period. This research adapted TAM as its theoretical model. The participants of the study were 62 history students from a senior high school in Ghana. The study also adopted a questionnaire as the research instrument. The data collected from the participants were then analysed using the Pearson Product-Moment Correlation analysis. The results from the study show that ease of use of WhatsApp Messenger, usefulness of WhatsApp Messenger, technological challenges, and student attitude towards WhatsApp Messenger use determines students' actual WhatsApp Messenger use in teaching and learning. Additionally, the study found that student attitude performed a mediating role between ease of use, usefulness, and technological challenges on the one hand and student actual WhatsApp use on the other hand. It was suggested that future studies consider structural equation modeling using the same conceptual model adapted for this study. Also, high school authorities should consider equipping school libraries with m-learning technologies to facilitate teaching and learning.

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Nana Osei Bonsu

Aburaman Senior High School, Ghana, nanseezy@gmail.com

Brandford Bervell

University of Cape Coast, Cape Coast, Ghana, b.bervell@ucc.edu.gh

Jusitce Kofi Armah

University of Cape Coast, Cape Coast, Ghana, jarmah@ucc.edu.gh

Simon-Peter Kafui Aheto

University of Ghana, Legon-Accra, Ghana, sahetu@ug.edu.gh

Valentina Arkorful

University of Cape Coast, Cape Coast, Ghana., valentina.arkorful@ucc.edu.gh

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WHATSAPP USE IN TEACHING AND LEARNING DURING COVID-19 PANDEMIC PERIOD: INVESTIGATING THE INITIAL ATTITUDES AND ACCEPTANCE OF STUDENTS

“Education is the most powerful weapon which you can use to change the world.”--Nelson Mandela

Introduction

Undoubtedly, our life today cannot escape digital technology. Every aspect of our lives and work depends on some sort of technology. As such, there has been a gradual adoption of technology in the classroom to make teaching and learning, worthwhile (Bonsu et al., 2020). Although social media was initially built to help people socialise, it has become an educational tool for teaching and learning and sharing educational content. The utilisation of social media outside the classroom also prepares learners for the 21st century, where students need to be innovative, collaborative, creative, and communicate effectively in the ever-changing world (Redecker et al., 2009). The prime reason for the adoption of social media for educational purposes is its familiar user interface to the youth, low cost, ability to allow students to share and access valuable information, connect and interact with fellow students, teachers, and other stakeholders (Qualman, 2009; Gon & Rawekar, 2017).

WhatsApp Messenger, one of the widely used social media applications, dates back to 2010. Its development replaced the SMS platform, which required no internet usage to exchange instant messages (Bouhnik & Dshen, 2014). WhatsApp Messenger immediately grew popular as a medium of messaging individuals and groups. Functionalities of WhatsApp Messenger include text messages, voice & video calls, attachment of images, audio files & video files, stickers or emoticons, and links to web addresses. Another functionality of WhatsApp Messenger is its end-to-end encryption to secure chats, voice, and video calls. As of October 2020, the social media giant had two billion users who access the platform daily (Clement, 2020). Due to the robust features of WhatsApp messenger, its usage has now been extended to teaching and learning in developing nations around the world, especially during the COVID-19 pandemic period. The extension of WhatsApp messenger to teaching and learning is because it enables students to study anywhere and anytime, collaborate, share learning materials, access study contents/material quickly, and encourage interaction between learners and teachers (Bansal & Joshi, 2014; Gon & Rawekar, 2017).

Ghana has about 34.57 million mobile phone subscribers and 10.11 million active internet users. This makes Ghana one of Africa's largest mobile markets (Tamakloe, 2018). Despite mobile phone penetration in Ghana, the Ghanaian Education regulations still restrict Junior and Senior High school students from using mobile phones in school. This restriction makes it impossible for both teachers and students to utilise social media for academic purposes. The utilisation of

social media for educational purposes can only be done during vacation (school break) — that is only when students will have full access to their mobile devices and social media.

When the COVID-19 pandemic struck the world, it led to the closure of most schools worldwide. In Ghana, schools were closed down in March and were re-opened in June. During this period, the government of Ghana encouraged schools and teachers to find innovative ways to ensure that teaching and learning continued in order to minimise the impact of the COVID-19 school break on the academic calendar while keeping students and teachers safe from the fast-moving pandemic. During the period, many schools and teachers resorted to using technology such as Learning Management Systems (LMS), WhatsApp Messenger, Google Classroom, video conferencing tools such as ZOOM, Google Meet, while the Ministry of Education initiated television lessons for students at all levels of education.

What necessitated this study is that although Technology Acceptance Model-based research abounds on WhatsApp Messenger and m-learning usage in education, most of the research focused on the pre-COVID-19 pandemic period (Suki & Suki, 2011; Bouhnik & Deshen, 2014; Shambere, 2014; Aburub & Alnawas, 2019; Ali, Mahomed, Yusof, Afzal & Shah, 2020). Additionally, the existing research did not examine the relationship between challenges associated with technology use and other Technology Acceptance Model (TAM) constructs. This study recognised the significant role technological challenges play in technology acceptance in developing nations with more barriers to ICT access. The study, thus, sought to examine high school students' attitude towards WhatsApp Messenger use and the actual use of WhatsApp Messenger for teaching and learning based on modified TAM.

Research Objectives

The main objectives that guided this study were to:

1. To find out the variables that best determine the actual use of WhatsApp Messenger for teaching and learning in senior high schools.
2. To find out the mediating role attitude of students plays in determining actual use of WhatsApp Messenger for teaching and learning in senior high schools.

Review of Related Literature

WhatsApp Messenger for Teaching and Learning

The use of WhatsApp as a teaching and learning platform has been largely researched and documented. When used in teaching and learning, the platform can improve students' critical thinking skills (Kustijono & Zuhri, 2018). Gon and Rawekar (2017) also revealed that the technical, educational, and instructional advantages of teaching and learning with WhatsApp far

outweigh the disadvantages. Immediate feedback from the facilitator and learning anytime, anywhere were the two main advantages of WhatsApp usage in the teaching and learning process (Gon & Rawekar, 2017). Furthermore, WhatsApp Messenger has a familiar user interface, making it easily navigable by students (Mpungose, 2020). This could mean that most students would prefer WhatsApp Messenger, which they are familiar with, to LMS.

Moreover, the nature of WhatsApp Messenger makes it possible for students to develop their writing skills. Students who learn via WhatsApp tend to improve on their punctuations and sentence structures (Fattah 2015). Similarly, the study of Hamda (2017) also revealed that the use of WhatsApp Messenger in teaching and learning enabled students to build their English language vocabulary. More so, WhatsApp provides easy accessibility of learning resources, the ability to create online groups, and end-to-end encryption to safeguard students' personal privacy (Rosenberg & Asterhan, 2018). Thus, with WhatsApp, students can access and share a wide range of learning materials such as audio, visual, audio-visual, voice, and video calls while having robust end-to-end encryption to secure personal data (Bouhnik & Deshen 2014).

Conceptual Model and Hypotheses Formulation

A modified Technology Acceptance Model (TAM) served as the theoretical basis for this study. Davis (1989) relied on Ajzen and Fishbien's Theory of Reasoned Action (TRA) to develop the TAM. TAM provides a theoretical basis to explain and predict the relationship among perceived ease of use, perceived usefulness, attitudes, behaviour intention, and actual system use (Alfadda & Mahd, 2021). Huang and Huang (2016) also argued that TAM mainly focuses on the relationship between emotional variables and technology actual Use.

There are four main variables in TAM: external variables, perceived usefulness, perceived ease of use, and attitude, which are fundamental determinants of technology use intention. In this study, the researchers maintained perceived usefulness, perceived ease of use, attitude, and actual use from the original TAM. The researchers also further introduced the variable 'Technological Challenges' to the model. The introduction of 'technological challenges' as a variable was based on the premise that technological challenges hinder technological acceptance and use in developing nations. The researchers hypothesise that learners' attitude towards the adoption and use of WhatsApp Messenger for teaching and learning will be primarily influenced by usefulness of WhatsApp Messenger, ease of use of WhatsApp Messenger, and technological challenges associated with the use of WhatsApp Messenger. WhatsApp's actual use in teaching and learning will also be influenced by students' attitude towards WhatsApp Messenger use, usefulness of WhatsApp Messenger, ease of use of WhatsApp Messenger, and technological challenges associated with the use of WhatsApp Messenger for teaching and learning. The relationship among constructs in the proposed conceptual model is illustrated in figure 1 below.

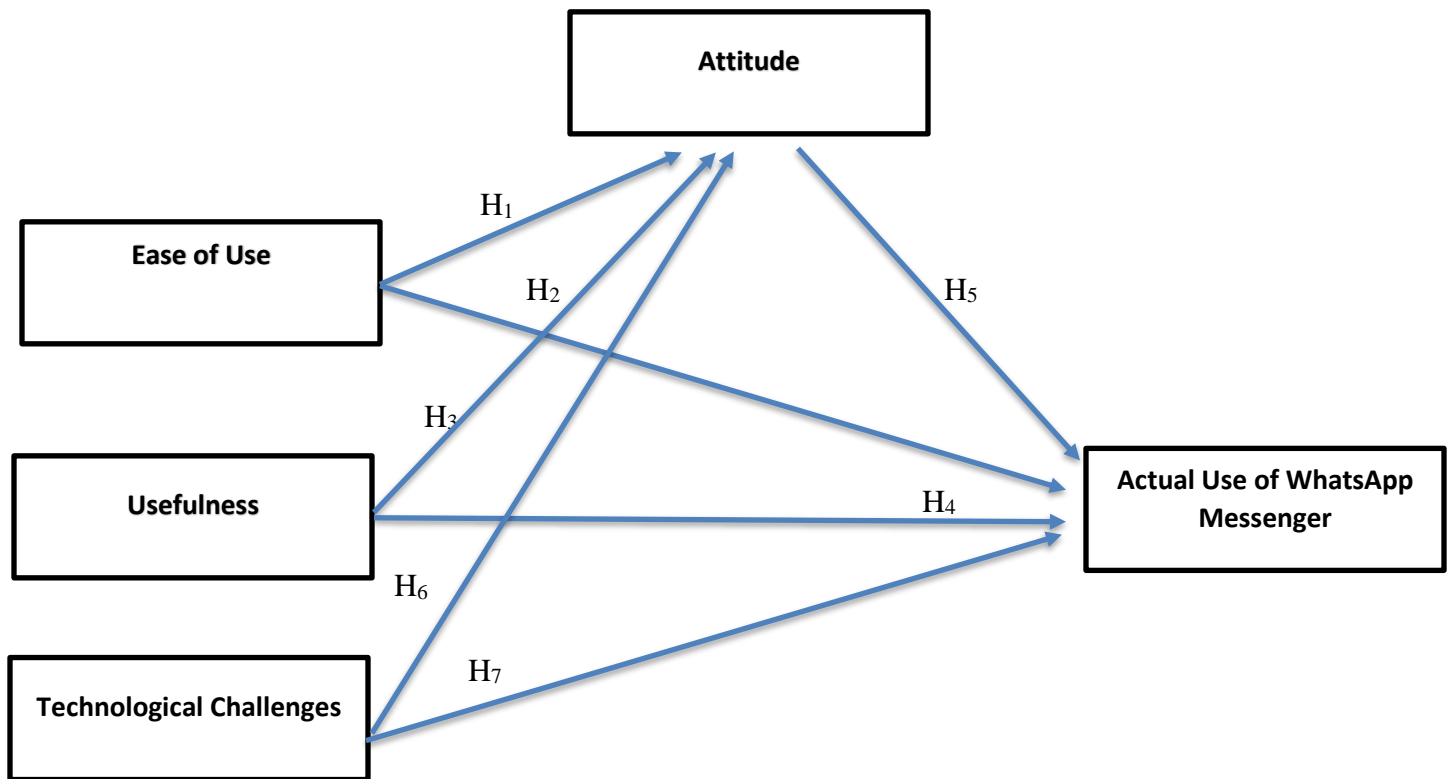


Figure 1. Conceptual model

Relationship Among Ease of Use, Attitude, and Actual Use of WhatsApp Messenger

Technology Acceptance Model posits that perceive ease of use (PEOU) and perceive usefulness (PU) are responsible for predicting user acceptance of information systems (Suki & Suki, 2011). PEOU, according to Davies, is defined as one's perception that the utilisation of a new technology system will be free from effort (Davis, 1989; 1993). Attitude (ATT), on the other hand, is defined as one's feeling towards using a new information system or technology. In the context of this study, PEOU refers to the perception that the utilisation of WhatsApp Messenger for teaching and learning will be free from effort. At the same time, attitude also relates to students feeling towards the Use of WhatsApp messenger for teaching and learning.

Both PU and PEOU have positive effects on attitude towards the use of technology (Suki & Suki, 2011). Regarding the relationship between PEOU and attitude, Shambere (2014) posited that Perceived ease of use of WhatsApp significantly affects attitude towards using WhatsApp for teaching and learning. Lee et al. (2019) also found a positive relationship between PEOU and the actual usage of technology. Similarly, Ali et al. (2020) confirmed that perceived ease of use significantly affects the usage and adoption of WhatsApp for teaching and learning (Ali et al., 2020). Thus, PEOU is more significant in predicting mobile learning acceptance than PU

(Aburub & Alnawas, 2019; Alasmari & Zhang, 2019). However, it should be noted that some researchers argued that PEOU might not have a significant effect on mobile learning acceptance because of the high usage of mobile devices among students (Arain et al., 2019). On this note, the researchers hypothesise that;

H₁: There is a statistically significant positive relationship between Ease of Use and Attitude of students towards WhatsApp Messenger.

H₂: There is a statistically significant positive relationship between Ease of Use and Actual Use of WhatsApp Messenger.

Relationship Among Usefulness, Attitude, and Actual Use of WhatsApp Messenger

Perceive Usefulness (PU) in Technology Acceptance Model (TAM) refers to the degree to which a person believes that using an information system would improve his or her job performance and output (Davis, 1989). Concerning this study, PU refers to the degree to which students believe that using WhatsApp for teaching and learning will improve their learning and academic performance. Thus, students' perceptions of benefits derived from using WhatsApp for teaching and learning (Shambere, 2014). Actual use will also refer to the actual use of WhatsApp Messenger for teaching and learning.

Sim et al. (2014) posited that the critical determinants for the acceptance and use of mobile technology are perceived usefulness, perceived ease of use, and users' attitude towards mobile technology usage. PU is known to positively affect attitude towards the use of technology systems (Sek et al., 2008). Kumar et al. (2020) also found that perceived usefulness of WhatsApp positively influences student's attitude towards its use. Thus, it can be inferred that users of WhatsApp Messenger who perceive it to be more useful for teaching and learning will have a more positive attitude towards its usage. Also, positive attitude towards WhatsApp Messenger use for teaching and learning can increase the user's behavioural intention, which will, in turn, increase actual ICT/WhatsApp usage (Tselios et al., 2011; Ali et al., 2020).

Furthermore, significant evidence from empirical research shows that PU is vital in explaining actual information system usage (Li et al., 2019). For instance, the research findings of Ali et al. (2020) revealed that perceived usefulness is vital in explaining WhatsApp Use. In the light of these findings, the researchers, therefore, postulate the following hypotheses:

H₃: There is a statistically significant positive relationship between Usefulness and Attitude of students towards WhatsApp Messenger.

H₄: There is a statistically significant positive relationship between Usefulness and Actual Use of WhatsApp Messenger.

H₅: There is a statistically significant positive relationship between students Attitude and Actual Use of WhatsApp Messenger.

Relationship Among Technological Barriers/Challenges, Actual Use, and Students Attitude towards WhatsApp Messenger.

Technological barriers and challenges hinder technology integration in teaching and learning in the least developed countries, mainly due to underdeveloped ICT infrastructures (Bingimlas, 2009; Purnomo & Kusnandar, 2018). These technological barriers also affect both E-learning and M-learning implementation in teaching and learning. Shambere (2014) and Stork et al. (2013) identified two main barriers to ICT utilisation in Africa. These barriers include barriers to access and affordability and the difficulty in attracting users.

Technological barriers significantly affect the acceptance and utilisation of ICT (Purnomo & Kusnandar, 2018). A study by Ryder and Machajewski (2017) found a significant relationship between students' attitude and students' access to the Internet and computers. Thus, access to the Internet, computers, and smartphones boosts students' attitude towards ICT acceptance. Furthermore, Bere and Rambe (2016) reported that the low cost of information communication technology significantly influences students' attitudes towards adopting mobile instant messaging for m-learning. This could mean that the lower the cost of communication, the positive attitude students have toward m-learning. For the successful utilisation of WhatsApp in teaching and learning, barriers to its usage should be addressed. From the foregoing, the researchers hypothesised that:

H₆: There is a statistically significant negative relationship between Technological Challenges and students' Attitude towards WhatsApp Messenger use.

H₇: There is a statistically significant negative relationship between Technological Challenges and Actual Use of WhatsApp Messenger for teaching and learning.

Research Methodology

Research Approach and Design

As a quantitative study, the researchers adopted the descriptive survey design. According to Gay (1987), the descriptive survey makes it possible for a researcher to collect and analyse quantitative data to test hypotheses or answer research questions regarding the current status of the subject of study. In this study, elements of the descriptive survey design proposed by Gay (1987) were identified and followed.

Participants

The study participants consisted of all 62 second-year history students of Aburaman Senior High School, Ghana, who participated in teaching and learning using a WhatsApp Messenger study

group. The participants were engaged in teaching and learning of history via a WhatsApp Messenger group during the COVID-19 school break from March to July 2020. The Participants were assured of their anonymity, and their consent was sought before the commencement of this study.

Data Collection and Analysis

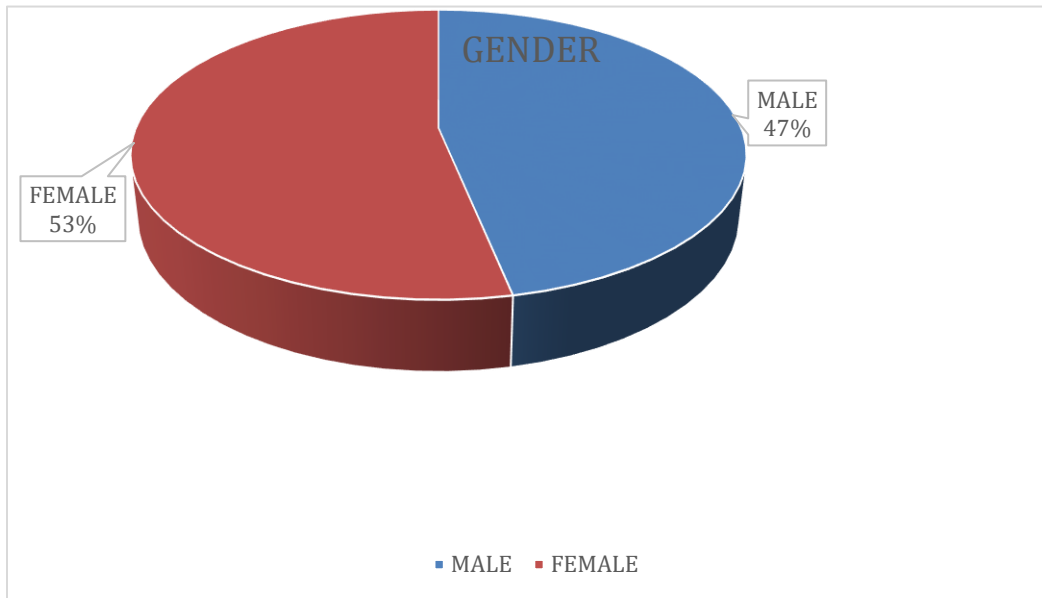
The data collection instrument was a questionnaire designed on the 5-points Likert scale (Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree). The questionnaire was adapted from prior studies of Davis (1989), Venkatesh and Davis (1996), Gon and Rawekar (2017), and Suki and Suki (2011). The questionnaire used for the study had two main sections, namely, the demographic data section and the constructs section. Gender and age formed the demographic section, while ease of use, usefulness, attitude, technological challenges, and actual use of Whatsapp Messenger formed the primary constructs for the study. The questionnaire had 21 items in total, of which 2 items were based on demographic data, while the remaining 19 were for the five constructs.

The data collected was then analysed using the Statistical Product and Service Solution (SPSS) version 24. The research hypotheses were analysed using Pearson product-moment correlation coefficient analysis. The P-value of .01 and .05 were used as a test for significance for the hypotheses. Furthermore, the researchers conducted pilot testing to test for the internal consistency of the research instrument. Data gathered from the pilot testing was analysed using Cronbach's Alpha reliability analysis in SPSS.

Presentation of Results

Analysis of Data from Participants

Figure 2: Background data of respondents



It is evident from figure 2 that out of the total 62 participants involved in the study, 47 per cent were males while 53 per cent were females. The gender inequality recorded could be attributed to the increasing number of female students reading history in senior high schools in Ghana. Again, concerning the age of the participants, 100 per cent of them were between 16-20 years. Thus, all the participants for the study fall within the same age range.

Reliability Analysis

The research scales adapted from Davis (1989), Venkatesh and Davis (1996), Gon and Rawekar (2017), and Suki and Suki (2011) have all been tested and proven by various researchers to have high internal consistency and reliability. The researchers also conducted Cronbach's alpha reliability analysis to ascertain the validity of the adapted questionnaire used for the study. The Cronbach's alpha value for the overall items on the scale recorded an alpha value of 0.877. The alpha values for the individual constructs also ranged from 0.707 to 0.782—which is generally regarded as reliable. The result from the Cronbach's alpha analysis is depicted in Table 1.

Table 1: Cronbach's Alpha Reliability Statistics

Variable	Cronbach's Alpha
Ease of Use (EOU)	0.710
Usefulness (U)	0.782
Attitude (ATT)	0.708
Technological Challenges (TC)	0.725

The Determinants of Students Attitude and Actual Use of WhatsApp Messenger for teaching and learning

To determine the strength and direction of the association among actual use, ease of use, usefulness, attitude, and technological Challenges, the researchers utilised Pearson's correlation for data analysis. The significant value of 0.01 and 0.05 were both used as a measure of significance of the correlation. The results of the study are presented in Table 2.

Table 2. Determinants of Students Attitude and Actual WhatsApp Messenger Use

Pearson correlation	1	2	3	4	5
AU	1				
EOU	.526**	1			
U	.529**	.655**	1		
ATT	.600**	.527**	.636**	1	
TC	-.236*	.407**	.352**	-.244*	1

**Correlation is significant at the 0.01 level(1-tailed)

*Correlation is significant at the 0.05 level(1-tailed)

The Relationship between Ease of Use of WhatsApp Messenger and Students Attitude towards its use for Teaching and Learning

The result from Table 2 shows that there is a strong positive correlation between the two variables, $r=0.527$ $p<0.01$, with high levels of ease of use associated with students' attitude towards the use of WhatsApp Messenger. This means that as students find it easy to use WhatsApp for teaching and learning, their attitude towards WhatsApp use for teaching and learning also increases or becomes positive, and vice versa. Again, the correlation between the two variables was statistically significant at p-value of less than 0.01. This implies that ease of use is a significant factor influencing students' attitude towards WhatsApp Messenger use for teaching and learning. The coefficient of determination (R^2) of 0.278 indicates that ease of use of WhatsApp Messenger determined 27.8 per cent of variance in explaining students' attitude towards WhatsApp for teaching and learning. The acceptable variance inflation factor (VIF) threshold of 1.896 also showed an absence of collinearity effects in the measurement. This is because the VIF value obtained is not more than the 3.3 recommendation by Kock (2015) and Hair et al. (2017). Based on the findings, the study failed to reject the alternate hypothesis which states that there is a statistically significant positive relationship between ease of use and students' attitude towards WhatsApp Messenger use for teaching and learning.

The Relationship between Ease of Use of WhatsApp Messenger and Actual Use of WhatsApp Messenger for Teaching and Learning

The study further hypothesised that there is a statistically significant positive relationship between ease of use and actual use of WhatsApp Messenger for teaching and learning. The findings from Table 2 show a strong positive correlation between ease of use and actual use of WhatsApp Messenger for teaching and learning ($r=0.526$, $p<0.01$) with high levels of ease of use associated with actual WhatsApp Messenger use. The result presupposed that the more easiness students find WhatsApp messenger to be, the more likely they will use it for teaching and learning. Furthermore, the correlation between ease of use and actual WhatsApp Messenger use was statistically significant at p-value of less than 0.01. This means that ease of use of WhatsApp Messenger is a significant factor influencing students' actual WhatsApp use for teaching and learning. The 0.276 coefficient of determination (R^2) indicates that ease of use of WhatsApp Messenger determined about 27.6 per cent of variance in explaining students' actual use of WhatsApp for teaching and learning. The data on variance inflation factor (VIF) also indicated an absence of collinearity effects with an acceptable threshold of 1.938, which is not more than the 3.3 recommendation by Kock (2015) and Hair et al. (2017). From the preceding, the study failed to reject the alternate hypothesis, which states that there is a statistically significant positive relationship between ease of use and actual use of WhatsApp Messenger for teaching and learning.

The Relationship between Usefulness of WhatsApp Messenger and Students Attitude towards its Use

Concerning the hypothesis which states that there is a statistically significant positive relationship between usefulness of WhatsApp Messenger and students attitude, the result from the Pearson correlation analysis in Table 2 indicates a strong positive correlation between usefulness of WhatsApp Messenger and students attitude towards its use ($r=0.636$, $p<0.01$) with high levels of usefulness of WhatsApp Messenger associated with students attitude towards its use. The result revealed that the more students find WhatsApp Messenger to be useful, the positive attitude they have towards its use in teaching and learning, and vice versa. Moreover, the correlation between usefulness of WhatsApp Messenger and attitude of students towards its use was statistically significant at p-value of less than 0.01. This indicates that usefulness of WhatsApp Messenger is a significant factor influencing students' attitude towards WhatsApp Messenger for teaching and learning. The coefficient of determination (R^2) of 0.404 also indicates that the predictor, Usefulness of WhatsApp Messenger, determined a total variance of 40.4 per cent explanation in the dependent variable, which is students' attitude towards WhatsApp Messenger use for teaching and learning. The variance inflation factor (VIF) also showed an absence of collinearity effects with an acceptable threshold of 1.780 based on the 3.3 recommendation (Kock, 2015; Hair et al., 2017). Thus, the study failed to reject the alternate hypothesis, which states that there is a statistically significant positive relationship between

usefulness of WhatsApp Messenger and students' attitude towards its use for teaching and learning.

The Relationship between Usefulness of WhatsApp Messenger and Actual WhatsApp Messenger Use for teaching and learning

Furthermore, the result revealed that there is a strong positive correlation between usefulness of WhatsApp Messenger and actual WhatsApp Messenger use for teaching and learning ($r=0.529$, $p<0.01$) with high levels of usefulness of WhatsApp Messenger associated with actual WhatsApp Messenger use. The result presupposed that the more students find WhatsApp Messenger to be useful, the more likely they will use it for teaching and learning. In addition, the correlation between usefulness of WhatsApp Messenger and actual use of WhatsApp Messenger was statistically significant at p-value of less than 0.01. This suggests that usefulness of WhatsApp Messenger is a significant factor influencing students' actual use of WhatsApp Messenger for teaching and learning. The coefficient of determination (R^2) of 0.279 proves that usefulness of WhatsApp Messenger determined about 27.9 per cent of variance in explaining students' actual use of WhatsApp for teaching and learning. The variance inflation factor (VIF) data also showed no collinearity effects with an acceptable threshold of 2.235. Given the findings, the study failed to reject the alternate hypothesis, which states that there is a statistically significant positive relationship between usefulness of WhatsApp Messenger and WhatsApp actual use or teaching and learning.

The Relationship between Students Attitude towards WhatsApp Messenger Use and Actual Use of WhatsApp Messenger for Teaching and Learning

For the relationship between students attitude towards WhatsApp Messenger use and actual WhatsApp use, the findings of the study divulged that there is a strong positive correlation between students attitude and actual WhatsApp use for teaching and learning ($r=0.600$, $p<0.01$), with high levels of students attitude towards WhatsApp Messenger use associated with actual WhatsApp Messenger use. This means students' positive attitude towards WhatsApp impacts high actual WhatsApp Messenger use for teaching and learning. Moreover, the correlation between students' attitude towards WhatsApp Messenger use and actual use of WhatsApp Messenger for teaching and learning was statistically significant at a p-value of less than 0.01. This suggests that students WhatsApp's attitude is a significant factor that influences students' actual use of WhatsApp Messenger for teaching and learning. The coefficient of determination (R^2) of 0.36 indicates that students' attitude determined about 36 per cent of variance in explaining students' actual WhatsApp Messenger use for teaching and learning. The acceptable variance inflation factor (VIF) threshold of 1.742 also indicated an absence of collinearity effects (Kock, 2015; Hair et al., 2017). Based on this revelation, the study failed to reject the alternate hypothesis, which states that there is a statistically significant positive relationship between students' attitude towards WhatsApp Messenger use and actual use of WhatsApp Messenger for teaching and learning.

The Relationship between Technological Challenges Associated with WhatsApp Messenger Use and Students attitude Towards WhatsApp Messenger Use for teaching and learning

The evidence from Table 2 also indicates that there is a weak negative correlation between technological challenges and students attitude towards WhatsApp Messenger use ($r = -0.244$, $p < 0.05$), with low levels of technological challenges associated with students attitude. This means that when students face more technological challenges regarding the use of WhatsApp Messenger for teaching and learning, they develop a negative attitude towards its use for teaching and learning, and vice versa. Also, the correlation between technological challenges and students' attitude towards WhatsApp Messenger use for teaching and learning was statistically significant at a p-value of less than 0.05. This means that technological challenges significantly influence students' attitude towards WhatsApp use for teaching and learning. The coefficient of determinations (R^2) value of 0.0595 also indicates that technological challenges determined about 5.95 per cent of variance in explaining students' attitude towards using WhatsApp Messenger for teaching and learning. The acceptable variance inflation factor (VIF) threshold of 1.218 also showed an absence of collinearity effects (Kock, 2015; Hair et al., 2017). Therefore, the study failed to reject the alternate hypothesis, which states that there is a statistically significant negative relationship between technological challenges and students' attitude towards WhatsApp Messenger use for teaching and learning.

The Relationship between Technological Challenges Associated with WhatsApp Messenger Use and Actual WhatsApp Messenger Use for Teaching and Learning

The result from Table 2 further shows that there is a weak negative correlation between technological challenges and actual WhatsApp Messenger use for teaching and learning, $r = -0.236$, $p < 0.05$, with low levels of WhatsApp Messenger's technological challenges associated with actual WhatsApp Messenger use. From the result, the more technological challenges students face concerning the use of WhatsApp messenger for teaching and learning, the less likely they will use it for teaching and learning, and vice versa. The correlation between technological challenges and actual WhatsApp Messenger use for teaching and learning was statistically significant at p-value of less than 0.05. This means that technological challenges significantly influence students' actual WhatsApp Messenger use for teaching and learning. The coefficient of determination (R^2) of 0.0556 indicates that technological challenges associated with WhatsApp Messenger use determined about 5.56 per cent of variance in explaining students' actual use of WhatsApp for teaching and learning. The acceptable variance inflation factor (VIF) threshold of 1.217 also showed an absence of collinearity effects in the measurement (Kock, 2015; Hair et al., 2017). Based on the findings, the study failed to reject the alternate hypothesis, which states that there is a statistically significant negative relationship between technological challenges and actual use of WhatsApp Messenger for teaching and learning.

Summary of Findings

Table 3. Summary of Main Findings

Hypothesis	Correlation coefficient (r)	Strength of correlation	Sig.	R ²	Tolerance	VIF	Effect size based on (r)	Result
H ₁ :EOU=>ATT	.527	High	.000	.274	.535	1.869	Large	Supported
H ₂ :EOU=>AU	.526	High	.000	.276	.516	1.930	Large	Supported
H ₃ :U=>ATT	.636	High	.000	.404	.562	1.780	Large	Supported
H ₄ :U=>AU	.529	High	.000	.279	.447	2.235	Large	Supported
H ₅ :ATT=>AU	.600	High	.000	.360	.574	1.742	Large	Supported
H ₆ :TC=>ATT	-.244	Weak	.028	.059	.821	1.218	Small	Supported
H ₇ :TC=>AU	-.236	Weak	.032	.055	.822	1.217	Small	Supported

Mediating Role of Attitude

Tables 3 and Table 4 show that ease of use (EOU) and attitude (ATT) are positively correlated ($r=.527$, $P<0.01$), usefulness (U) and attitude (ATT) are also positively correlated ($r=.636$, $P<0.01$), and technological challenges (TC) and attitude (ATT) are negatively correlated ($r=-.244$, $P<0.05$) on one hand. On the other hand, attitude (ATT) is positively correlated with actual WhatsApp Messenger use (AU) ($r=.600$, $P<0.01$). The result indicates that ease of use, WhatsApp's usefulness, and technological challenges associated with the use of WhatsApp Messenger influence students' attitude towards WhatsApp Messenger use for teaching and learning. In contrast, attitude, in turn, influences students WhatsApp actual use for teaching and learning.

Table 4: Mediating Role of Attitude

Pearson correlation	1	2	3	4
ATT	1			
EOU	.527**	1		
U	.636**	.655**	1	
TC	-.244*	.407**	.352**	1

**Correlation is significant at the 0.01 level (1-tailed)

*Correlation is significant at the 0.05 level (1-tailed)

Discussion of Findings

Concerning the relationship between WhatsApp's ease of use and actual WhatsApp use, the findings showed that ease of use positively correlates with actual use of WhatsApp Messenger for teaching and learning in the Senior High School (SHS) level. The result is incongruent with Lee et al. (2019) who posited that there is a positive relationship between perceived ease of use and the actual use of technology. This implies that students need adequate training in WhatsApp Messenger's functions and features before the platform is adopted for teaching and learning.

Furthermore, the findings also showed that WhatsApp's usefulness positively correlates with actual WhatsApp use of for teaching and learning in the Senior High School level. The high correlation coefficient ($r=.529$) of WhatsApp's usefulness than WhatsApp's ease of use ($r=.526$) indicates that WhatsApp's usefulness significantly influences actual WhatsApp use than WhatsApp's ease of use. This finding is consistent with that of Ali et al. (2020), who revealed that perceived usefulness is an essential construct in explaining WhatsApp usage. Thus, students are likely to use WhatsApp Messenger for teaching and learning if they perceive it to be useful. The implication is that students need to be abreast with the usefulness of WhatsApp Messenger for teaching and learning before the system is utilised by the teacher or the instructor, as this will help students use the platform for teaching and learning effectively.

Next, regarding the relationship between technological challenges and actual WhatsApp Messenger use, the findings also revealed that technological barriers negatively correlate with actual use of WhatsApp Messenger for teaching and learning. This implies that the lower the technological challenges and barriers, the higher the use of WhatsApp Messenger for teaching and learning by students. And the higher the challenges, the lower the usage of WhatsApp Messenger for teaching and learning. The finding corroborates Purnomo and Kusnandar (2018), who found that technological barriers and challenges influence the acceptance and use of ICT significantly. Schools, teachers, and the ministry/department of education should find diverse ways of eliminating barriers to WhatsApp/technology use: This will enable teachers and students to adopt the platform for teaching and learning in Africa and other developing worlds.

Moreover, the study found a positive correlation between students' attitude towards WhatsApp Messenger use and actual WhatsApp Messenger use for teaching and learning in SHS. This implies that student's attitude was a significant factor influencing students' WhatsApp's actual use for teaching and learning. The finding is in line with Tselios et al. (2011) and Ali et al. (2020), who reported that a positive attitude towards WhatsApp usage for teaching and learning could increase the user's behavioural intention and actual WhatsApp usage.

Concerning the mediating role of attitude, the study revealed that WhatsApp's ease of use and usefulness of WhatsApp Messenger positively associate with students' attitude towards its use. In contrast, technological challenges negatively associate with students' attitude towards WhatsApp Messenger use for teaching and learning. On the other hand, WhatsApp Attitude positively associates with WhatsApp Actual Use for teaching and learning. The tripartite relationship among WhatsApp Messenger's ease of use, WhatsApp's usefulness, and technological barriers indicate that students develop a more positive attitude towards using WhatsApp for teaching and learning when they see the platform as useful and with no difficulty and barriers.

The above findings agree with Suki and Suki (2011) and Shambere (2014) who reported that PU and PEOU positively affect attitude towards the use of WhatsApp Messenger for teaching and learning. Also, concerning the relationship between technological challenges and students' attitude towards WhatsApp Messenger use for teaching and learning, the finding corroborates with Ryder and Machajewski's (2017) study, which found a significant relationship between students' attitudes and students' attitudes' access to the Internet and computers. It also corroborates with Bere and Rambe (2016) finding that low-cost communication significantly influences students' attitude towards the adoption of mobile instant messages for m-learning. Regarding the relationship between students attitude towards WhatsApp Messenger use and actual use of WhatsApp Messenger for teaching and learning, the finding confirms the finding of Tselios et al. (2011) and Ali et al. (2020) that positive attitude towards WhatsApp Messenger for teaching and learning can increase the user's actual ICT/WhatsApp usage.

Conclusion

The main focus of the study was to gain insight into factors that influence actual WhatsApp Messenger use and students' attitude towards its use for teaching and learning in a senior high school in Ghana. The study adapted four TAM constructs, specifically perceived ease of use, perceived usefulness, attitude, and actual use. Technological challenges and barriers are significant issues confronting technology acceptance in less developed nations; hence, the researchers included technological challenges to the model to help better understand its relationship with students' attitude towards technology use and actual system use. The findings provided essential information to help explain the associations among students' attitudes, ease of use, WhatsApp's Usefulness, WhatsApp's actual use, and technological barriers in using WhatsApp Messenger for learning and learning during the COVID-19 global crisis. A conclusion could be drawn from the findings and supporting literature that, for students to successfully learn with technology i.e. WhatsApp Messenger during a global pandemic, educators should find a platform that is easy to use, useful, and free from technological barriers.

Limitation of the Study

Because of the small sample size of this study, the generalizability of the results may be limited. Also, the cross-sectional study was conducted in one Senior High School in Ghana. Hence, longitudinal research is needed to examine the fluctuation of WhatsApp usage and attitude of students towards WhatsApp use for learning in senior high school.

Implication for Theory and Practice

The study proved that a negative relationship exists between technological Challenges and students' attitude, and technological challenges and actual WhatsApp Messenger use. This was necessary to provide better insights into the role technological challenges play in the TAM model.

The findings also depicted that high school students' acceptance and use of WhatsApp Messenger for teaching and learning was a product of WhatsApp's ease of use, WhatsApp's usefulness, students' attitude, and technological challenges associated with WhatsApp Messenger use for teaching and learning.

Authorities and decision-makers of senior high school education in the least developed countries should also focus on improving internet connectivity to enable students and teachers to utilise WhatsApp Messenger and other m-learning technologies for teaching and learning.

Authorities should provide mobile learning tools to libraries in senior high schools to enable students to access m-learning technologies for teaching and learning.

Authorities should strive to train students and teachers on the usefulness of WhatsApp messenger for supplementing traditional teaching and learning. Thus, training should be organised periodically to help reduce the difficulty both students and teachers face in using WhatsApp for teaching and learning while making its educational Use more effective and efficient.

Suggestions for Future Studies

Future studies may consider structural equation modeling using the conceptual model which was adapted for this study. Additionally, future studies can also include students from other subject areas other than history. It is proposed that future studies may also utilise a larger sample size to predict the relationships among the variables better. Finally, the researchers believe that a study is required to investigate students coping strategies to WhatsApp usage for Emergency Remote Teaching amid a global crisis.

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