



Effects of WhatsApp Package on Senior Secondary School Students' Motivation, Achievement and Gender in Physics in Jos, Plateau State, Nigeria

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ABSTARCT

It has been observed that over dependent on the usual face-to-face methods of instruction adopted by Nigerian teachers over the use of social media has been the major learning barriers of secondary school students during global health pandemic and other natural and artificial disaster threats leading to School closure. Therefore, this study aimed at examining the Effects of WhatsApp package on Senior Secondary School Students' Motivation and Gender in Physics in Jos-North, Plateau State, Nigeria. The study employed the quasi experimental design. The population of this study is 121 SS2 students offering physics from two public schools. Three research questions were posed and answered and two null hypotheses were formulated and tested at 0.05 level of significance. Physics Motivation questionnaire (PMQ) and Physics Achievement Test (PAT) were used for the data collection. The instruments were validated by two experts from physics education unit, and Test, measurement and evaluation units, all from Faculty of Education University of Jos. Data were analyzed using mean, standard deviation and ANCOVA using the Statistical Package for Social Sciences (SPSS) version 23 software. The reliability index of the PMQ was determined and found to be 0.98 and that of PAT stood at 0.71. The finding revealed that there is a significant difference in motivation of students taught physics using WhatsApp strategy and Lecture method in favour of WhatsApp strategy, students in the treatment group achieved higher than those in the control group and that WhatsApp does not discriminate against gender. The findings recommended that Schools and parents should provide social media applications such as WhatsApp to motivate learning within and outside the classroom. Stakeholders in education should organize workshop and seminars to educate serving and pre-serving teachers on the operation and implementation of WhatsApp to stimulate and enhance productive learning motivation for quality assurance in physics.

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INTRODUCTION

The world is changing as a result of science and technological development driven by physics education and innovations. Physics is the

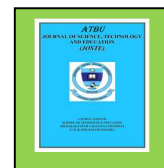
study of matter, energy and their interactions with physical quantities (Osinabi, Azeez, Igwebuike & Danladi; 2020). It is the science of measurement and interaction of physical quantities with other

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particles. Physics is the basis of science and technology innovations because its principles, laws and theories are widely used by experts for technological development and advancement in many countries including Nigeria. According to Owusu (2022), no nation can advance technologically without a solid foundation in Physics. The importance of physics is found in the discovery of hydroelectric power and electronics, modern vehicles and nuclear weapons, computers and communication networks, artificial intelligence and medical instruments, thermonuclear power plants and instruments.

Despite the glaring importance of physics to scientific, technological and socioeconomic development of any nation, students' performance in the subject keeps on declining. The poor performance in physics by school leavers has been hinged by many researchers on poor teaching strategies, lack of motivation, inadequate qualified teachers, lack of well-equipped physics laboratories, teachers' inability to use modern gadgets like mobile phones, ICT facilities among others. This ugly trend if not address would result to the decrease in the production of power in physics which would equally lead to retardation in scientific and technological development of the nation. Achievement in physics involves the extent to which learners are able to learn desired learning content, behavior and skills needed for both personal and societal development. Achievement in physics also involves observable and measurable product of education. Akinbobola (2019), stated that physics students taught with mobile learning achieved and retained significantly better than those taught with lecture method. Learning achievement is possible when physics teachers educate learners about the importance of physics and the opportunities it offers towards the development of learner and the society at large and also uses modern methods of instruction by considering the learner's ability, previous experience, availability of learning materials and learning barriers. The physics teacher physically or virtually set the academic tone, evaluate and help improve the

skills of learners, review instructional objectives, examine learning materials, use standard curriculum, sets performance objectives and make research to improve physics as a subject.

Motivation is an energizer or driving force of learning achievement in education that makes someone to effectively learn and when incorporated by physics teachers during teaching and learning process, accelerates achievement of educational objectives for national development. (Mtega & Bernard 2013), stated that social media has the potential to enhance student's engagement, motivation and learning outcomes. Motivated physics students are eager to learn, willing to undertake learning activities also attend lessons regularly and punctually thereby making the work of teachers easy. Social media tools and applications such as WhatsApp which appeal to the interest and motivation of adolescents can be used to enhance learning achievements. Similarly, Nsabayeze, Iyamuremye, Kwitonda and Mbonyirivuze (2021) opined that WhatsApp promotes students' motivation, engagement, collaboration, interaction, participation, and ubiquitous learning.

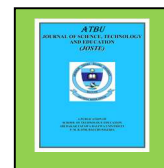
Gender refers to the special constructed phenomenon that is brought about by societal socio-cultural and religion ascription of different roles, duties, behaviors, and mannerism to two sexes. These social assigned roles by both sexes differs in traditional Nigerian setting, female and male sex roles are seen as mutually exclusive as many assume that technological based subjects which are problem solving in nature are for male students than their female counterparts. Babajide (2011), opine that science and technology are male dominated as girls' shy away from such field of study and conceptual science like physics and chemistry are given a masculine outlook by educational practitioners. Ntibi and Ibok (2020) revealed a significant difference between male and female academic achievement in physics using social media in favor of females. Ntaka (2020), which showed that there was no significant difference in the rating of social media WhatsApp amidst male and female students in Secondary schools. The need to incorporate the use of WhatssApp to

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avoid sexual discrimination in education so as to eliminate the shortage of either male or female representations in science and technology is one of the concerns of the researchers.

Teaching of physics in secondary schools include both theoretical and practical experiences which a learner is expected to gain under the auspices of a school instructor as prerequisite for success. Physics involve all those physicists learn, think and manipulate in our natural environment for problem solving. Teaching method is implemented by an instructor whose job is to deliberately organize, communicate and facilitate valuable knowledge, attitudes and skills needed for growth and development of learners and the society at large in a conducive learning atmosphere. The method used can be identified by the type of activities perform by both the teacher and students together during teaching and learning session.

The need to incorporate new blended social media computers, mobile phone and internet applications such as WhatsApp which motivates learning interest in most adolescence due to its universal access to information, convenience, functionality, support higher order thinking skills and flexibility of social technologies needed to enhance physics teaching and learning at different comfortable locations with limited barriers and threats. Social media today has taken a firm place in the lives of younger generations, hence the need to incorporate in teaching to provide an opportunity for learners to interact with course content, their instructor and peers in and outside the classroom under the close monitoring and supervision of the teacher.

Statement of the Problem

In the past, teachers and students relied so much on face-to-face four-walled instructional methods as well as scarce and expensive printed materials as the source of knowledge, while all communications in the classroom was through ink and paper file. The invention of computers, mobile phones and their associated internet networks has brought a remarkable change to a lot of professions especially in science education physics inclusive.

Despite the importance of physics to humanity, learning achievement in physics is still not encouraging as reported by the West Africa Examination Council (WAEC, 2020). Mojeed (2021) also reported that in the last two years, the Unified Tertiary Matriculation Examination (UTME) revealed a lag in the performance of students in physics especially in the use of computer devices. This can be attributed to poor motivation, over dependence on the usual face-to-face methods of instruction which was affected by global health pandemic, socio-economic problems, political and security threats. School closures in response to these challenges have shed more light on numerous issues affecting access to quality educational achievement and the attainment of a peaceful learning environment in Nigeria (Usman & Madudili, 2021). Thus, the need to examine the effects of WhatsApp package on Senior Secondary School Students' Motivation, Achievement and Gender in Physics in Jos, Plateau State, Nigeria.

Aims and Objectives of the Study

The aim of this study is to examine the effects of WhatsApp package on Senior Secondary School Students' Motivation in Physics in Jos, Plateau State, Nigeria. Specifically, the study seeks to address the following objectives:

1. find the pre-test and post-test motivation mean scores of students taught physics using WhatsApp and conventional lecture method;
2. Determine the post-test motivation mean scores of students in physics based on gender.
3. Ascertain the differences pretest between the pretest and posttest achievement mean scores taught physics using WhatsApp and those taught with conventional lecture method.

Research Questions

The following research questions were be answered in this study:

1. What is the pre-test and post-test motivation mean scores of students taught physics

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- using WhatsApp package and conventional lecture method?
2. What is the post-test motivation mean scores of students in physics based on gender?
 3. What is the pre-test and post-test achievement mean scores of students taught physics using WhatsApp package and conventional lecture method?

Hypotheses

The following hypotheses were tested at 0.5level of significance:

1. There is no significant difference in the post-test motivation mean scores of students taught Physics using WhatsApp package and conventional lecture method.
2. There is no significant difference in the post-test motivation scores of students in physics based on gender.
3. What is the pre-test and post-test achievement mean scores of students taught physics using WhatsApp package and conventional lecture method?

METHOD AND PROCEDURE

This investigation employs the quasi-experimental design. Specifically, the pre-test and post-test experimental and control group. The experimental group were exposed to the use of WhatsApp strategy using WhatsApp text, charts and video lesson contents for teaching and learning physics while the control group were exposed to the traditional or conventional lecture method of teaching physics. The design used does not allowed randomization of subjects, as such, intact class was used. The data was collected using

Physics Motivation Questionnaire (PMQ) with thirty Likert-scale items of 5points: Strongly Agreed (SA), Agree (A), Strongly Disagree (SD) and Disagree (D), Undecided (U). The study consists of the entire 1,950 public senior secondary school physics students of SS2 class out of which 1066 are male and 884 are

female in all the 173 co-educational secondary schools of 23 public schools and 105 private schools in Jos, Plateau State, Nigeria. The sample used for the intact class in this study consist of 121 SS2 students offering physics with 60 boys and 61 girls selected from two public schools in Jos, Plateau State. The SS2 students of both schools were used as intact class for the study. This means that there was no randomization of subjects.

The validity of physics achievement test (PAT) and Physics Motivation Question (PMQ) was done by two experts one from the Department of Science and Technology Education, and one from Research, Measurement and Evaluation unit all from Faculty of education University of Jos, after which their judgements, inputs and suggestions were corrected before the production of the final instrument for administration with the help of research assistants. The reliability was determined using Cronbach's coefficient alpha formula on the Statistical Package for Social Sciences (SPSS) software version 23. The reliability of the instrument was found to be 0.71, after pretesting of the item.

The method used in analyzing the pretest and post-test data collected was both inferential and descriptive statistics. Mean and standard deviation was used to answer the research questions. The data collected was subjected to Statistical Package for Social Sciences (SPSS) version 23 software. While the null hypotheses formulated were tested using Analysis of covariance (ANCOVA) and the decision to either accept or reject the null hypothesis was considered at 0.05level of significance.

RESULTS AND DISCUSSIONS

Research Question 1: What is the pre-test and post-test motivation mean scores of students taught physics using WhatsApp package and conventional lecture method?

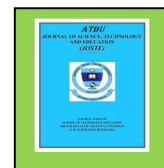


Table 1: Pre-test and Post-test Motivation Mean Scores of Students in Physics using WhatsApp Package and Conventional Lecture Method

Teaching Strategy	N	Pretest M	SD	Posttest M	SD	Mean Difference
WhatsApp	57	33.12	9.12	65.08	16.18	31.95
Lecture	64	32.22	8.79	64.76	15.92	30.54

0.41

Table1. The pre-test scores of the experimental shows a mean score of 33.13 and standard deviations of 9.12 while the control shows a mean score of 34.22 and standard deviations of 8.79 which is in favour of the control group. For the post-test motivation, the result shows the experimental mean score of 65.08 and standard deviations of 16.18 while the control group mean score was 64.76 and standard deviations of 15.93 which is in favour of the

experimental method with a mean difference between of 31.95 and 30.54 respectively and a total mean difference of 0.41. This implies that there is no significant difference in the motivation level of students offering physics using WhatsApp package and lecture method.

Research Question 2: What is the post-test motivation mean scores of students in physics based on gender?

Table 2: Post-test Motivation Mean Scores of Students in Physics Based on Gender using WhatsApp Package

Gender	N	M	SD	Mean Difference
Male	31	82.07	8.95	0.38
Female	26	81.69	8.06	

Table 2 presented the mean scores for male students was 82.07 and the standard deviation was 8.95 while the mean scores for female was 81.69 and the standard deviation was 8.06 with a mean difference of 0.38. This implies that there is no significant difference in the post-test motivation mean scores of male and

female students taught Physics using WhatsApp package.

Research Question3: What is the pre-test and post-test achievement mean scores of students taught physics using WhatsApp package and conventional lecture method?

Table 3: Pre-test and Post-test Achievement Mean Scores of Students Taught Physics using WhatsApp Package and Conventional Lecture Teaching Method

Teaching Strategy	N	Pre-test M SD	Post-test M SD	Mean Difference
WhatsApp	57	30.31 6.76	63.92 16.30	33.61
Lecture	64	31.70 7.82	55.78 14.75	24.08

9.53

Table 3. The pre-test result shows a mean score of 30.31 and standard deviation of 6.79 for the experimental while the control group shows a mean score of 31.70 and standard deviation of 7.82 which is in favour of the control method and group. For the post-test academic

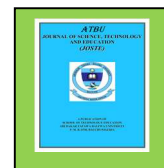
achievement, the post-test result of the experimental shows a mean score of 63.92 and standard deviation of 16.30 while the mean score of the control group was 55.78 with a standard deviation of 14.75 which is in favour of the experimental method and group with a group

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mean difference of 33.61 and 24.08 respectively and a total means score difference of 9.53. This implies that the achievement of students offering physics are better achieved when exposed to the experimental method.

Hypothesis 1: There is no significant difference in the post-test motivation mean scores of students taught Physics using WhatsApp package and conventional lecture method.

Table 4: ANCOVA Summary of Post-test Result on Motivation between Experimental and Control Groups

Source	Type III Sum of Squares	Df	Mean Square	F	p-value
Corrected model	1434.985	2	717.493	3.106	.053
Intercept	12099.367	1	12099.367	52.382	.000
Post Experiment	59.754	1	59.754	.259	.613
Post Control	7.478	25	.299	1.503	.016
Error	12473.155	54	230.984	6.211	
Total	206469.00	57			
Corrected Total	13908.140	56			

Table 4. The result yielded $F(6.211) = 0.016$, $p < 0.05$, since the p-value of 0.016 is less than 0.05 level of significance, the null hypothesis was rejected, indicating that there is a significant difference between the experimental and control group of Senior Secondary Two

students' motivation mean score in Physics in favour of the experimental group.

Hypothesis 2: There is no significant difference in the post-test motivation scores of students in physics based on gender.

Table 5: ANCOVA Summary of Post-test Result on Motivation between Students in the experimental Group Based on Gender

Source	Type III Sum of Squares	Df	Mean Square	F	p-value
Corrected model	871.315	3	290.438	1.037	.383
Intercept	12541.107	1	12541.107	44.757	.000
Post Experiment	798.161	1	798.161	2.848	.097
Post Control	844.894	2	422.447	1.508	.230
Error	16812.435	60	280.207		
Total	252424.000	64			
Corrected Total	17683.750	63			

The result yielded $F(1.508) = 0.230$, $p < 0.05$, since the p-value of 0.230 is greater than 0.05 level of significance, the null hypothesis was accepted, indicating that there is no significant difference between the experimental and control group motivational mean scores of students taught Physics. Therefore, it was resolved that the use of WhatsApp package in teaching physics is not gender biased.

DISCUSSION OF FINDINGS

The findings in table 1 revealed a higher motivation level of students in physics

when exposed to WhatsApp package than lecture method. This result agrees with the findings of (Mtega and Bernard 2013), which revealed that social media has the potential to enhance student's engagement, motivation and learning outcomes. WhatsApp innovative teaching package has increased students' learning motivation in this digital age, as they operate and manipulate social media tools and network for effective learning achievement at the comfort of their environment.

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The findings of this study in Table 2 revealed a negligible difference in the achievement of students offering physics in favour of males. This means that there is no significant difference between the male and female student's motivation level in physics when exposed to WhatsApp package. This finding is contrary to that of Ntibi and Ibok (2020), which revealed a significant difference between male and female academic achievement in physics using social media in favour of females. Hence the slight difference observed in this finding may be a chance factor. Therefore, WhatsApp package as the favorite and affordable platform among adolescence does not discriminate against gender motivation.

The finding in table 3 showed that there is a significant difference in the Post-Test achievement mean scores of students taught Physics using WhatsApp package and lecture method in favour of WhatsApp package. The study agrees with that of Nsabayezi, Iyamuremye, Kwitonda and Mbonyirivuze (2021) that WhatsApp promotes students' motivation, engagement, collaboration, interaction, participation, and ubiquitous learning. Hence, WhatsApp teaching and learning package has improved student's motivation towards physics learning achievement.

Table 4 results shows $F(6,211) = 0.016$, $p < 0.05$, since the p-value of 0.016 is less than 0.05 level of significance, the null hypothesis was rejected, indicating that there is a significant difference between the experimental and control group of Senior Secondary Two students' motivation mean score in Physics in favour of the experimental group.

The finding in table 5 showed that there is no significant difference between male and female students' motivation mean scores taught Physics using WhatsApp package. This agrees with that of Ntaka (2020), which showed that there was no significant difference in the rating of social media WhatsApp amidst male and female students in Secondary schools. Hence WhatsApp does not discriminate against gender and also generates opportunities for students to make contributions to their learning, develop concepts

through collaborative interactions, and model individual to solve physics problems in and outside the classroom.

CONCLUSION

Based on the findings of this study, the researcher concluded that WhatsApp instructional package has shown to enhance and promote students' motivation in physics better than the conventional lecture method. However, the WhatsApp instruction favored both male and female students in terms of motivational as well as achievement. Hence, physics teachers should always diversify their teaching strategy with the use of WhatsApp package as being gender insensitive.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. Pre-serving physics teachers as well as secondary school students should be trained on how to use WhatsApp package to enhance their learning motivation and academic achievement.
2. Seminars and workshops should be organized by educational stakeholders in order to educate practicing teachers on the use of WhatsApp package in teaching and learning at all levels due to efficiency in content delivery and gender friendly.
3. Curriculum planners and textbooks authors should mainstream social media in physics and other subjects of students' educational curriculum activities to provide them with other trending teaching and learning opportunities.

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